



(12)

EUROPEAN PATENT APPLICATION

- (43)

Date of publication:
21.08.2024 Bulletin 2024/34
- (51)

International Patent Classification (IPC):
B42D 25/351 (2014.01)
- (21)

Application number: 23156830.4
- (52)

Cooperative Patent Classification (CPC):
B42D 25/351
- (22)

Date of filing: 15.02.2023

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|---|---|
| <div>(84)</div> <div>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 ME MK MT NL
NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN</div> <div>(71)</div> <div>Applicant: HID Global Ireland Teoranta
Galway H91 FKF1 (IE)</div> | <div>(72)</div> <div>Inventors:<ul style="list-style-type: none">NOLAN, Frank
Kilcolgan, Co. Galway (IE)BLEE, Paul
Baile na hAbhann, Co. Galway (IE)</div> <div>(74)</div> <div>Representative: Kramer Barske Schmidtchen
Patentanwälte PartG mbB
European Patent Attorneys
Landsberger Strasse 300
80687 München (DE)</div> |
|---|---|

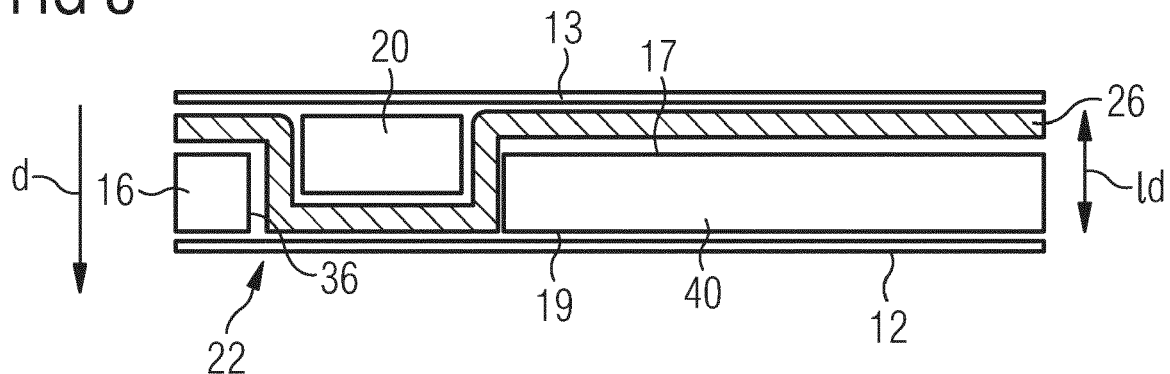
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SECURITY DOCUMENT AND METHOD OF MANUFACTURING THE SAME

- (57)

A security document (10) includes a first layer (16) including a security layer (26) such as a printed pattern or a foil, which extends at two different levels having a desired level difference inside the security document (10). The resulting three-dimensional structure increases
- the security of the security document (10), because a potential counterfeiter trying to cut open the security document (10) will likely also cut through the portion of the security layer (26) connecting the different levels. The resulting cut can be visually recognized.

FIG 3



Description

Technical Field

[0001] The present disclosure generally relates to security features for security documents, in particular, personalizable security documents such as identification cards, passports, driver's licenses, and the like.

Background

[0002] Physical identification documents generally employ a variety of different security features to authenticate and secure the document. Some documents contain a hologram (or several holograms) as a security feature. The presence of a hologram makes it possible to obtain a visual effect that depends on the angle of observation. This creates a first level of security, with the holographic features being easily identifiable, while at the same time providing aesthetic and attractive effects. For example, the presence of a hologram may result in a color change and/or an animation effect. US 2016/0075164 A1 discloses a security element comprising a volume hologram.

[0003] There are also other approaches for providing security features for such identification documents or other security documents. One example is the use of fluorescent inks to provide features which are only visible under UV light. US 2014/0319817 A1 discloses a security document comprising a first pattern and a second pattern, which overlap to define a security pattern. The two patterns differ in their fluorescent properties such that upon irradiation with a first wavelength, the light emitted by the first pattern is dominant, and upon irradiation with a second wavelength, the light emitted by the second pattern is dominant.

[0004] The present disclosure is directed, at least in part, to improving or overcoming one or more aspects of prior systems, without being limited to a particular type of security document.

Summary of the Disclosure

[0005] According to one aspect of the present disclosure, a security document comprises a substrate including a first layer, the first layer having a first recess in a first surface of the first layer. The security document further comprises a security feature formed in the substrate, the security feature including a security layer provided in a continuous manner on the first surface of the first layer and inside the first recess, and a patch of material disposed at least in part inside the first recess and on top of the security layer.

[0006] According to another aspect of the present disclosure, a method of manufacturing a security document comprises the steps of providing a first layer of a substrate, forming a security layer on a first surface of the first layer, and forming a first recess in the first layer at a

position that corresponds to the security layer. For example, the security layer may be formed by printing a pattern or image onto the first layer, or by applying a sheet-like security structure onto the first layer, for example, a DOVID ribbon or sheet. The method further comprises the steps of arranging a patch of material on top of the security layer from a side of the first surface, and moving the patch of material towards an opposite surface of the first layer together with a portion of the security layer disposed below the patch of material such that the security layer extends in a continuous manner at different levels inside the substrate.

[0007] Other features and aspects of the present disclosure will be apparent from the following description and the accompanying drawings.

Brief Description of the Drawings

[0008]

Fig. 1 shows a schematic plan view of an exemplary security document in accordance with the present disclosure,

Fig. 2 shows a schematic cross-sectional view of the security document in accordance with the present disclosure,

Fig. 3 shows an enlarged explosive cross-sectional view of the security document in accordance with the present disclosure,

Fig. 4 shows a schematic plan view and a schematic cross-sectional view of another security document in accordance with the present disclosure,

Fig. 5 shows a schematic plan view and two schematic cross-sectional views of another security document in accordance with the present disclosure,

Fig. 6 shows a schematic plan view of yet another security document in accordance with the present disclosure,

Fig. 7 shows several cross-sectional views of security documents in accordance with the present disclosure, and

Fig. 8 shows schematic cross-sectional views illustrating a method of manufacturing a security document in accordance with the present disclosure.

Detailed Description

[0009] The following is a detailed description of exemplary embodiments of the present disclosure. The exemplary embodiments described herein are intended to teach the principles of the present disclosure, enabling those of ordinary skill in the art to implement and use the present disclosure in many different environments and for many different applications. Therefore, the exemplary embodiments are not intended to be, and should not be considered as, a limiting description of the scope of protection. Rather, the scope of protection shall be defined by the appended claims.

[0010] The present disclosure is based at least in part on the realization that security features of security documents typically are arranged on or in individual layers forming the security document, for example, an ID card or a data page of a passport or the like. However, it has been realized that the layered structure of such security documents may result in vulnerabilities with respect to a potential manipulation of the security document. For example, if a security feature is arranged in an individual layer on a document, a counterfeiter can try to cut open the security document at a different layer, leaving the security feature intact. The counterfeiter may then be able to manipulate/falsify other elements of the security document, for example, data elements, an image showing a holder of the document, etc., and to reassemble the manipulated security document.

[0011] Accordingly, it has been realized that the security of such security documents can be further increased when a security feature such as a print layer, a hologram, a DOVID or the like is provided in multiple layers (at multiple different levels) of a security document, in particular, in a continuous manner. In this way, the security feature extends in a continuous manner between said different levels. When a counterfeiter tries to open the security document, it is very difficult to cut the security document without also cutting the portion of the security feature that extends between the different levels of the security document. If the security feature is visible from one or both sides of the security document, the resulting cut can be observed to identify that the security document has been tampered with. In accordance with the present disclosure, any appropriate security feature can be provided at multiple different levels. Further examples are laser engraved or other laser created features, portraits, threads, ribbons, fluorescent or phosphorescent layers (visible, for example, under UV or infrared light), etc.

[0012] The present disclosure is also based at least in part on the realization that the arrangement of a security feature in three dimensions, i.e., such that the same extends between different levels of the security document, can be achieved in a simple and cost-effective manner by first providing the security feature as a plane security feature in the usual manner, and then modifying the plane security feature such that a portion of the same is moved towards a different level inside the security document, leaving the security feature intact. In this manner, as described above, a security feature extending in a continuous manner between different levels of the security document can be formed.

[0013] Here, it has been realized that it is particularly advantageous to form a recess in the layer on which the security feature is provided, at a position that corresponds to the security feature. It is particularly advantageous to form the recess in an opposite surface of the layer on which the security feature is arranged, at a position that corresponds to the same. By removing an appropriate amount of material on the opposite side of the layer, it becomes possible to press the security feature

(together with the remaining portion of the underlying layer, if any) downwards, for example, during assembly of the security document and its several layers. In this manner, a corresponding recess or depression is formed in the surface of the layer supporting the security feature, with the security feature extending in a continuous manner from the surface of the layer to the bottom of the recess or depression thus formed. In an alternative, the recess could also be formed in the surface on which the security feature is to be provided, prior to arranging the same on this surface, and the portion of the security feature could then be moved into the already formed recess. In both cases, however, the step of forming a recess in the layer on which the security feature is provided is performed. It will be appreciated that, especially in the first case, the term "recess", when referring to the part in which a portion of the security feature is provided, is to be interpreted broadly, i.e., does not have to include sharp edges or steps, but can also have a curved profile, in particular, at a transition between the surface and the recess, or at a bottom of the same.

[0014] It has also been realized that, in some embodiments, an element that is to be protected inside the security document can be arranged such that it is partially or completely surrounded by the security feature that extends in a continuous manner between two different levels. This results in that it is very difficult or almost impossible to gain access to the element to be protected without cutting through the portion connecting the different levels of the security feature at least in a part of the same.

[0015] Further, it has been realized that the above-described security feature can not only be realized in security documents such as cards and the like, but can also be used in an advantageous manner, in particular, in a data page structure of a passport or the like. Here, it has been realized that the security can be further increased when the security feature extends in a continuous manner not only in the corresponding layer or layers of the data page, but also extends continuously to a hinge portion attaching the layer of the data page.

[0016] Fig. 1 shows a schematic plan view of an exemplary security document 10 in accordance with the present disclosure. In the embodiment shown in Fig. 1, security document 10 is a security card such as a driver's license, personal identity card, or the like. As shown in Fig. 1, security document 10 comprises a substrate 1 that has a substantially plane rectangular shape. A primary identification feature 2, for example, a portrait 11 of the holder of the document, is formed in a portion of substrate 1. Further, a security feature 3, which will be described in more detail below, is formed in another portion of substrate 1. Both primary identification feature 2 and security feature 3 are arranged such that they can be seen from a first side S1 of substrate 1 when security document 10 is viewed from said first side. Here, it will be appreciated that the expression "security document" as used herein covers both a personalizable security document (before the same has been personalized, e.g., without portrait

11), and such a security document after personalization.

[0017] As shown in Fig. 2, which is a schematic cross-sectional view of substrate 1, substrate 1 is formed from a plurality of layers of material, such as polycarbonate, PVC, PET composites or other plastic materials. Here, it will be appreciated that any appropriate materials that are commonly used for such identification or security documents can be used.

[0018] As shown in Fig. 2, exemplary substrate 1 includes a first layer 16. First layer 16 has a first recess 36 in a first surface 17 of first layer 16. As mentioned above, first recess 36 does not necessarily have to include sharp edges or steps, but can also have a rounded profile, especially at transitions. A further layer, for example, a first protective layer 13 is arranged on top of first layer 16. In the same manner, a second protective layer 12 is arranged on an opposite side S2 of substrate 1. In the exemplary embodiment shown in Fig. 2, a second layer 18 is provided below first layer 16, separated from the same by an additional intermediate layer 15. In some embodiments, as shown in the example in Fig. 2, an additional security feature 8 may be provided on or in second layer 18. For example, additional security feature 8 may be a watermark, a hologram, a UV-sensitive ink or the like, which can be observed in an appropriate manner from first side S1 and/or second side S2 of substrate 1.

[0019] It will be appreciated that the additional layers mentioned above are only exemplary, and are not necessary for a security document formed in accordance with the present disclosure. As such, for example, it may be sufficient that first layer 16 is the only core layer of security document 10, which layer 16 may be covered by appropriate protective layers 12, 13 on one or both sides of the same. Accordingly, in the following, the description will focus mainly on first layer 16 and security feature 3 provided on the same.

[0020] As shown in Fig. 2, security feature 3 is formed in substrate 1 such that it includes a security layer 26 that is provided in a continuous manner on first surface 17 of first layer 16 and inside first recess 36. A patch of material 20 is disposed at least in part inside first recess 36 and on top of security layer 26. Here, the expression "patch of material" is to be understood such that it covers any preferably solid body made of a specific material. In particular, the patch of material 20 may be made from the same material as first layer 16, for example, polycarbonate, PVC, or other plastic materials. Preferably, patch of material 20 is transparent, such that the portion of security layer 26 disposed below the same is visible when security document 10 is viewed from first side S1. In some embodiments, the layers of document 10 form a transparent window at the location of security feature 3, such that security layer 26 can be seen from both sides of substrate 1. In other embodiments, patch of material 20 does not have to be transparent. In this case, the underlying layers may be transparent, such that security layer is visible from second side S2 of substrate 1. It will be appreciated that patch of material 20 does not need to

be a separate body, but can be connected to or integrally formed with, for example, first protective layer 13, at least after assembly of security document 10 including said layers.

[0021] As shown in Fig. 3, in some embodiments, patch of material 20 is disposed inside first recess 36 such that a step 22 is formed in security layer 26 at a transition between the first surface 17 and first recess 36. Here, as mentioned above, the corners of step 22 may be rounded, which may be a result of the manufacturing method that will be described later.

[0022] In some embodiments, patch of material 20 may have a size that substantially corresponds to a size of first recess 36. In other words, when viewed from first side S1, the dimensions of patch of material 20 may be substantially the same as the dimensions of first recess 36. Alternatively and/or additionally, a thickness of patch of material 20 in a depth direction d of first recess 36 may be substantially the same as a depth of first recess 36 in depth direction d. Here, depth direction d is the direction substantially perpendicular to first surface 17, i.e., substrate 1. As such, depth direction d is also the direction along which the different layers of security document 10 are arranged, as shown in Fig. 2.

[0023] Returning to Fig. 3, the arrangement of a portion of security layer 26 inside first recess 36 results in that a level difference 1d is formed between a top portion of security layer 26 provided on first surface 17 and a bottom portion of security layer 26 provided inside first recess 36. In particular, level difference 1d may be between around 50 μm and around 600 μm , preferably between around 100 μm and around 500 μm , more preferably between around 150 μm and around 300 μm , for example, around 250 μm .

[0024] In some embodiments, level difference 1d may correspond to a thickness of first layer 16, as shown, for example, in Fig. 3. In particular, this may be the case when first recess 36 extends through first layer 16 such that it opens in an opposite surface 19 of first layer 16, i.e., first recess 36 penetrates first layer 16. As will be described in more detail below, this can be achieved by using corresponding manufacturing methods of security document 10. In such a case, security layer 26 inside first recess 36 may be substantially flush with opposite surface 19, i.e., may be aligned with opposite surface 19 of first layer 16. Of course, in other embodiments, first recess 36 may not penetrate first layer 16, and security layer 26 may be arranged on a bottom of first recess 36.

[0025] In some embodiments, as shown, for example, in Figs. 2 and 3, first layer 16 may include a data element 40 surrounded at least in part by security layer 26 inside first recess 36. As shown, for example, in Fig. 3, this results in that, when a counterfeiter tries to cut open security document 10, for example, from the left side of Fig. 3 in order to gain access to data element 40, the counterfeiter will inevitably cut through the portion of security feature 26 that extends inside first recess 36, in particular, from the portion of security feature 26 arranged on first

surface 17 to the portion of security feature 26 that is arranged at the bottom of first recess 36. If the patch of material 20, as well as first protective layer 13 are transparent, the resulting cut through security feature 26 can be observed from first side S1 after the tampered document has been reassembled.

[0026] In some embodiments, as shown in Fig. 5, security layer 26 inside first recess 36 may completely surround data element 40. For example, as illustrated in Fig. 5, first recess 36 may be formed in a central portion of substrate 1, such that its sides extend substantially in parallel and adjacent to the outer peripheral edges of substrate 1. Patch of material 20 may have a shape that is essentially complementary to the shape of first recess 36, and may, for example, include data element 40 to be protected from tampering. When security layer 26, for example, a printed line pattern or the like, is formed in a continuous manner on first surface 17 of first layer 16 and the bottom of first recess 36, as shown in Fig. 5, data element 40 is surrounded from all sides by a portion of security feature 26 that extends between first surface 17 and the bottom of first recess 36. In this manner, regardless of the direction from which a counterfeiter tries to cut open security document 10, the counterfeiter will inevitably have to cut through security feature 26 when trying to access data element 40. As mentioned above, this cut can be observed from the first side S1 of substrate 1 after security document 10 has been reassembled.

[0027] Here, it will be appreciated that, in some embodiments, first recess 36 may be formed as a groove that extends along a peripheral direction of substrate 1, preferably as a continuous groove having an annular shape. Also in this manner, any element to be protected, such as data element 40, that it is surrounded by said groove is protected in the above-described manner, because regardless the direction of attack, a potential counterfeiter will have to cut through a portion of security layer 26 in order to access the element to be protected.

[0028] In some embodiments, first recess 36 may extend from an outer peripheral surface 31 of substrate 1, as shown in Fig. 4. In other words, an edge portion of first layer 16 may have a step-like configuration, and the groove or depression that is formed in the edge portion of first layer 16 forms first recess 36. Also in this manner, security layer 26 can be provided in a continuous manner such that it extends between different levels and forms step 22. Again, this may advantageously be combined with the configuration in which first recess 36 extends along a peripheral direction of substrate 1, for example, as a continuous groove that is open towards first surface 17 and an outer peripheral surface 31 of first layer 16. In other words, first recess 36 may extend from outer peripheral surface 31 of substrate 1, as shown in Fig. 4.

[0029] As can be seen from Fig. 4, in some embodiments, security layer 26 may be provided in one or more second recesses 37, 39 formed in first surface 17, and may be covered by corresponding patches of material 21, 23. In other words, the configuration described above

with respect to first recess 36 may be repeatedly present in substrate 1, either in first layer 16 or even in different layers of substrate 1, if desired. Here, it will be appreciated that security layer 26 does not need to be a single continuous layer, but can be formed by a plurality of separate portions (or security layers) provided in the respective recesses.

[0030] The bottom part of Fig. 4 also shows that the different recesses may have different depths along the depth direction d, where appropriate. Again, patches of material 21, 23 may be made of the same material as first layer 16, or may be made of different materials. Preferably, patches of material 21, 23 are transparent, such that any breach of security layer 26 can be observed from first side S 1.

[0031] Fig. 6 shows another embodiment of security document 10 in accordance with the present disclosure, where security document 10 is a data page of a passport or the like and includes a hinge 3 to which substrate 1 is attached. In some embodiments, as is shown in the examples in Fig. 7, security layer 26 may extend in a continuous manner from first layer 16 into hinge 3. In addition to the one or more recesses, which result in corresponding steps being formed in security feature 26, the extension into hinge 3 may result in the presence of a further step or level difference in security feature 26 at the point of attachment of first layer 16 to hinge 3. This may further increase the security of security document 10, because a further potential weakness, namely, the attachment to the passport or the like via hinge 3 can be protected by forming another step in security feature 26, which may be cut through in case a counterfeiter tries to separate security document 10 from the passport or the like. Of course, the same advantages can also be achieved by providing at least one recess at the side of first layer 16 that is connected via hinge 3. In this case, a first step is formed at the connection to hinge 3, and at least this first step will be separated when a potential attacker tries to open security document 10 from the side of hinge 3.

[0032] Security layer 26 may have any appropriate shape that allows for an arrangement of the same inside first recess 36. For example, security layer 26 may be a pattern or image printed onto first surface 17 (and extending inside first recess 36), or a sheet-like security structure applied onto first layer 17, for example, a hologram, a DOVID ribbon or sheet, or any other foil or material layer. In case security layer 26 is a printed pattern or the like, it may be advantageous to use continuous line patterns, which extend from first surface 17 to a bottom of first recess 36, such that any cut through this pattern can be easily observed when viewing document 10 from first side S1.

[0033] It will be appreciated that, if security layer 26 is a pattern or image printed onto first surface 17, first recess 36 generally will not extend all the way through first layer 16, such that a portion of the pattern or image can be arranged on a bottom of first recess 36. On the other hand, if security layer 26 is a sheet-like security structure

that is applied onto first layer 17, it will be appreciated that first recess 36 may extend all the way through first layer 16, because the sheet-like security structure can be arranged inside first recess 36 in an appropriate manner, as will be described in the following in more detail.

Industrial applicability

[0034] With the above-described configurations, it becomes possible to further increase the security of a document such as a personal ID card, a driver's license, a passport or the like. This is because, with the security feature disclosed herein, a security layer is provided in a continuous manner at different levels of the security document. Therefore, when a counterfeiter attempts to manipulate the security document by cutting open the same, it is very difficult for the counterfeiter to do so without also cutting through the security feature. The resulting cut can be observed, such that the attempted forgery can be recognized.

[0035] In the following, exemplary methods of manufacturing security document 10 will be described in more detail.

[0036] Generally, a method in accordance with the present disclosure comprises a first step of providing a first layer 16 of a substrate 1. Here, again, it will be appreciated that any appropriate material can be used for first layer 16, such as polycarbonate, PVC, or other plastic materials.

[0037] In another step, a security layer 26 may be formed on first surface 17 of first layer 16, for example, by printing a pattern or image onto first layer 16, or by applying a sheet-like security structure onto first layer 16, for example, a DOVID ribbon or sheet or a hologram, or another foil or layer.

[0038] In another step, a recess 40 is formed in first layer 16 at a position that corresponds to security layer 26. For example, as shown in the upper part of Fig. 8, recess 40 may be formed in an opposite surface 19 of first layer 16 that is opposite to first surface 17. Here, it will be appreciated that recess 40 may be formed in any appropriate manner, for example, by milling or the like. As a result, first layer 16 is obtained, in which recess 40 is formed in opposite surface 19, and essentially plane security layer 26 is arranged on first surface 17 at least in part at a position that corresponds to the position of first recess 36.

[0039] It will be appreciated that, in some embodiments, the step of forming recess 40 may be performed prior to the step of forming security layer 26, for example, if recess 40 penetrates first layer 16, or security layer is a printed image or pattern.

[0040] Next, a patch of material 20 may be arranged on top of security layer 26 from a side of first surface 17, as shown in Fig. 8. Then, patch of material 20 may be moved towards opposite surface 19 of first layer 16 together with a portion of security layer 26 disposed below patch of material 20, such that security layer 26 extends

in a continuous manner at different levels inside substrate 1, as described above and as shown in the lower part of Fig. 8. Here, first recess 36 is formed by moving patch of material 20 downward and displacing the remaining material of first layer 16 at the position where recess 40 was formed. As such, it will be appreciated that layer 16 has to have appropriate properties that allow for the elastic deformation of the same by patch of material 20. Of course, in case security layer 26 is a material layer, this also applies to the material of security layer 26. In this manner, first layer 16 as described above can be easily obtained. In some embodiments, the movement of patch of material 20 (the formation of first recess 36) will occur during the lamination of first layer 16 with one or more other layers. Such lamination processes are usually performed at temperatures of, for example, 120 °C for PVC or 180 °C for polycarbonate. In some cases, patch of material 20 may be attached to another layer (for example, security layer 26, or protective layer 13 shown in Fig. 3) at least temporarily prior to lamination with first layer 16 to assure proper placement of the same. In some embodiments, patch of material may be integrally formed with, for example, protective layer 13 or any other layer that is directly on top of first layer 16.

[0041] It will be appreciated, however, that the above-described method is only one example of forming security document 10 including first layer 16. For example, if security layer 26 is a printed pattern or image, it may be possible to form first recess 36 as recess 40 in first surface 17 prior to forming security layer 26 on first surface 17 and the inner surface of first recess 36. Also in this manner, a continuous security layer 26 that extends from first surface 17 towards an inside of first recess 36 may be obtained, again resulting in the desired step-like configuration with a level difference. Also in this case, patch of material 20 is present as the material that fills the space inside first recess 36.

[0042] On the other hand, if security layer 26 is formed as a sheet-like security structure, for example, a DOVID ribbon or sheet, a hologram or another layer of material (for example, with a thickness between 10 and 30 μm), recess 40 may either be formed in opposite surface 19, may be formed as first recess 36 in first surface 17, or may extend through first layer 16 as first recess 36, and security layer 26 may then be moved (e.g. pressed) downward using patch of material 20 to achieve the desired step-like configuration.

[0043] Here, it will be appreciated that the step of moving patch of material 20 in order to press down security layer 26 may be performed at any appropriate stage of the manufacturing of security document 10. For example, patch of material 20 may be moved downwards when combining (laminating) first layer 16 with one or more additional layers to form security document 10. In some embodiments, patch of material 20 may be formed as part of another layer that is combined with first layer 16 to form substrate 1. Of course, the step of moving patch of material 20 downwards can also be performed as a

separate step prior to combining the layers, using any appropriate mechanical device (i.e., applying pressure or the like), perhaps in combination with heating of first layer 26 and/or security layer 26.

[0044] It will be appreciated that the foregoing description provides examples of the disclosed systems and methods. However, it is contemplated that other implementations of the disclosure may differ in detail from the foregoing examples. All references to the disclosure or examples thereof are intended to reference the particular example being discussed at that point and are not intended to imply any limitation as to the general disclosure.

[0045] Recitation of ranges of values herein are merely intended to serve as a shorthand method for referring individually to each separate value falling within the range, unless otherwise indicated herein, and each separate value is incorporated into the specification as if it were individually recited herein. All method steps described herein can be performed in any suitable order, unless otherwise indicated or clearly contradicted by the context.

[0046] Although the preferred embodiments of the present disclosure have been described herein, improvements and modifications may be incorporated without departing from the scope of the following claims.

Claims

1. A security document (10) comprising:
 - a substrate (1) including a first layer (16), the first layer (16) having a first recess (36) in a first surface (17) of the first layer (16);
 - a security feature (3) formed in the substrate (1), the security feature (3) including a security layer (26) provided in a continuous manner on the first surface (17) of the first layer (16) and inside the first recess (36); and
 - a patch of material (20) disposed at least in part inside the first recess (36) and on top of the security layer (26).
2. The security document of claim 1, wherein a step (22) is formed in the security layer (26) at a transition between the first surface (17) and the first recess (36).
3. The security document of claim 1 or 2, wherein the patch of material (20) has a size that corresponds to a size of the first recess (36), preferably wherein a thickness of the patch of material in a depth direction (d) of the first recess (36) is essentially the same as a depth of the first recess (36) in the depth direction.
4. The security document of any one of claims 1 to 3, wherein a level difference (ld) between a top portion of the security layer (26) provided on the first surface (17) and a bottom portion of the security layer (26) provided inside the first recess (36) is between around 50 μm and around 600 μm , preferably between around 100 μm and around 500 μm , more preferably between around 150 μm and around 300 μm , for example, around 250 μm .
5. The security document of any one of claims 1 to 4, wherein the first recess (36) extends through the first layer (16) such that it opens in an opposite surface (19) of the first layer (16).
6. The security document of claim 5, wherein the security layer (26) inside the first recess (36) is substantially flush with the opposite surface (19).
7. The security document of any one of claims 1 to 6, wherein the first layer (16) includes a data element (40) surrounded at least in part by the security layer (26) inside the first recess (36).
8. The security document of claim 7, wherein the security layer (26) inside the first recess (36) completely surrounds the data element (40).
9. The security document of any one of claims 1 to 8, wherein the first recess (36) is formed as a groove that extends along a peripheral direction of the substrate (1), preferably as a continuous groove having an annular shape.
10. The security document of any one of claims 1 to 9, wherein the first recess (36) extends from an outer peripheral surface (31) of the substrate (1).
11. The security document of any one of claims 1 to 10, wherein the patch of material (20) is transparent and, optionally, made from the same material as the first layer (16), for example, polycarbonate, PVC, PET, or other plastic materials.
12. The security document of any one of claims 1 to 11, wherein the security layer (26) is provided in one or more second recesses (37, 39) formed in the first surface (17) and is covered by corresponding patches of material (21, 23).
13. The security document of any one of claims 1 to 12, wherein the security document is a data page of a passport or the like and includes a hinge (3) to which the substrate (1) is attached, and the security layer (26) extends in a continuous manner from the first layer (16) into the hinge (3).
14. The security document of any one of claims 1 to 13, wherein the security layer (26) is one of a pattern or image printed onto the first surface (17), and a sheet-like security structure applied onto the first layer (17),

for example, a DOVID ribbon or sheet.

15. A method of manufacturing a security document (10), comprising:

5
providing a first layer (16) of a substrate (1);
forming a security layer (26) on a first surface
(17) of the first layer (16), for example, by printing
a pattern or image onto the first layer (16), or by
10 applying a sheet-like security structure onto the
first layer (16), for example, a DOVID ribbon or
sheet;
forming a recess (40) in the first layer (16) at a
position that corresponds to the security layer
(26);
15 arranging a patch of material (20) on top of the
security layer (26) from a side of the first surface
(17); and
moving the patch of material (20) towards an
opposite surface (19) of the first layer (16), op-
20 tionally together with a portion of the security
layer (26) disposed below the patch of material
(20), such that the security layer (26) extends in
a continuous manner at different levels inside
25 the substrate (1).

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FIG 1

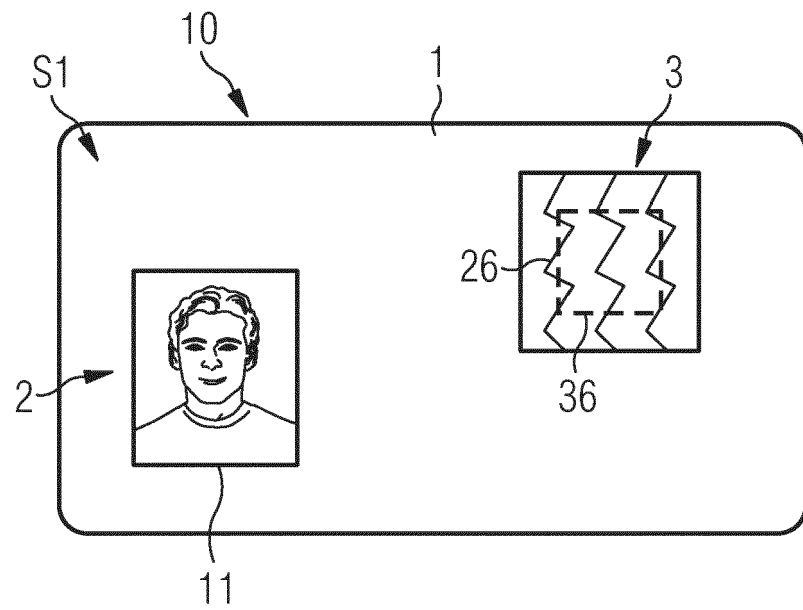


FIG 2

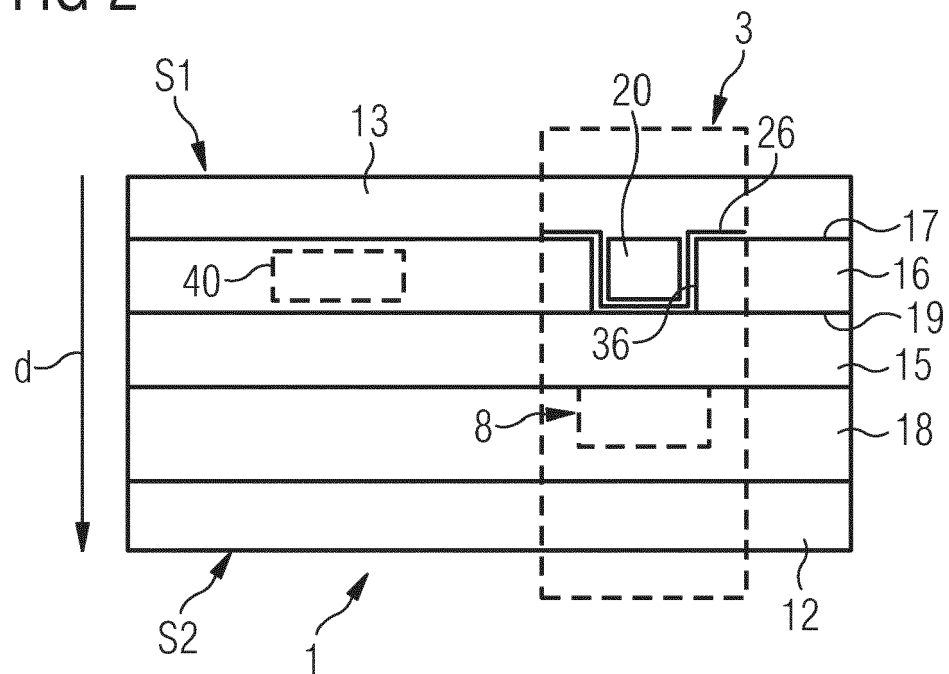


FIG 3

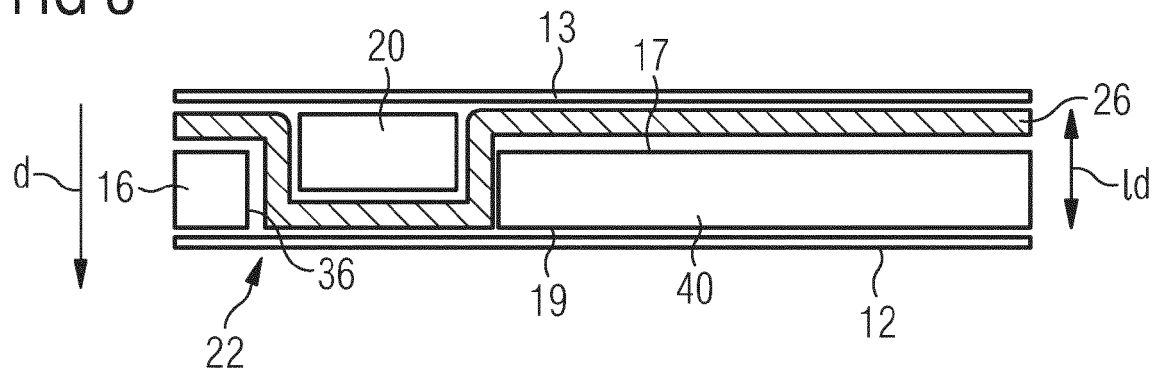


FIG 4

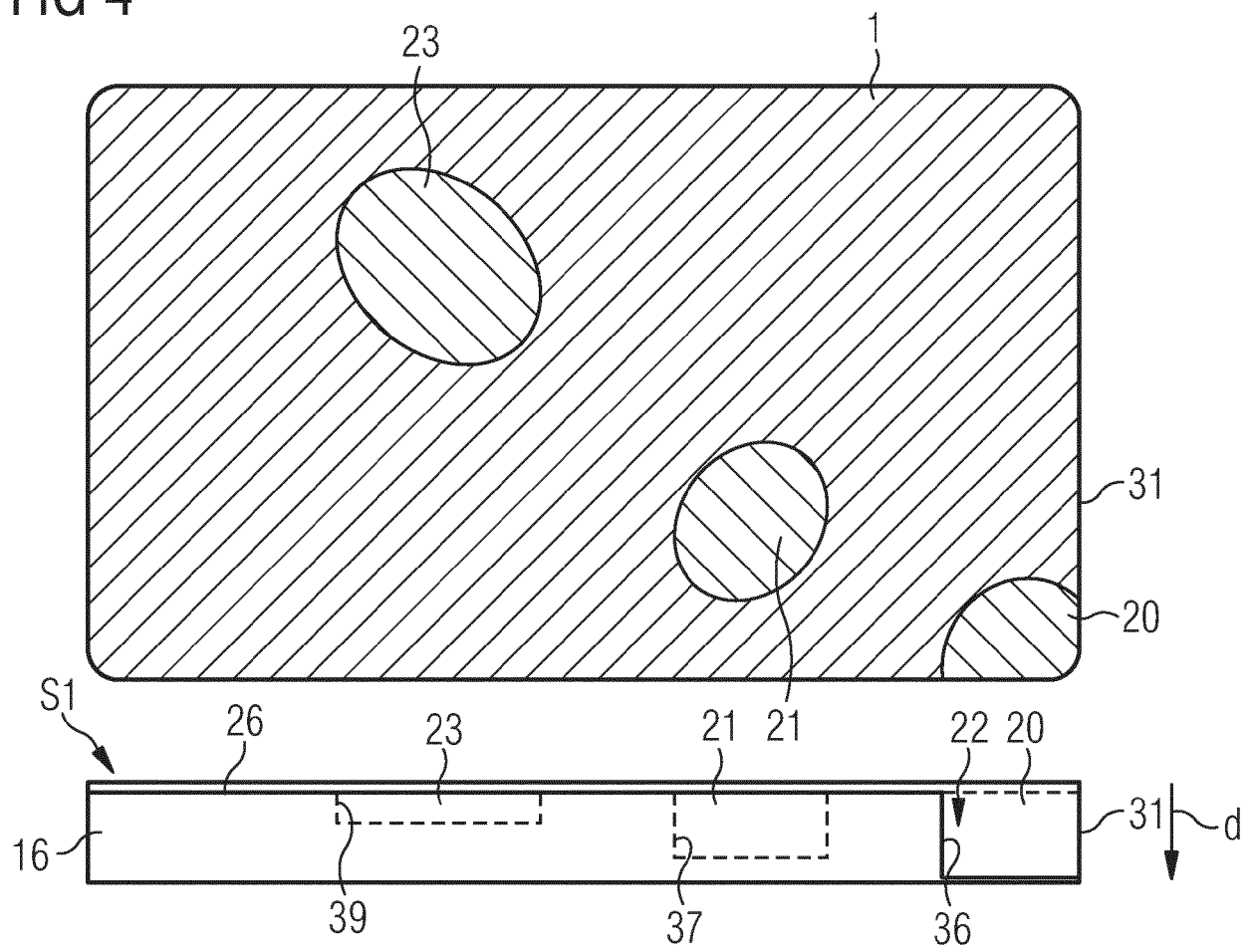


FIG 5

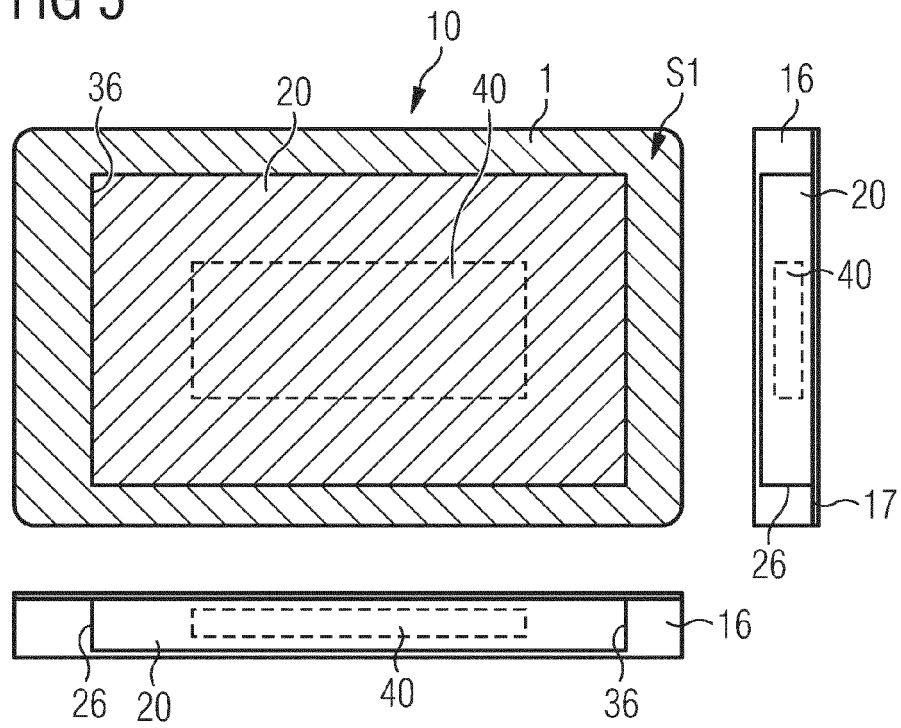


FIG 6

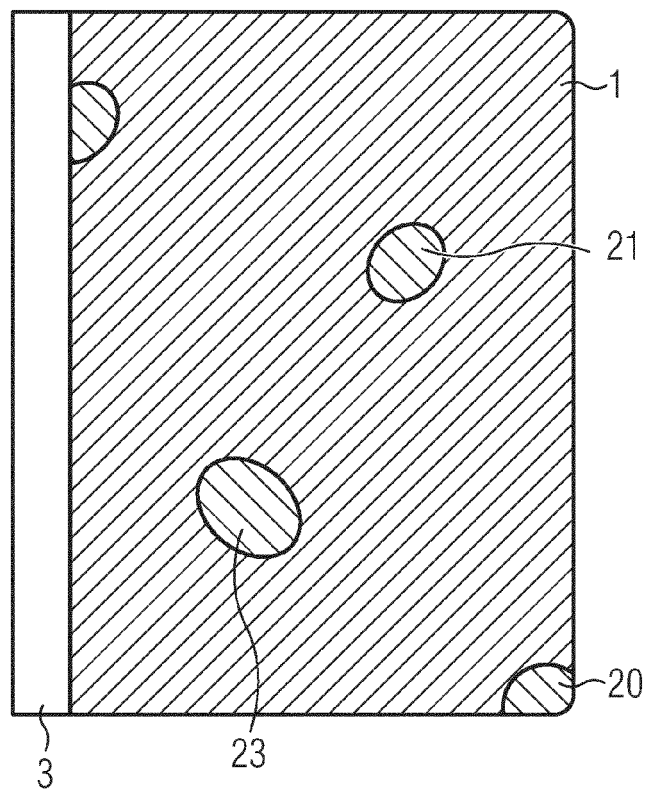


FIG 7

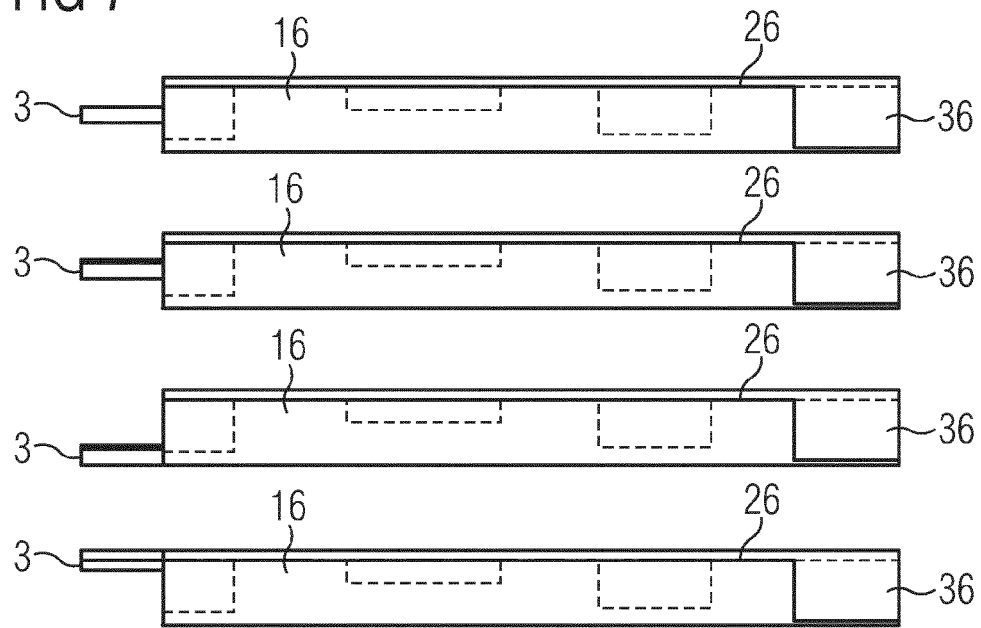
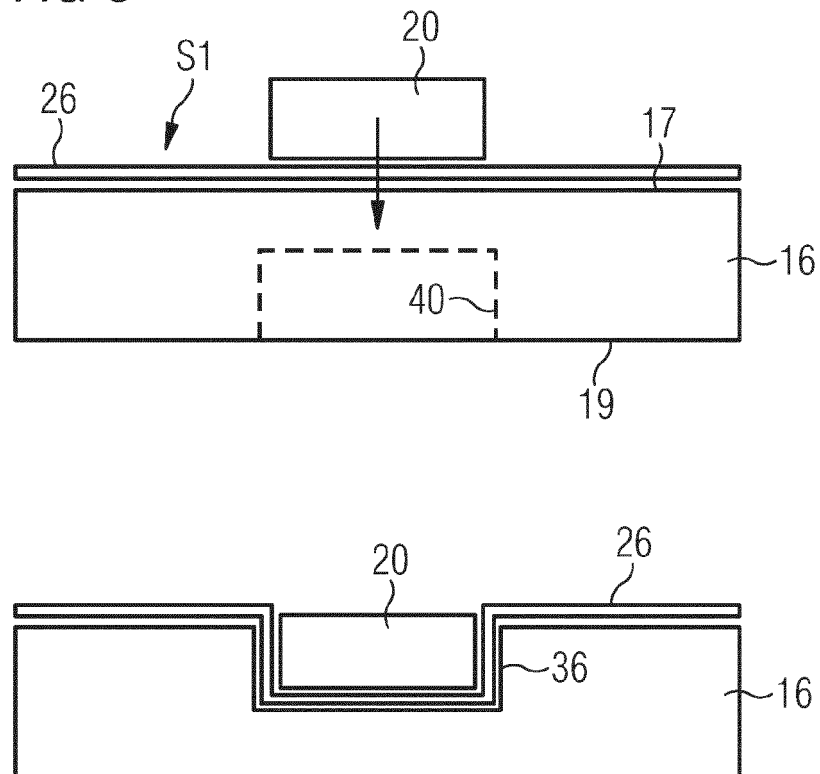


FIG 8





EUROPEAN SEARCH REPORT

Application Number

EP 23 15 6830

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EPO FORM 1503 03.82 (P04C01)

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* figure 5 *			

			TECHNICAL FIELDS SEARCHED (IPC)
			B42D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 3 July 2023	Examiner Langbroek, Arjen
CATEGORY OF CITED DOCUMENTS 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		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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