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(54) **ATTACHMENT LAYER FOR ATTACHING A DATA SHEET IN A SECURITY DOCUMENT**

BEFESTIGUNGSSCHICHT ZUR BEFESTIGUNG EINES DATENBLATTES IN EINEM SICHERHEITSDOKUMENT

COUCHE DE FIXATION PERMETTANT DE FIXER UNE FEUILLE DE DONNÉES DANS UN DOCUMENT DE SÉCURITÉ

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Description**Technical Field**

[0001] The present disclosure is directed towards a security sheet comprising an attachment layer. The present disclosure is further directed towards a security document comprising such a security sheet, methods of manufacturing such attachment layers, security sheets and security documents and methods of authenticating such security documents.

Background

[0002] Security documents and booklets, such as passports, passbooks, identification documents, certificates, licences, cheque books and the like, commonly comprise one or more security sheets on which information is provided. A passport booklet typically comprises a cover, a plurality of internal visa pages and at least one security sheet displaying the personal data of the passport holder. Typically the visa pages are made from paper and are sewn together along a stitch line coincident with the fold of the document. The security sheet may be formed from a plastic, typically polycarbonate, and during its manufacture a number of thin plastic layers are laid over one another and laminated together, thereby forming a thicker plastic body. As this plastic body is typically rigid it is not directly attached at the stitch line or otherwise the booklet may not be able to bend effectively about the fold. Instead, the plastic body is attached about the fold using a flexible hinge or attachment layer embedded in and extending from the plastic body.

[0003] It is known to provide security features on the attachment layer. US-A-2017/0326901 or WO 2016/091277 A1 discloses the application of a security print pattern and/or a security thread to a flexible band for connection to a data page and a booklet.

[0004] WO 2016/091277 A1 discloses a security sheet comprising: a data sheet displaying data, the data sheet extending across a width from an inner edge to an outer edge; and an attachment layer attached to the data sheet, wherein the attachment layer is for attaching the data sheet in a security document, wherein the attachment layer comprises: a textile comprising a plurality of interlaced wefts and warps, wherein at least two warps and/or at least two wefts are formed from at least two yarns having different haptic and/or optical characteristics, wherein the yarns are fibrous and comprise a plurality of fibres attached together; and a hinge portion outside of the data sheet, wherein the at least two yarns having different haptic and/or optical characteristics are located on the hinge portion.

[0005] CA-A-2753958 discloses a flap being provided with a security feature such as an incision, embossing, imprint or thread. However, it is beneficial to enhance the security of documents against counterfeiting, forgery and attempts to dismantle the security documents.

Summary

[0006] Objects of the present disclosure include addressing these problems. An object of the present disclosure includes providing a strong and durable attachment between the security sheet and the rest of a security document. A further object includes increasing the difficulty of forging, counterfeiting and dismantling a security sheet including an attachment layer. Further objects include providing an improved method of manufacture of such a security sheet and a security document comprising such a security sheet.

[0007] The present disclosure therefore provides security sheets, security documents and methods in accordance with the claims. In particular, the attachment layer comprises a textile comprising at least two yarns having different haptic and/or optical characteristics. The at least two yarns having different haptic and/or optical characteristics form regions of the textile and attachment layer with the different haptic and/or optical characteristics. By having at least two yarns of different haptic and/or optical characteristics the technical complexity of recreating the security document is increased as both the haptic and/or optical characteristics and relative locations of the yarns will have to be matched.

[0008] In the present disclosure "yarns" are long, thin strand of materials forming part of the textile. For example, the yarns may comprise a material, such as a plant, mineral, animal or synthetic material, selected from at least one of cotton, wool, linen/flax, bamboo, silk, jute, modal, polyamide, polyester, viscose, glass, polypropylene, polyaramid, polyurethane, nylon, bonded nylon, rayon, acrylic, polycotton and/or other suitable fibres. Each yarn may be substantially circular, trilobal, fibrillated, grooved, dog bone or multiform in cross section. The yarns are fibrous and comprise a plurality of fibres attached together. The attachment may be mechanical and the yarns may not comprise a continuous body of plastic or the like. The yarns may comprise spun thread, in which a plurality of fibres may be twisted together. A ply structure of each yarn may be single or one-ply (i.e. single strands of fibres twisted together or single filament strands), multi-ply (i.e. a plurality of single yarns twisted together) or cord yarns (i.e. a plurality of multi-ply yarns twisted together in a twist direction). The at least two yarns may have different haptic and/or optical characteristics by virtue of being formed from different types (or compositions) or categories of yarns, each type varying from another type in the yarn material, yarn cross section, yarn ply structure, yarn twist direction, yarn diameter, yarn coating and/or yarn impregnation. The textile preferably comprises a plurality of interlaced wefts and warps formed from the at least two yarns. The textile is preferable woven or knitted. The yarns may form the textile by weaving, knitting, sewing or another interlacing method.

[0009] In the present disclosure "different optical characteristics" means that the at least two yarns are distin-

guishable from one another visually by the naked eye (i.e. by the human eye only without optical aids such as infrared cameras or the like). Preferably the at least two yarns are at least distinguishable from one another by the naked eye when viewed in reflected visible light incident upon them. However, in embodiments they may be additionally or alternatively distinguishable from one another by the naked eye when they are viewed in reflected non-visible light incident, in transmitted visible light and/or transmitted non-visible light. In the present disclosure "visible light" refers to light having a wavelength within the visible spectrum, which is approximately 400 to 750nm, whilst "non-visible light" refers to light having wavelengths outside of this range (e.g. ultraviolet or infrared light). A user may therefore be able to authenticate the security document (i.e. confirm that it is not a counterfeit or forgery) based upon the optical sensory feedback from the human eye. If the different appearances of the at least two yarns are not identified as being correct the security document can be identified as being inauthentic. Such optical sensory feedback is achieved, in particular, by selecting yarns that have different physical characteristics that are perceptible by the human eye. The at least two yarns may therefore have different visible colours, different non-visible light properties (e.g. different luminescences), different opacities, different diameters and/or may scatter or reflect light to different degrees resulting in different levels of gloss.

[0010] In the present disclosure the term "different haptic characteristics" means that the at least two yarns are distinguishable from one another by human touch (i.e. they are detectable as being different to one another as tactile sensory feedback by the human body). A user may therefore be able to authenticate the security document (i.e. confirm that it is not a counterfeit or forgery) based upon the tactile sensory feedback resulting from the different textures. If the different textures of the at least two yarns are not identified as being correct the security document can be identified as being inauthentic. Such tactile sensory feedback is achieved, in particular, by selecting yarns that have different physical characteristics that are perceptible by human touch. The at least two yarns may therefore have different textures resulting from different diameters, a different surface roughness, a different hardness and/or a different stiffness.

[0011] The at least two yarns preferably have different visible colours when viewed in reflected light incident upon them. The colours may result from the appropriate selection of colours resulting from the yarn material, yarn coating and/or yarn impregnation for example with dyes. For example, the at least two yarns may comprise different dyes of different visible colours. In the present disclosure, the term "visible colour" means a colour which can be seen by the naked human eye under reflected visible light. It is most preferable that the visible light is white light, i.e. contains substantially all the visible wavelengths in more or less even proportion. The term colour includes achromatic hues such as black, grey,

white, silver etc., as well as chromatics such as red, blue, yellow, green, brown etc. "Different colours" are those which clearly present a contrast to one another that is visible to the naked human eye in reflected light even without a close inspection. The difference might be in terms of the colour's hue or tone or both. For example, in preferred embodiments, two colours will be considered substantially the same as one another if the Euclidean distance ΔE_{ab}^* between them in CIELAB colour space (i.e. the CIE 1976 L*a*b* colour space) is less than 3, more preferably less than 2.3, more preferably less than 1. The value of ΔE_{ab}^* is measured using the formula:

$$\Delta E_{ab}^* = \sqrt{[(\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2]}$$

[0012] Where ΔL^* , Δa^* and Δb^* are the distance between the two colours along the L*, a* and b* axes respectively (see "Digital Color Imaging Handbook" (1.7.2 ed.) by G. Sharma (2003), CRC Press, ISBN

0-8493-0900-X, pages 30 to 32). Conversely, if ΔE_{ab}^* is greater than or equal to 1, more preferably 2.3 or yet more preferably 3, the two colours will be considered

different. The colour difference ΔE_{ab}^* can be measured using any commercial spectrophotometer, such as those available from Hunterlab of Reston, Virginia, USA.

[0013] The different colours may also be a result of the materials in the yarn exhibiting different colours at different viewing angles. Examples of such materials include thin-film interference structures, interference pigments, pearlescent pigments, liquid crystal film and pigments, photonic crystals and the like.

[0014] In the present disclosure "different non-visible light properties" means that the at least two yarns are distinguishable from one another by the human eye when viewed in non-visible, reflected or transmitted, light. In particular, the at least two yarns may have different luminescent properties (e.g. fluorescent or phosphorescent) and/or different infrared absorption characteristics. In particular, when viewed in ultraviolet light (i.e. a wavelength of 200-400 nm) or infrared light (i.e. a wavelength of 750 nm to 1 mm) incident upon the at least two yarns, the at least two yarns exhibit different colours (as defined above). The at least two yarns may comprise a suitable material, coating or impregnation (such as a luminescent ink coating or impregnated in the yarn) for achieving such effects. In a particular example the at least two yarns may have a first colour combination (e.g. the same or different colours) when viewed in visible light and a second colour combination (e.g. the same or different colours, but different to those of the first colour combination) when viewed in a combination of visible and non-visible light. The at least two yarns may also comprise photochromic and/or thermochromic components that alters the colours when ultraviolet light and/or heat

are applied. Suitable inks and embodiments are disclosed in WO-A-2004/050376.

[0015] In the present disclosure "different opacities" means that at least one yarn is more transparent (i.e. more light can be transmitted therethrough) than at least one further yarn. The at least two yarns may have different opacities and different colours and, in particular, the at least two yarns can be non-clear and coloured. For example, at least one yarn may comprise a transparent polymer (e.g. polyester) and at least one further yarn may comprise a substantially opaque cotton or other opaque polymer.

[0016] In the present disclosure "different diameters" means that at least one yarn has a greater diameter than at least one further yarn such that the difference in diameter is distinguishable by human touch and/or by the human eye. In particular, at least one yarn may be distinguishable by human touch and/or by the human eye from at least one adjacent yarn by virtue of having the yarns having different diameters. The diameters of at least one yarn may vary along its length and the different diameters may be distinguishable where the at least one yarn has a smaller or larger diameter to at least one further yarn. In particular, the diameter of at least one yarn may be at least approximately 125%, at least approximately 150%, at least approximately 200%, at least approximately 300% or at least approximately 400% of the diameter of at least one further yarn. Each yarn may have a diameter in the range of from approximately 26 microns up to approximately 300 microns.

[0017] In the present disclosure "different levels of gloss" means that at least one yarn exhibits higher specular reflection (i.e. it exhibits higher gloss) than at least one further yarn (i.e. it has a more matt appearance). The difference in levels of gloss may be implemented by appropriate selection of the yarn material, yarn coating and/or yarn impregnation. For example, at least one yarn may comprise a high gloss, polished and smooth surfaced polymer (e.g. polyester) and at least one further yarn may comprise substantially matt cotton.

[0018] In the present disclosure "different surface roughness" means that at least one yarn has a higher surface roughness (i.e. a higher coefficient of friction) than at least one further yarn such that the difference in surface roughness is distinguishable by human touch. Different surface roughness can be achieved by appropriate selection of the yarn material, yarn cross section, yarn ply structure, yarn twist direction and/or yarn coating. For example, fibrillated yarn generally have a higher surface roughness than smooth and polished round yarns. At least one yarn may have a higher surface roughness compared to at least one further yarn by virtue of the yarns having different, preferably opposing twist directions. For example, a yarn with a twist in a first direction would be perceived as having a lower surface roughness when rubbed in the first direction. An adjacent yarn with a twist in a second direction opposite to that of the first direction would be perceived as having a higher

surface roughness when rubbed in the first direction.

[0019] In the present disclosure "different hardness" means that at least one yarn has a hardness that is distinguishable from at least one further yarn by human touch. In a particular embodiment at least one yarn is a continuous soft-touch material (e.g. thermoplastic polyurethane, polyethylene or polypropylene) which is substantially softer than at least one further yarn. In particular, the soft-touch material may have a Shore hardness in the range of from approximately 30A to approximately 95A on the Shore A scale and up to approximately 65 on the Shore D scale. More preferably the soft-touch material may have a Shore hardness in the range of from approximately 30 to approximately 80 on the Shore A scale. The data sheet may comprise polycarbonate, which has a typical Shore hardness of 80D on the Shore D scale. The hardness may be determined according to the test set out in ASTM D2240. Different surface hardness can be achieved by appropriate selection of the yarn material. For example, a yarn of a polymer (e.g. polyester) will generally have a higher hardness than cotton.

[0020] In the present disclosure "different stiffness" means that at least one yarn has a stiffness that is sufficiently higher than the stiffness of at least one further yarn such that they are distinguishable from one another. Human touch may distinguish between a yarn of high stiffness and a yarn of low stiffness by virtue of the differences in their resilience to bending of the textile under human touch at their respective locations. For example, a yarn of lower stiffness may comprise cotton and a yarn of higher stiffness may comprise polyester or acrylic.

[0021] In a first arrangement at least two warps and/or wefts are formed from the at least two yarns having different haptic and/or optical characteristics. Thus the at least two yarns may form part of the regular array of warps and wefts of a textile. The warps preferably extend substantially parallel to one another and the wefts preferably extend substantially parallel to one another and preferably substantially perpendicular to the warps. In the present disclosure "extend substantially parallel to one another" means that the warps or wefts generally extend parallel to one another through the textile, but may extend in different directions locally at the points of interlacing, weaving, knitting or stitching.

[0022] As a result, the yarns of different haptic and/or optical characteristics may extend substantially parallel and/or perpendicular to one another and substantially between opposing edges of the attachment layer. A plurality of warps may differ from a plurality of wefts in a first haptic and/or optical characteristic (e.g. a plurality of wefts may have a smaller diameter than a plurality of warps). At least two of the plurality of warps may differ from each other in at least one second haptic and/or optical characteristic (e.g. by having different colours), which is preferably different to the first haptic and/or optical characteristic. At least two of the plurality of wefts may differ from each other in at least one third haptic

and/or optical characteristic (e.g. by having different levels of gloss), which is preferably different to the first and/or second haptic and/or optical characteristic.

[0023] In a preferred embodiment the textile comprises at least three warps and the outer distal and proximal warps are different visible colours and/or the warps between the distal and proximal warps are different visible colours to the distal and/or proximal warps. In a further preferred embodiment the textile comprises at least three warps formed from at least three yarns of different visible colours such that the at least three warps form a colour progression from a first visible colour to a different second visible colour. A colour progression would assist in identifying forgeries since it would be difficult for a forger to replace any of the warp yarns with exactly the correct hue to match the colour progression. Such a colour progression may also be formed by forming the warps of different non-visible light properties such that they exhibit a colour progression between first and second colours that are visible when viewed in non-visible light.

[0024] In a further preferred embodiment the wefts comprise yarns of different diameters. In particular, connection weft yarns that extend into the data sheet may have a smaller diameter than infill weft yarns that extend between the connection weft yarns but do not extend into the data sheet. Distal and/or proximal warps of a hinge portion of the attachment layer may have a large diameter than the other warps such that they form raised edges of the hinge portion to human touch.

[0025] In a second arrangement the attachment layer comprises a textile comprising at least one motif integrated therein and a background region. The background region comprises is formed from at least one background yarn, which may form interlaced warps and wefts. The at least one motif comprises at least one motif yarn having different haptic and/or optical characteristics to the at least one background yarn. Thus the at least one motif has different haptic and/or optical characteristics to the background region. The background region at least partially surrounds the at least one motif.

[0026] By having the at least one motif embedded and integrated in the textile the at least one motif need not comprise only warps or wefts of different haptic and/or optical characteristics extending parallel and/or perpendicular to one another as in the first arrangement. The at least one motif therefore forms a, preferably complex, image or design distinguishable against the background region. The or each at least one motif may convey recognisable information to a reader and may form at least one of a pattern, symbol, flag, emblem, flower, logo, drawing, letter, pictogram, illustration, alphanumeric character, grapheme, national emblem, coat of arm, personal data, name, photograph, serial number, indicium and code.

[0027] By integrating the at least one motif in the textile it is much harder for a forger to alter any information or recognisability it conveys. Furthermore, if the attachment layer is removed from the security document, either from

the stitching or data sheet, it is more difficult for the forger to maintain the structure of both the at least one motif and the rest of the textile. Any structural damage to the at least one motif due to such dismantling of the security document could be easily identified.

[0028] The at least one motif yarn is interlaced with, for example knitted, woven or stitched with, the at least one background yarn. Preferably the background region and at least one motif together form a structural sheet of the textile, such as a damask on a Jacquard loom.

[0029] Preferably the at least one motif is a discrete element separated from edges of the attachment layer. Preferably the attachment layer comprises a plurality of motifs. A single motif or a plurality of motifs, with spacings of background region between individual motifs, may extend between, preferably opposing, edges of the attachment layer.

[0030] In a preferred embodiment of the second arrangement the at least one motif is a different visible colour to at least one further motif and/or the background region when viewed by the naked eye in reflected visible light incident upon the attachment layer. The at least one motif may also be a covert security feature that is perceived differently by the naked eye, or is only perceivable by the naked eye, when viewed in reflected visible light as compared to reflected non-visible light by virtue of the at least one motif yarn and at least one background yarn having different non-visible light properties. In a particularly preferred embodiment the at least one motif and at least one further motif and/or the background region have a first colour combination (e.g. the same or different colours) when viewed in visible light and a second colour combination (e.g. the same or different colours, but different to those of the first colour combination) when viewed in a combination of visible and non-visible light.

[0031] In a particularly preferred embodiment, which may be formed from a two tone damask on a Jacquard loom, on a front side of the attachment layer at least one front side motif is a first colour and the front side background region is a second colour. On a reverse side of the attachment layer at least one reverse side motif is the second colour and the reverse side background region is the first colour. The motifs and backgrounds have inverse shapes of one another.

[0032] In a further preferred embodiment, which may be formed from a brocade on a Jacquard loom, the background region may comprise a structural background sheet comprising a plurality of wefts and warps formed from the at least one background yarn. The at least one motif may be formed by at least one motif yarn woven into the structural background sheet in a supplementary and non-structural arrangement (i.e. the at least one motif yarn does not substantially contribute to the maintenance of the sheet like continuous structure of the textile). If formed as a brocade, the reverse side of the attachment layer can be adapted to provide difference effects by being continuous or discontinuous.

[0033] As will be apparent from the embodiments of the

detailed description, the present disclosure further includes a combination of the first and second arrangements in which the attachment layer comprises the at least one motif and the background region formed from the background and motif yarns of different haptic and/or optical characteristics and the background region itself comprises at least two background yarns forming at least two warps and/or wefts having different haptic and/or optical characteristics.

[0034] The attachment layer may, in addition to the at least one motif and/or at least two yarns having different haptic and/or optical characteristics, comprise other security features such as at least one security thread or security print. The security document may comprise one or more additional security features, such as fibres, particles, watermarks, laser perforations, threads, print, optically variable features, laser markings, tactile features, graphics, personal data, features not visible in visible light (e.g. luminescent or fluorescent features), patches and the like.

[0035] The attachment layer comprises a textile comprising at least one first region of a first textile structure and at least one second region of a second textile structure. The at least one first region and at least one second region may optionally comprise the at least two yarns of different haptic and/or optical characteristics disclosed herein such that they have the corresponding different haptic and/or optical characteristics. Warps form first regions and wefts form second regions in accordance with the first arrangement discussed above.

[0036] Due to the different first and second textile structures the first and second regions have different haptic and/or optical characteristics. The at least one first region preferably has a different texture to that of the at least one second region, the different texture being distinguishable to human touch. The different textile structures result from:

- The at least one first textile structure comprises at least two adjacent warps or wefts forming at least two first regions separated by a minimum distance such that a gap between them is distinguishable by human touch. The at least one second region and at least one second textile structure comprises the wefts or warps extending between the at least two first regions. The minimum distance is at least approximately 0.5 mm and may be at least approximately 1 mm or at least approximately 2 mm. The first regions are detectable, for example, by a human finger being drawn from the warp or weft of the first region, along the wefts or warps of the second region in the gap and to the adjacent warp or weft of the further first region. The tactile response detects the gap as an undulation in the surface of the textile.

[0037] The different textile structures may also result from:

- The textile comprises first and second regions of different thicknesses, such as by the first textile structure having more overlapping yarns through its thickness than the second textile structure. The thicker regions can be visually identified (e.g. as a thicker motif against a thinner background region or vice-versa) and human touch can distinguish between the different thicknesses;
- The first textile structure may comprise at least one supplementary yarn (e.g. the at least one motif yarn) in a structural background sheet (e.g. formed from the at least one background yarn) whilst the at least one second textile structure may comprise the structural background sheet, the supplementary yarn not extending into the at least one second textile structure. Such an arrangement can be formed as a brocade as discussed above. The at least one first region may be detectable, for example, by a human finger being drawn along the at least one first region to the at least one second region and the tactile response detecting the different textures. The at least one supplementary yarn may form a detectable raised structure;
- The first textile structure may comprise a different number of warps and/or wefts per unit area than the second textile structure (i.e. have a different thread count). The first and second regions would therefore have different textures and the different density of warps and/or wefts would be visually detectable;
- The first textile structure may comprise a different interlacing (e.g. weaving, knitting or stitching) pattern to the second textile structure (e.g. the first and second regions comprise warps and/or wefts extending in different directions to the warps and/or wefts of the at least one second region). The first and second regions would therefore have different textures and the different interlacing pattern of warps and/or wefts would be visually detectable;

[0038] The attachment layer comprises a textile which may comprise at least two regions of different colours, luminescence, diameter, surface roughness, hardness, stiffness and/or gloss. The at least two regions may be formed from the at least two yarns of different types and/or haptic and/or optical characteristics disclosed herein.

[0039] The at least two yarns of different types, first and second regions of different texture or at least one motif are located on the hinge portion. The at least two yarns of different types, first and second regions of different texture or at least one motif may overlap or be separated from the fold.

Brief Description of the Drawings

[0040] By way of example only, embodiments of a security sheet, a security document and a method of

manufacture in accordance with the present disclosure are now described with reference to, and as shown in, the accompanying drawings, in which:

FIGURE 1 is a perspective view of a security document, particularly a passport, according to the present disclosure in an open configuration;
 FIGURE 2 is a schematic cross-sectional side elevation of a fold area of the security document of Figure 1 in an exploded configuration;
 FIGURE 3 is a schematic plan view of an embodiment of a security sheet according to the present disclosure;
 FIGURE 4, which is in accordance with the claims, is a schematic plan view of a further embodiment of a security sheet according to the present disclosure;
 FIGURE 5 is a schematic plan view of a front side of a further embodiment of a security sheet according to the present disclosure;
 FIGURE 6 is a schematic plan view of a reverse side of the security sheet of Figure 5; and
 FIGURE 7, which is in accordance with the claims, is an illustration of an example of a security sheet according to the present disclosure and is in accordance with the embodiment of Figure 4.

Detailed Description

[0041] Figures 1 and 2 illustrate a security document 10 in accordance with the present disclosure. The security document 10 may be of any suitable type, but may comprise a security booklet, such as a passport as illustrated, a passbook, an identification document, a certificate, a licence, a cheque book or the like. The security document 10 comprises a security sheet 11, in this case a data page, foldable about and preferably attached along a fold 12 to a plurality of leaves 13. The plurality of leaves 13 may comprise a fibrous substrate, for example paper and/or cotton and may form visa pages. The security document 10 also comprises a cover 14, which is foldable about and attached to the fold 12 and/or is adhered to an outer leaf (not shown) located on the outside of the leaves 13 and security sheet 11. The attachment is preferably stitching through the security sheet 11, leaves 13 and/or cover 14 at the fold 12, although other attachment means such as adhesion may be used and the attachment means may be offset from the fold 12.

[0042] The security sheet 11 is illustrated in further detail in Figure 3. The security sheet 11 comprises a data sheet 15, which preferably comprises plastic and may be formed from a plurality of plastic body layers connected together, comprising data 16 and an attachment layer 17 attached to the data sheet 15. The data sheet 15 extends across a width from an inner edge 22, located proximate the fold 12, to an outer edge 23, distal to the fold 12. The data sheet 15 extends across a thickness between substantially planar first and second outer surfaces 28, 29. The data sheet 15 may comprise at least one of a ther-

moplastic polymer, polycarbonate, polybutylene terephthalate, polyester, polyethylene, polypropylene, polyvinyl chloride, a co-polymer comprised of any of the previous thermoplastic polymers, a fibrous substrate and the like.

[0043] The attachment layer 17 is configured to securely connect the attachment layer 17 to the data sheet 15 and to the rest of the security document 10. The attachment layer 17 is thus preferably flexible, substantially resistant to plastic deformation and tear resistant and may comprise a substantially elongate sheet or body as illustrated. The attachment layer 17 comprises a connection portion 60 extending from a hinge portion 26. The connection portion 60 is at least partially located in or on and attached to the data sheet 15 and outer edge 23). The hinge portion 26 is located outside of the data sheet 15. The fold 12 and/or attachment means discussed above extend through the hinge portion 26.

[0044] The attachment layer 17 (or preferably at least the hinge portion 26 thereof) comprises a textile having a mesh of interlaced, knitted, woven, stitched, overlapping or otherwise integrated wefts 30 and warps 31. The warps 31 may extend substantially parallel to one another and/or the fold 12. The wefts 30 may extend substantially parallel to one another and/or may be substantially perpendicular to the warps 31 and/or fold 12. The connection portion 60 may comprise at least portions of wefts 30, referred to as connection wefts 25, as illustrated in Figure 3. The plurality of connection wefts 25 are separated from an adjacent connection weft 25 by a spacing 27. The connection wefts 25 may comprise portions of the wefts 30 extending out of and forming the hinge portion 26 as in Figure 3. The connection portion 60 is therefore firmly connected to the data sheet 15 by a frictional force applying a resistance to the attempted removal of the attachment layer 17 from the data sheet 15. The connection portion 60 may instead comprise a mesh of both wefts 30 and warps 31, rather than only the connection wefts 25, such that the entire attachment layer 17 is a meshed textile. Although the connection wefts 25 are preferably part of the textile, they may instead comprise strips, a film and/or other elongate bodies extending from the hinge portion 26.

[0045] The textile of the attachment layer 17 comprises at least one motif 71 (which may also be referred to as a first region) integrated with a background region 70 (which may also be referred to as a second region) in accordance with the second arrangement of the disclosure as discussed above. In Figure 3 the attachment layer 17 comprises motifs 71 representing the letters "D", "L", "R" and a logo. The at least one motif 71 or first region may have a first textile structure that is different to a second textile structure of the background region 70 or second region. In particular, the at least one motif 71 is formed by at least one motif yarn interlocked with, knitted, woven and/or stitched and extending through at least one background yarn forming the background region 70. The at least one motif yarn and at least one background yarn,

and therefore the at least one motif 71 and a background region 70, have different haptic and/or optical characteristics selected from those set out above. The at least one motif yarn may extend multiple times between the outer surfaces of the attachment layer 17 to form the pattern of the at least one motif 71. The background region 70 and at least one motif 71 may together form the mesh (e.g. by each forming wefts 30 and warps 31) of the textile. The background yarn forms wefts 30 and/or warps 31 of the background region 70 and the at least one motif yarn is interlocked with the textile by being looped around the wefts 30 and/or warps 31. The background region 70 may be a single, substantially continuous colour. The at least one motif 71 and background region 70 may be formed using the Jacquard process on a Jacquard loom.

[0046] By virtue of the at least one motif yarn and at least one background yarn being different visible colours, the at least one motif 71 may be a different visible colour to at least part of the background region 70 adjacent to the at least one motif 71 when viewed by the naked eye in reflected light incident upon the attachment layer 17. For example, the background region 70 may appear substantially as at least one first colour (e.g. white) at least partially around the at least one motif 71 whilst the at least one motif 71 may be at least one different second colour (e.g. non-white). A single motif 71, or each of a plurality of motifs 71, may comprise a plurality of different colours when viewed by the naked eye in reflected light incident upon the attachment layer 17. For example, the at least one motif 71 may comprise different colours corresponding to the image or design it represents.

[0047] By selecting different haptic and/or optical characteristics for the motif and/or background yarns, various effects can be achieved with the embodiment of Figure 3. In particular, the at least one motif yarn may have a different surface roughness, hardness, stiffness and/or diameter to the at least one background yarn. As a result, the at least one motif 71 can be distinguished by human touch by virtue of having a higher or lower surface roughness, diameter, stiffness and/or hardness to the at least partially surrounding background region 70. A particularly preferred effect can be achieved by the at least one motif yarn having a greater diameter than the at least one background yarn, which results in the outer surface of the at least one motif 71 being raised above the at least partially surrounding outer surface of the background region 70. The resulting raised texture is easily distinguishable to human touch and also creates a three dimensional effect visible to the naked human eye. The effect can be further developed by having a plurality of motif yarns of different diameters such that the outer surface of the motif itself is textured with different contours, thereby forming complex three dimensional effects visible to the human eye.

[0048] By having different textile structures the at least one motif 71 has a different texture to the background region 70 such that they are distinguishable from one another by human touch. In particular, the presence of the

at least one motif yarn in the at least one motif 71 is detectable as providing a texture distinguishable to the texture of the background region 70. Such a different texture is also achieved if the at least one motif yarn and at least one background yarn have substantially the same haptic and/or optical characteristics.

[0049] As illustrated in Figure 3, the at least one motif 71 may be not extend over the fold 12 and/or attachment means or stitch line such that the entire at least one motif 71 can be viewed when the security document 10 is open at the security sheet 11. The at least one motif 71 may extend over the fold 12. If the fold 12 is offset from the attachment means, such as by being offset from the stitch line, the at least one motif 71 may extend over the fold 12 and/or attachment means. In such arrangements the difficulty of attempting to adapt the at least one motif 71 is increased since the adaptation will require the entire removal of the security sheet 11 from the security document 10 to reach the area under the fold 12 or attachment means.

[0050] As illustrated in Figure 3, the at least one motif 71 may be located only in the hinge portion 26 such that it is located and visible outside of the data sheet 15. However, the at least one motif 71 may be at least partially located on the connection portion 60 and/or at least partially located within or on the data sheet 15. Thus the at least one motif 71 may be difficult to reach during an attempted adaptation.

[0051] As illustrated in Figure 3, the at least one motif 71 may be separated from the edges of the attachment layer 17 such that it is a discrete element entirely surrounded by the background region 70. In particular, the at least one motif 71 may not extend between opposing edges of the attachment layer 17 and may be in contact with fewer than three edges of the attachment layer 17. The or each at least one motif 71 may extend across less than approximately 50% of the area of the hinge portion 26, less than approximately 25% of the area of the hinge portion 26 or less than approximately 10% of the area of the or hinge portion 26. The surface area of the at least one motif 71 may be less than approximately 50%, 25% or 10% of the surface area of the background region 70.

[0052] However, as illustrated in the embodiment of Figures 5 and 6, the at least one motif 71 (in the form of a sinusoid in this example) may extend between opposing edges of the attachment layer 17 (in this case three edges of the attachment layer 17 and four edges of the hinge portion 26). Figure 5 and 6 also illustrate how the colours of the at least one motif 71 and background region 70 can be a first colour combination on a front side (as in Figure 5) of the attachment layer 17 and a second colour combination, which is the inverse of the first colour combination, on a reverse side (as in Figure 6) of the attachment layer 17. In the illustrated example the front side motif 71 is black and the front side background region 70 is white. On the reverse side there are correspondingly positioned and shaped reverse side illustrated example the front side motif 71 is black and the front side background

region 70 is white. On the reverse side there are correspondingly positioned and shaped reverse side motif 71 and reverse side background region 70, the reverse side motif 71 being white and the reverse side background region 70 being black. Such an inverse colour arrangement can be achieved by forming a two tone damask on a Jacquard loom in which the at least one front side motif 71 and reverse side background region 70 are formed from the at least one motif yarn of the first colour and the front side background region 70 and at least one reverse side motif 71 are formed from the at least one background yarn of the second colour.

[0053] Figure 4 illustrates an embodiment of the security sheet 11 in accordance with the first arrangement discussed above, and in accordance with the claims, in which the attachment layer 17 comprises a textile comprising at least two yarns 80, 81, 82, 83, 84, 85, 86, 87 of different haptic and/or optical characteristics. Figure 4 illustrates the attachment layer 17 in an exploded view in order to illustrate its composition, but in practice will be tightly pulled together and may comprise significantly more connection wefts 25 (e.g. at least twenty or fifty connection wefts 25). Figure 7 is an illustration of a portion of an exemplary security sheet 11 formed according to the embodiment of Figure 4. The hinge portion 26 comprises at least one yarn 80, 81, 82, 83, 84, 85, 86, 87 extending at least partially through the hinge portion 26 to form the wefts 30 and warps 31. In particular, a plurality of wefts 30 and/or warps 31 may comprise a single continuous yarn 80, 81, 82, 83, 84, 85, 86, 87. The attachment layer 17 comprises at least one connection weft yarn 80, first infill weft yarn 81, second infill weft yarn 82 and warp yarn 83, 84, 85, 86, 87.

[0054] The outer warps 31 are formed from a distal warp yarn 81 and a proximal warp yarn 87. The distal warp yarn 83 is located adjacent to the inner edge 22 of the data sheet 15, the proximal warp yarn 87 is located adjacent the free proximal edge (i.e. the top edge of Figure 3) of the attachment layer 17 and infill warp yarns 84, 85, 86 are located therebetween. The hinge portion 26 may have a width between its outer warps 31 (i.e. between the distal and proximal warp yarns 83, 87) of at least approximately 8 mm or at least approximately 10 mm and/or optionally up to approximately 30mm or approximately 20 mm. The hinge portion 26 comprises only five warps 31 or warp yarns 83, 84, 85, 86, 87 as in the illustrated embodiment, but may comprise five or fewer warps 31, ten or fewer warps 31 or fifteen or fewer warps 31. At least two of the adjacent warps 31 or warp yarns 83, 84, 85, 86, 87 of the hinge portion 26 are separated from one another (in particular separated in a direction perpendicular to the inner edge 22, optionally also the attachment line and/or fold 12) by at least approximately 0.5 mm, and optionally by at least approximately 1 mm, at least approximately 1.5 mm, at least approximately 2 mm or at least approximately 3 mm. By virtue of this separation adjacent warps 31 form first regions of a first textile structure whilst the wefts 30 extending between the

adjacent warps 31 form a second textile structure. Due to the separation being relatively large, it is possible to detect the gap or separation between the adjacent warps 31 by human touch.

[0055] The at least one connection weft yarn 80 forms the connection wefts 61. The at least one connection weft yarn 80 extends at least partially into the hinge portion 26 and is interlaced with at least one or warp 31, but is not interlaced with itself. The connection weft yarn(s) 80 preferably comprises a plurality of ends by comprising a plurality of adjacent, substantially parallel, yarns, strips, threads or filaments. In particular, the connection weft yarn(s) 80 may comprise a synthetic yarn, such as nylon, and may comprise a plurality of monofilaments. Preferably the connection weft yarn(s) 80 is substantially clear or transparent in a similar manner to the at least one body layer such that it is substantially hidden in the data sheet 15 after formation and such that the connection weft yarn(s) 80 have different optical characteristics compared to other yarns of the textile 81, 82, 83, 84, 85, 86, 87. The first infill weft yarn 81, second infill weft yarn 82 and/or warp yarn 83 may comprise polyester. The first and second infill weft yarns 81, 82 continuously form infill wefts 62, which extend between the connection wefts 61, of the hinge portion 26 by looping within the hinge portion 26 between the between the distal and proximal warp yarns 83, 87. The connection weft yarn(s) 80 may have a smaller diameter than the first infill weft yarn 81, second infill weft yarn 82 and/or at least one warp yarn 83, 84, 85, 86, 87 such that the connection wefts 61 have a smaller diameter than the infill wefts 62 and/or warps 31 of the hinge portion 26. As a result, the connection weft yarn(s) 80 have different haptic characteristics and are distinguishable to human touch to the other yarns of the textile 81, 82, 83, 84, 85, 86, 87. The connection weft yarns 80 are therefore individually identifiable in the attachment layer 17 and thus any tampering thereof is difficult to hide. In addition, the hinge portion 26 therefore comprises relatively strong yarns to prevent ripping or other damage along the attachment line whilst the connection wefts 61 add little bulk to the data sheet 15 and are therefore more discreet. The connection weft yarn 80 may be less than approximately 150 denier, less than approximately 150 denier and is preferably approximately 80 denier. The first infill weft yarn 81, second infill weft yarn 82 and/or warp yarn 83 may be at least approximately 200 decitex, at least approximately 300 decitex and is preferably approximately 400 decitex.

[0056] The interlacing between the weft and warp yarns 80, 81, 82, 83, 84, 85, 86, 87 is not shown in Figure 4, but preferably they are interlocked to one another, such as by knitting. In particular, the warp yarns 83, 84, 85, 86, 87 may be knitted into at least one weft yarn 80, 81, 82 such that they are attached to one another by a stitch. In the present disclosure "knitting" refers to forming closed, interlocked loops between yarns. Preferably the knitting is crochet knitting and each interlock comprises a crochet knitting stitch. Using knitting as the interlacing method

rather than weaving results in an attachment layer 17 that is harder for a forger to unpick and remove from the security document 10. During manufacture, a plurality of warp yarns 83, 84, 85, 86, 87 may be fed by a machine into contact with the weft yarns 80, 81, 82 for interlacing therewith. Preferably the machine is a knitting machine and more preferably a crochet knitting machine.

[0057] At least two of the yarns 80, 81, 82, 83, 84, 85, 86, 87 of the hinge portion 26 have different visible colours such that they have different optical characteristics. In preferred embodiments at least two warp yarns 83, 84, 85, 86, 87, and preferably at least the distal and proximal warp yarns 83, 87, are different colours. For example, the distal warp yarn 83 may be a first colour and the proximal warp yarn 87 may be a different second colour. In the case of at least three (preferably at least five or at least 10) warp yarns 83, 84, 85, 86, 87 they may also form a colour progression from the first colour to the different second colour. The colour progression may be formed by the at least one infill warp yarn 84, 85, 86 having at least one further different colour formed by a colour mixture of the first and second colours. Thus the hue of the colour of the warp yarns 83, 84, 85, 86, 87 may graduate from the first colour at the distal warp yarn 83, through the infill warp yarns 84, 85, 86 to the second colour at the proximal warp yarn 87. One or more of the infill warp yarns 84, 85, 86 may form a third colour and the colour progression may be a variance in hues from the first colour to the third colour and from the third colour to the second colour. Fourth and further colours may be added. Thus the colours of the warps 31 and warp yarns 83, 84, 85, 86, 87 may form a rainbow, iris or ombre, which are difficult for a counterfeiter to replicate.

[0058] In alternative embodiments the distal and proximal warp yarns 83, 87 may be a first colour whilst the infill warp yarns 84, 85, 86 may be a second colour or form a graduation of hue between the first colour of the distal and proximal warp yarns 83, 87. The warp yarns 80, 81, 82, 83, 84, 85, 86, 87 may also have at least one different colour to at least one of the at least one connection weft yarn 80, first infill weft yarn 81 and second infill weft yarn 82.

[0059] The security sheet 11 may be formed by the connection together of the attachment layer 17 and at least one plastic body layer forming the data sheet 15 by, for example, lamination, adhesion, welding and/or any other suitable method. During lamination or welding heat and/or pressure are applied to fuse or push the plurality of body layers together and the plastic of at least one body layer is pushed through the at least one spacing 27 between the connection wefts 25, through mesh openings of the mesh or through the textile (depending upon the construction of the connection portion 60). The attachment layer 17 may be pressed into the first or second outer surface 28, 29 formed by the outer body layers such that the connection portion 60 is at least partially attached at or adjacent to and overlapping the first outer surface 28 of the data sheet 15. At least one strip 50 may overlap at

least part of the connection portion 60 and is attached to or embedded within the data sheet 15 such that it forms part of the first outer surface 28 of the data sheet 15. Alternatively the connection portion 60 may be attached between adjacent body layers prior to lamination such that it is located within the thickness of the data sheet 15. The lamination may be performed using any suitable method and may be a substantially in-line method, similar to that of WO-A-2017/060684 and WO-A-2017/060688, in which a plurality of security sheets 11 are formed continuously.

[0060] Various alternatives to the embodiments discussed above fall within the scope of the present disclosure. The at least one motif 71 discussed in respect of Figure 3 may be included in the security sheet 11 of Figure 4 and the different coloured warp yarns 83, 84, 85, 86, 87 discussed in respect of Figure 4 may be included in the security sheet 11 of Figure 3.

[0061] In a particular arrangement the at least one motif 71 may be formed from at least one motif yarn that does not have different optical and/or haptic characteristics as the at least one background yarn forming the background region 70. The aforementioned description of Figures 3, 5 and 6 equally applies to this arrangement, but without the yarns having different optical and/or haptic characteristics. The at least one motif 71 may be visible and/or detectable by human touch by virtue of the textile structure in the at least one motif 71 being different to the textile structure in the background region 70 in any of the manners listed in the Summary. For example, the thread count in the at least one motif 71 may be higher than in the background region 70 such that it is distinguishable by appearing to have a denser concentration of warps 31 and/or wefts 30.

[0062] In addition, the first and second regions of different textile structures may be formed differently to the adjacent warps 31 as in Figures 4 and 7. The textile may comprise first and second regions that also have different weft spacings, different textile thicknesses, different interlacing patterns, different thread counts and/or the like. For example, the textile may have a higher thickness in the at least one motif 71, forming at least one first region, to the thickness of the background region 70, forming the second region.

Claims

1. A security sheet (11) comprising:

a data sheet (15) displaying data (16), the data sheet (15) extending across a width from an inner edge (22) to an outer edge (23); and an attachment layer (17) attached to the data sheet (15), wherein the attachment layer (17) is for attaching the data sheet (15) in a security document (10), wherein the attachment layer (17) comprises:

- (a) a textile comprising a plurality of interlaced wefts (30) and warps (31), wherein at least two warps (31) and/or at least two wefts (30) are formed from at least two yarns (80, 81, 82, 83, 84, 85, 86, 87) having different haptic and/or optical characteristics, wherein the yarns are fibrous and comprise a plurality of fibres attached together; and (b) a hinge portion (26) outside of the data sheet (15), wherein the at least two yarns having different haptic and/or optical characteristics are located on the hinge portion (26),
- characterised in that** at least two adjacent warps (31) of the hinge portion (26) are separated from one another in a direction perpendicular to the inner edge (22) by at least 0.5 mm.
2. A security sheet (11) as claimed in claim 1 wherein the at least two yarns have different haptic and/or optical characteristics by having different visible colours, non-visible light properties, diameters, opacities, surface roughness, stiffness, hardness and/or different levels of gloss.
 3. A security sheet (11) as claimed in claim 1 or claim 2 wherein:
 - the at least two yarns having different haptic and/or optical characteristics are different types, each type varying from another type in the yarn material, yarn cross section, yarn ply structure, yarn diameter, yarn coating and/or yarn impregnation;
 - at least two yarns have a first colour combination when viewed in visible light and a second colour combination when viewed in a combination of visible and non-visible light, the first and second colour combinations being different from one another; and/or
 - the diameter of at least one yarn is at least 125%, at least 150%, at least 200%, at least 300% or at least 400% of the diameter of at least one further yarn.
 4. A security sheet (11) as claimed in any one of the preceding claims wherein the adjacent warps (31) form first regions of a first textile structure and wefts (30) extending between the adjacent warps (31) form a second textile structure, wherein the first regions and second regions comprise the at least two yarns of different haptic and/or optical characteristics disclosed herein such that the first and second regions have the corresponding different haptic and/or optical characteristics.
 5. A security sheet (11) as claimed in any one of the preceding claims wherein:
 - a plurality of warps (31) differ from a plurality of wefts (30) in a first haptic and/or optical characteristic;
 - at least two of the plurality of warps (31) differ from each other in at least one second haptic and/or optical characteristic; and/or
 - at least two of the plurality of wefts (30) differ from each other in at least one third haptic and/or optical characteristic.
 6. A security sheet (11) as claimed in any one of the preceding claims wherein:
 - the textile comprises at least three warps (31), the at least three warps (31) comprising outer distal and proximal warps and at least one middle warp between the distal and proximal warps, wherein the distal and proximal warps are of different visible colours and/or the at least one middle warp between the distal and proximal warps is at least one different visible colours to the distal and/or proximal warps;
 - the textile comprises at least three warps (31) and/or at least three wefts (30) formed from at least three yarns of different colours such that the at least three yarns form a colour progression from a first colour to a different second colour;
 - the wefts (30) are knitted with the warps (31); and/or
 - at least one weft (30) is transparent.
 7. A security sheet (11) as claimed in any one of the preceding claims wherein the textile comprises at least one motif (71) integrated with a background region (70).
 8. A security sheet (11) as claimed in claim 7 wherein the background region (70) is formed by at least one background yarn and the at least one motif (71) is formed by at least one motif yarn having different haptic and/or optical characteristics to the at least one background yarn such that the at least one motif has different haptic and/or optical characteristics to the background region.
 9. A security sheet (11) as claimed in claim 7 or claim 8 wherein:
 - at least one motif (71) forms at least one of a pattern, symbol, flag, emblem, flower, logo, drawing, letter, pictogram, illustration, alphanumeric character, grapheme, national emblem, coat of arm, personal data, name, photograph, serial number, indicium and code; and/or
 - the at least one motif (71) is a discrete element

separated from edges of the attachment layer (17).

10. A security sheet (11) as claimed in any one of claims 7 to 9 wherein:

the at least one motif (71) is a different visible colour to at least one further motif (71) and/or the background region (70);

the at least one motif (71) is perceived differently by the naked eye, or is only perceivable by the naked eye, when viewed in reflected visible light as compared to reflected non-visible light by virtue of the at least one motif yarn and at least one background yarn having different non-visible light properties; and/or

the at least one motif (71) and at least one further motif (71) and/or the background region (70) have a first colour combination when viewed in visible light and a second colour combination when viewed in a combination of visible and non-visible light.

11. A security sheet (11) as claimed in any one of claims 7 to 10 wherein:

at a front side of the attachment layer (17) at least one front side motif (71) is a first colour and a front side background region is a second colour; and

at a reverse side of the attachment layer (17) at least one reverse side motif (71) is the second colour and a reverse side background region is the first colour.

12. A security sheet (11) as claimed in any one of claims 7 to 11 wherein:

the background region (70) and at least one motif (71) together form a structural sheet of the textile; or

the background region (70) comprises a structural background sheet comprising at least one background yarn and the at least one motif (71) is formed by at least one motif yarn integrated into the structural background sheet in a supplementary and non-structural arrangement.

13. A security document (10) comprising the security sheet (11) of any one of the preceding claims attached to a plurality of leaves and foldable about a fold, wherein the inner edge (22) is located proximate the fold (12) and the outer edge (23) is distal to the fold (12).

14. A method of manufacturing the security sheet (11) of any one of claims 1 to 12, the method comprising forming the textile from the at least two yarns having

different haptic and/or optical characteristics, wherein the two yarns are located on the hinge portion.

15. A method of authenticating a security document (12) comprising the security sheet (11) of any one of claims 1 to 12, the method comprising:

applying part of a human body to the attachment layer (17) and authenticating the security document (10) based upon human tactile feedback distinguishing between the at least two yarns of different haptic characteristics; and/or viewing, by the human eye, the attachment layer (17) in reflected visible or non-visible light and authenticating the security document (10) based upon optical sensory feedback from the human eye distinguishing between the at least two yarns of different optical characteristics.

Patentansprüche

1. Sicherheitsblatt (11), umfassend:

ein Datenblatt (15), das Daten (16) anzeigt, wobei sich das Datenblatt (15) über eine Breite von einer Innenkante (22) zu einer Außenkante (23) erstreckt; und

eine Befestigungsschicht (17), die an dem Datenblatt (15) befestigt ist, wobei die Befestigungsschicht (17) zum Befestigen des Datenblatts (15) in einem Sicherheitsdokument (10) dient, wobei die Befestigungsschicht (17) umfasst:

(a) ein Textil, das eine Mehrzahl von verflochtenen Schussfäden (30) und Kettfäden (31) umfasst, wobei mindestens zwei Kettfäden (31) und/oder mindestens zwei Schussfäden (30) aus mindestens zwei Garnen (80, 81, 82, 83, 84, 85, 86, 87) mit unterschiedlichen haptischen und/oder optischen Eigenschaften gebildet sind, wobei die Garne faserartig sind und eine Mehrzahl von miteinander verbundenen Fasern umfassen; und

(b) einen Scharnierabschnitt (26) außerhalb des Datenblatts (15), wobei die mindestens zwei Fäden mit unterschiedlichen haptischen und/oder optischen Eigenschaften auf dem Scharnierabschnitt (26) angeordnet sind,

dadurch gekennzeichnet, dass mindestens zwei benachbarte Kettfäden (31) des Scharnierabschnitts (26) in einer Richtung senkrecht zur Innenkante (22) um mindestens 0,5 mm voneinander getrennt sind.

2. Sicherheitsblatt (11) nach Anspruch 1, bei dem die mindestens zwei Fäden unterschiedliche haptische und/oder optische Eigenschaften aufweisen, indem sie unterschiedliche sichtbare Farben, Eigenschaften für nicht sichtbares Licht, Durchmesser, Opazitäten, Oberflächenrauheit, Steifigkeit, Härte und/oder unterschiedliche Glanzgrade aufweisen.

3. Sicherheitsblatt (11) nach Anspruch 1 oder 2, bei dem:

die mindestens zwei Fäden mit unterschiedlichen haptischen und/oder optischen Eigenschaften unterschiedliche Typen sind, wobei jeder Typ sich von einem anderen Typ in Fadenmaterial, Fadenquerschnitt, Fadenlagenstruktur, Fadendurchmesser, Fadenbeschichtung und/oder Fadenimprägnierung unterscheidet; mindestens zwei Fäden eine erste Farbkombination bei Betrachtung in sichtbarem Licht und eine zweite Farbkombination bei Betrachtung in einer Kombination aus sichtbarem und nicht sichtbarem Licht aufweisen, wobei die erste und die zweite Farbkombination voneinander verschieden sind; und/oder der Durchmesser mindestens eines Garns mindestens 125 %, mindestens 150 %, mindestens 200 %, mindestens 300 % oder mindestens 400 % des Durchmessers von mindestens einem weiteren Garn beträgt.

4. Sicherheitsblatt (11) nach einem der vorhergehenden Ansprüche, bei dem die benachbarten Kettfäden (31) erste Bereiche einer ersten textilen Struktur bilden und sich zwischen den benachbarten Kettfäden (31) erstreckende Schussfäden (30) eine zweite textile Struktur bilden, wobei die ersten und zweiten Bereiche die hier offenbaren mindestens zwei Garne mit unterschiedlichen haptischen und/oder optischen Eigenschaften umfassen, so dass die ersten und zweiten Bereiche die entsprechenden unterschiedlichen haptischen und/oder optischen Eigenschaften aufweisen.

5. Sicherheitsblatt (11) nach einem der vorhergehenden Ansprüche, bei dem:

eine Mehrzahl von Kettfäden (31) sich von einer Mehrzahl von Schussfäden (30) in einer ersten haptischen und/oder optischen Eigenschaft unterscheidet; mindestens zwei der Mehrzahl von Kettfäden (31) sich voneinander in mindestens einer zweiten haptischen und/oder optischen Eigenschaft unterscheiden; und/oder mindestens zwei der Mehrzahl von Schussfäden (30) sich voneinander in mindestens einer dritten haptischen und/oder optischen Eigen-

schaft unterscheiden.

6. Sicherheitsblatt (11) nach einem der vorhergehenden Ansprüche, bei dem:

das Textil mindestens drei Kettfäden (31) umfasst, wobei die mindestens drei Kettfäden (31) äußere distale und proximale Kettfäden und mindestens einen mittleren Kettfaden zwischen den distalen und proximalen Kettfäden umfassen, wobei die distalen und proximalen Kettfäden unterschiedliche sichtbare Farben aufweisen und/oder der mindestens eine mittlere Kettfaden zwischen dem distalen und dem proximalen Kettfaden mindestens eine andere sichtbare Farbe aufweist als der distale und/oder der proximale Kettfaden; das Textil mindestens drei Kettfäden (31) und/oder mindestens drei Schussfäden (30) umfasst, die aus mindestens drei Garnen unterschiedlicher Farben gebildet sind, so dass die mindestens drei Garne einen Farbverlauf von einer ersten Farbe zu einer unterschiedlichen zweiten Farbe bilden; die Schussfäden (30) mit den Kettfäden (31) verstrickt sind; und/oder mindestens ein Schussfaden (30) transparent ist.

7. Sicherheitsblatt (11) nach einem der vorhergehenden Ansprüche, bei dem das Textil mindestens ein Motiv (71) umfasst, das in einen Hintergrundbereich (70) integriert ist.

8. Sicherheitsblatt (11) nach Anspruch 7, bei dem der Hintergrundbereich (70) aus mindestens einem Hintergrundgarn gebildet ist und das mindestens eine Motiv (71) aus mindestens einem Motivgarn gebildet ist, das andere haptische und/oder optische Eigenschaften als das mindestens eine Hintergrundgarn aufweist, so dass das mindestens eine Motiv andere haptische und/oder optische Eigenschaften als der Hintergrundbereich aufweist.

9. Sicherheitsblatt (11) nach Anspruch 7 oder 8, bei dem:

mindestens ein Motiv (71) mindestens eines von einem Muster, Symbol, einer Flagge, einem Emblem, einer Blume, einem Logo, einer Zeichnung, einem Buchstaben, einem Piktogramm, einer Illustration, einem alphanumerischen Zeichen, einem Graphem, einem nationalen Emblem, einem Wappen, persönlichen Daten, einem Namen, einem Foto, einer Seriennummer, einem Freimachungsvermerk und einem Code bildet; und/oder das mindestens eine Motiv (71) ein diskretes

Element ist, das von den Rändern der Befestigungsschicht (17) getrennt ist.

10. Sicherheitsblatt (11) nach einem der Ansprüche 7 bis 9, bei dem:

das mindestens eine Motiv (71) eine andere sichtbare Farbe hat als mindestens ein weiteres Motiv (71) und/oder der Hintergrundbereich (70);

das mindestens eine Motiv (71) bei Betrachtung in reflektiertem sichtbarem Licht im Vergleich zu reflektiertem nicht sichtbarem Licht aufgrund des mindestens einen Motivgarns und mindestens eines Hintergrundgarns mit unterschiedlichen Eigenschaften für nicht sichtbares Licht mit bloßem Auge anders wahrgenommen wird oder nur mit bloßem Auge wahrnehmbar ist; und/oder das mindestens eine Motiv (71) und das mindestens eine weitere Motiv (71) und/oder der Hintergrundbereich (70) bei Betrachtung in sichtbarem Licht eine erste Farbkombination und bei Betrachtung in einer Kombination aus sichtbarem und nicht sichtbarem Licht eine zweite Farbkombination aufweisen.

11. Sicherheitsblatt (11) nach einem der Ansprüche 7 bis 10, bei dem:

an einer Vorderseite der Befestigungsschicht (17) mindestens ein Vorderseitenmotiv (71) eine erste Farbe und ein Vorderseitenhintergrundbereich eine zweite Farbe aufweist; und an einer Rückseite der Befestigungsschicht (17) mindestens ein Rückseitenmotiv (71) die zweite Farbe und ein Rückseitenhintergrundbereich die erste Farbe aufweist.

12. Sicherheitsblatt (11) nach einem der Ansprüche 7 bis 11, bei dem:

der Hintergrundbereich (70) und mindestens ein Motiv (71) zusammen ein Strukturblatt des Textils bilden; oder

der Hintergrundbereich (70) eine Hintergrundstrukturschicht umfasst, die mindestens ein Hintergrundgarn umfasst, und das mindestens eine Motiv (71) durch mindestens ein Motivgarn gebildet wird, das in die Hintergrundstrukturschicht in einer ergänzenden und nicht-strukturellen Anordnung integriert ist.

13. Sicherheitsdokument (10), umfassend das Sicherheitsblatt (11) nach einem der vorhergehenden Ansprüche, das an einer Mehrzahl von Blättern angebracht ist und um eine Falte faltbar ist, wobei die Innenkante (22) in der Nähe der Falte (12) angeordnet ist und die Außenkante (23) von der Falte (12)

entfernt ist.

14. Verfahren zur Herstellung des Sicherheitsblatts (11) nach einem der Ansprüche 1 bis 12, wobei das Verfahren das Bilden des Textils aus den mindestens zwei Garnen mit unterschiedlichen haptischen und/oder optischen Eigenschaften umfasst, wobei die beiden Garne auf dem Scharnierabschnitt angeordnet werden.

15. Verfahren zum Authentifizieren eines Sicherheitsdokuments (12), das das Sicherheitsblatt (11) nach einem der Ansprüche 1 bis 12 umfasst, wobei das Verfahren umfasst:

Aufbringen eines Teils eines menschlichen Körpers auf die Befestigungsschicht (17) und Authentifizieren des Sicherheitsdokuments (10) auf der Grundlage einer taktilen Rückmeldung des Menschen, die zwischen den mindestens zwei Garnen mit unterschiedlichen haptischen Eigenschaften unterscheidet; und/oder Betrachten der Befestigungsschicht (17) mit dem menschlichen Auge in reflektiertem sichtbarem oder nicht sichtbarem Licht und Authentifizieren des Sicherheitsdokuments (10) auf der Grundlage einer optischen sensorischen Rückmeldung des menschlichen Auges, wobei zwischen den mindestens zwei Fäden mit unterschiedlichen optischen Eigenschaften unterschieden wird.

Revendications

1. Feuille de sécurité (11) comprenant :

une feuille de données (15) affichant des données (16), la feuille de données (15) s'étendant d'un côté à l'autre d'une largeur d'un bord interne (22) à un bord externe (23) ; et une couche de fixation (17) fixée à la feuille de données (15), dans laquelle la couche de fixation (17) sert à fixer la feuille de données (15) dans un document de sécurité (10), dans laquelle la couche de fixation (17) comprend :

- (a) un textile comprenant une pluralité de trames (30) et chaînes (31) entrelacées, dans laquelle au moins deux chaînes (31) et/ou au moins deux trames (30) sont formées à partir d'au moins deux fils (80, 81, 82, 83, 84, 85, 86, 87) présentant des caractéristiques haptiques et/ou optiques différentes, dans laquelle les fils sont fibreux et comprennent une pluralité de fibres fixées ensemble ; et
(b) une partie charnière (26) à l'extérieur de

- la feuille de données (15), dans laquelle les au moins deux fils présentant des caractéristiques haptiques et/ou optiques différentes sont situés sur la partie charnière (26),
- caractérisée en ce qu'**au moins deux chaînes (31) adjacentes de la partie charnière (26) sont séparées l'une de l'autre dans une direction perpendiculaire au bord interne (22) d'au moins 0,5 mm.
- 5
- 10
2. Feuille de sécurité (11) selon la revendication 1 dans laquelle les au moins deux fils présentent des caractéristiques haptiques et/ou optiques différents en présentant des couleurs visibles, des propriétés de lumière non visible, des diamètres, des opacités, des rugosités de surface, une rigidité, une dureté et/ou des niveaux de brillance différents.
- 15
3. Feuille de sécurité (11) selon la revendication 1 ou la revendication 2 dans laquelle :
- 20
- les au moins deux fils présentant des caractéristiques haptiques et/ou optiques différentes sont de différents types, chaque type variant d'un autre type en matériau de fil, coupe transversale de fil, structure d'épaisseur de fil, diamètre de fil, revêtement de fil et/ou imprégnation de fil ;
- 25
- au moins deux fils présentent une première combinaison de couleurs lorsqu'ils sont vus dans une lumière visible et une seconde combinaison de couleurs lorsqu'ils sont vus dans une combinaison de lumière visible et non visible, les première et seconde combinaisons de couleurs étant différentes l'une de l'autre ; et/ou
- 30
- le diamètre d'au moins un fil est d'au moins 125 %, d'au moins 150 %, d'au moins 200 %, d'au moins 300 % ou d'au moins 400 % du diamètre d'au moins un fil supplémentaire.
- 35
4. Feuille de sécurité (11) selon l'une quelconque des revendications précédentes dans laquelle les chaînes (31) adjacentes forment des premières régions d'une première structure de textile et des trames (30) s'étendant entre les chaînes (31) adjacentes forment une seconde structure de textile, dans laquelle les premières régions et les secondes régions comprennent les au moins deux fils de propriétés haptiques et/ou optiques différentes divulgués ici de sorte que les première et seconde régions présentent les caractéristiques haptiques et/ou optiques différentes correspondantes.
- 40
- 45
5. Feuille de sécurité (11) selon l'une quelconque des revendications précédentes dans laquelle :
- 50
- une pluralité de chaînes (31) diffèrent d'une
- 55
- pluralité de trames (30) dans une première caractéristique haptique et/ou optique ;
- au moins deux de la pluralité de chaînes (31) diffèrent l'une de l'autre dans au moins une deuxième caractéristique haptique et/ou optique ; et/ou
- au moins deux de la pluralité de trames (30) diffèrent l'une de l'autre dans au moins une troisième caractéristique haptique et/ou optique.
6. Feuille de sécurité (11) selon l'une quelconque des revendications précédentes dans laquelle :
- le textile comprend au moins trois chaînes (31), les au moins trois chaînes (31) comprenant des chaînes distales et proximales et au moins une chaîne intermédiaire entre les chaînes distales et proximales, dans laquelle les chaînes distales et proximales sont de différentes couleurs visibles et/ou l'au moins une chaîne intermédiaire entre les chaînes distales et proximales est d'au moins une couleur visible différente de celle des chaînes distales et/ou proximales ;
- le textile comprend au moins trois chaînes (31) et/ou au moins trois trames (30) formées d'au moins trois fils de différentes couleurs de sorte que les au moins trois fils forment une progression de couleur d'une première couleur à une seconde couleur différente ;
- les trames (30) sont tricotées avec les chaînes (31) ; et/ou
- au moins une trame (30) est transparente.
7. Feuille de sécurité (11) selon l'une quelconque des revendications précédentes dans laquelle le textile comprend au moins un motif (71) intégré à une région d'arrière-plan (70).
8. Feuille de sécurité (11) selon la revendication 7 dans laquelle la région d'arrière-plan (70) est formée par au moins un fil d'arrière-plan et l'au moins un motif (71) est formé par au moins un fil de motif présentant des caractéristiques haptiques et/ou optiques différentes de celles de l'au moins un fil d'arrière-plan de sorte que l'au moins un motif présente des caractéristiques haptiques et/optiques différentes de celles de la région d'arrière-plan.
9. Feuille de sécurité (11) selon la revendication 7 ou la revendication 8 dans laquelle :
- au moins un motif (71) forme au moins l'un d'un modèle d'un symbole, d'un drapeau, d'un emblème, d'une fleur, d'un logo, d'un dessin, d'une lettre, d'un pictogramme, d'une illustration, d'un caractère alphanumérique, d'un graphème, d'un emblème national, d'un blason, de don-

- nées personnelles, d'un nom, d'une photographie, d'un numéro de série, d'un indice et code ; et/ou
l'au moins un motif (71) est un élément discret séparé de bords de la couche de fixation (17).
- 10.** Feuille de sécurité (11) selon l'une quelconque des revendications 7 à 9 dans laquelle :
- l'au moins un motif (71) est d'une couleur visible différente de celle d'au moins un motif (71) supplémentaire et/ou de la région d'arrière-plan (70) ;
l'au moins un motif (71) est perçu différemment à l'œil nu, ou est seulement perceptible à l'œil nu, lorsqu'il est vu dans une lumière visible réfléchie par rapport à une lumière non visible réfléchie en vertu de l'au moins un fil de motif et d'au moins un fil d'arrière-plan présentant des propriétés de lumière non visible différentes ; et/ou
l'au moins un motif (71) et au moins un motif (71) supplémentaire et/ou la région d'arrière-plan (70) présentent une première combinaison de couleurs lorsqu'ils sont vus dans une lumière visible et une seconde combinaison de couleurs lorsqu'ils sont vus dans une combinaison de lumière visible et non visible.
- 11.** Feuille de sécurité (11) selon l'une quelconque des revendications 7 à 10 dans laquelle :
- au niveau d'un côté avant de la couche de fixation (17) au moins un motif (71) de côté avant est d'une première couleur et une région d'arrière-plan de côté avant est d'une seconde couleur ; et au niveau d'un côté inverse de la couche de fixation (17) au moins un motif (71) de côté inverse est de la seconde couleur et une région d'arrière-plan de côté inverse est de la première couleur.
- 12.** Feuille de sécurité (11) selon l'une quelconque des revendications 7 à 11 dans laquelle :
- la région d'arrière-plan (70) et au moins un motif (71) forment ensemble une feuille structurale du textile ; ou
la région d'arrière-plan (70) comprend une feuille d'arrière-plan structurale comprenant au moins un fil d'arrière-plan et l'au moins un motif (71) est formé par au moins un fil de motif intégré dans la feuille d'arrière-plan structurale dans un agencement supplémentaire et non structural.
- 13.** Document de sécurité (10) comprenant la feuille de sécurité (11) selon l'une quelconque des revendications précédentes fixée à une pluralité de feuillets et pliable autour d'un pli, dans lequel le bord interne (22) est situé à proximité du pli (12) et le bord externe (23) est distal par rapport au pli (12).
- 14.** Procédé de fabrication de la feuille de sécurité (11) selon l'une quelconque des revendications 1 à 12, le procédé comprenant la formation du textile à partir des au moins deux fils présentant des caractéristiques haptiques et/ou optiques différentes, dans lequel les deux fils sont situés sur la partie charnière.
- 15.** Procédé d'authentification d'un document de sécurité (12) comprenant la feuille de sécurité (11) selon l'une quelconque des revendications 1 à 12, le procédé comprenant :
- l'application d'une partie d'un corps humain à la couche de fixation (17) et l'authentification du document de sécurité (10) sur la base du retour d'informations tactile humain qui fait la distinction entre les au moins deux fils de caractéristiques haptiques différentes ; et/ou
la visualisation, par l'œil humain, de la couche de fixation (17) dans une lumière visible ou non visible réfléchie et l'authentification du document de sécurité (10) sur la base d'un retour d'informations sensoriel optique de l'œil humain qui fait la distinction entre les au moins deux fils de différentes caractéristiques optiques.

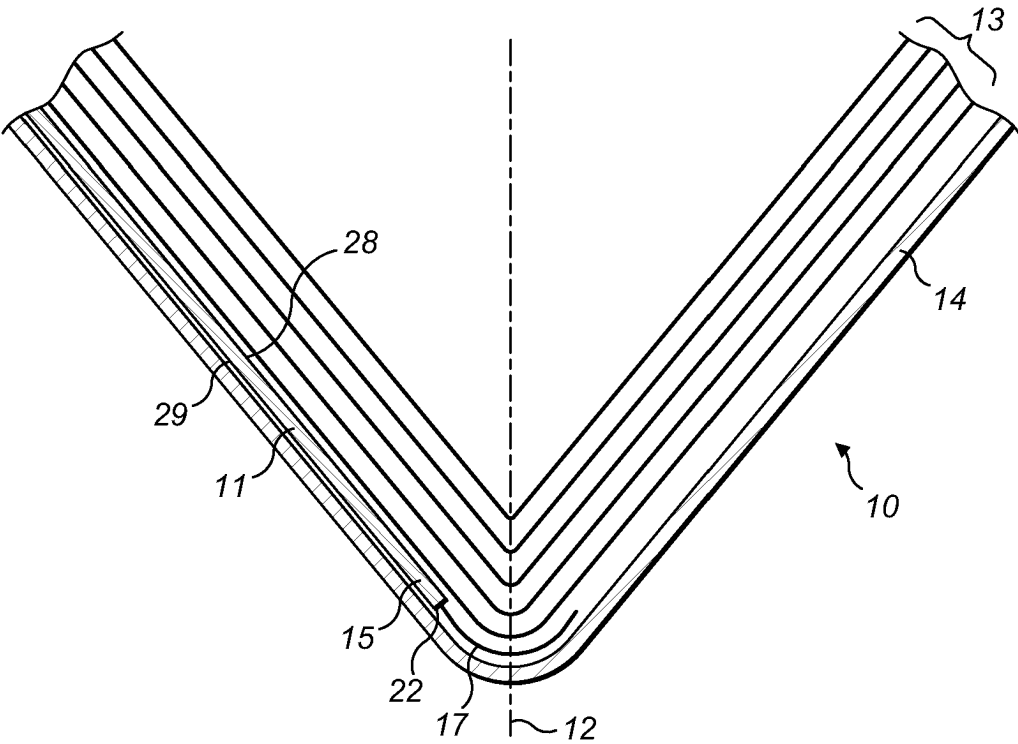


FIG. 2

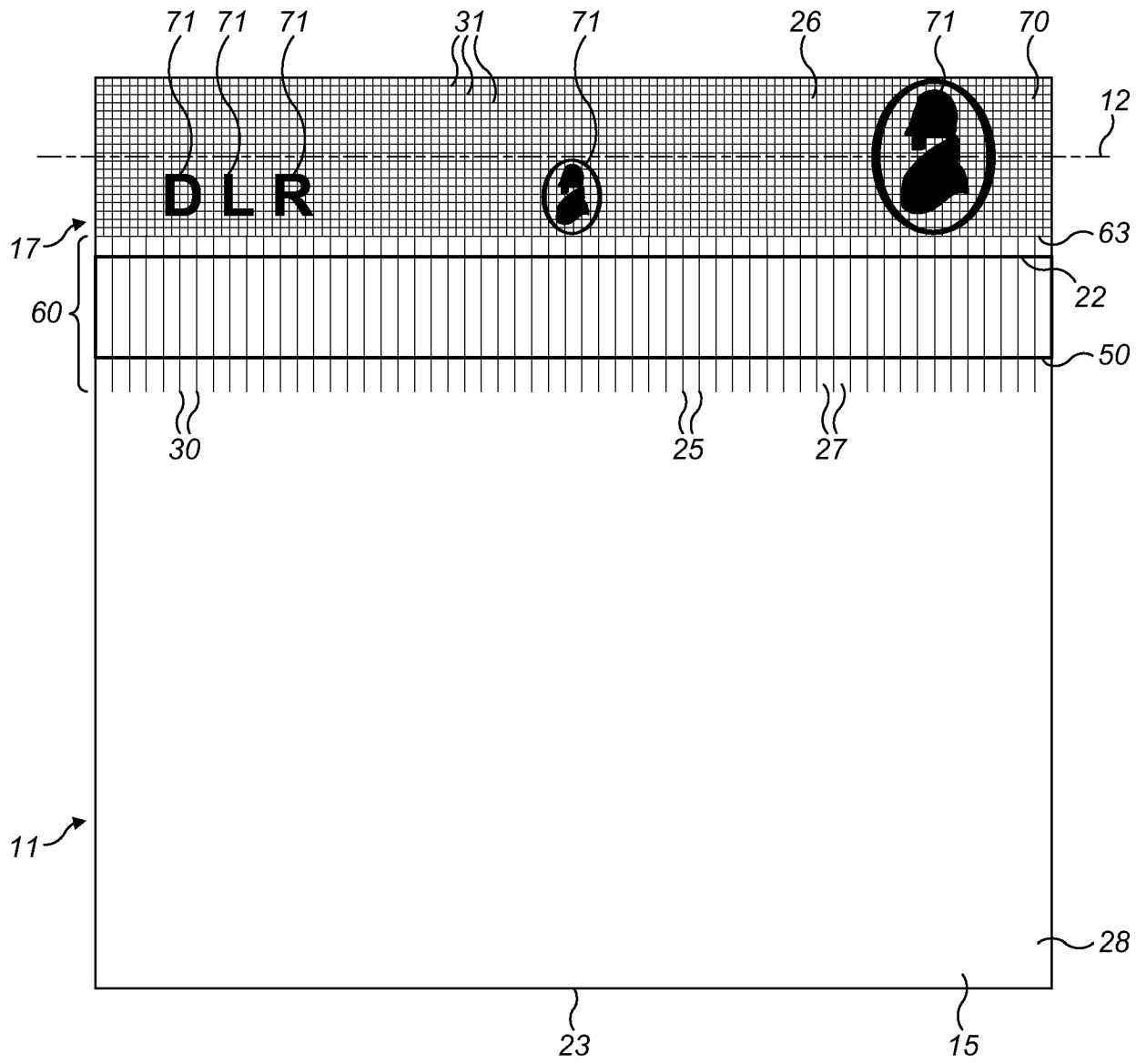


FIG. 3

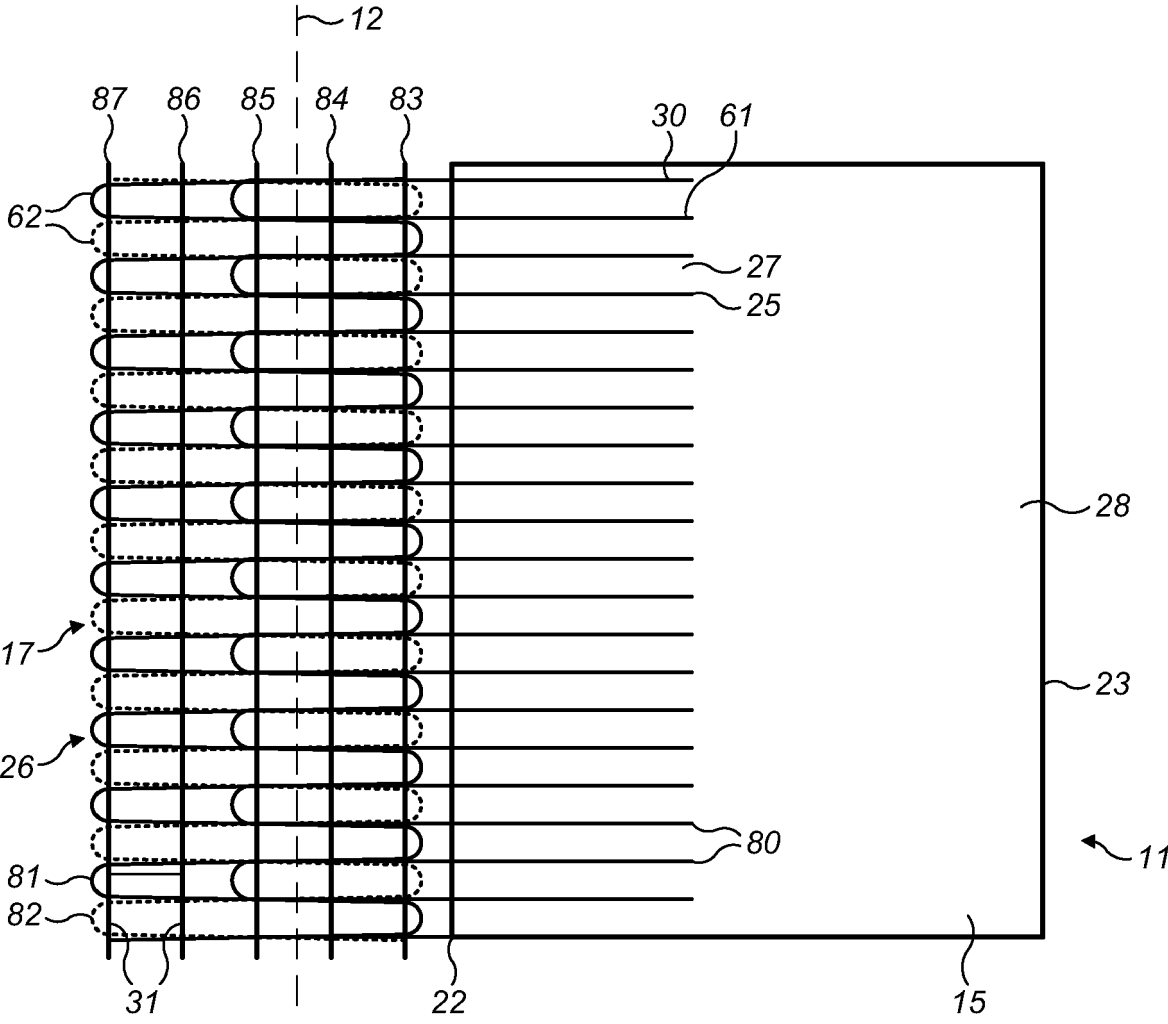


FIG. 4

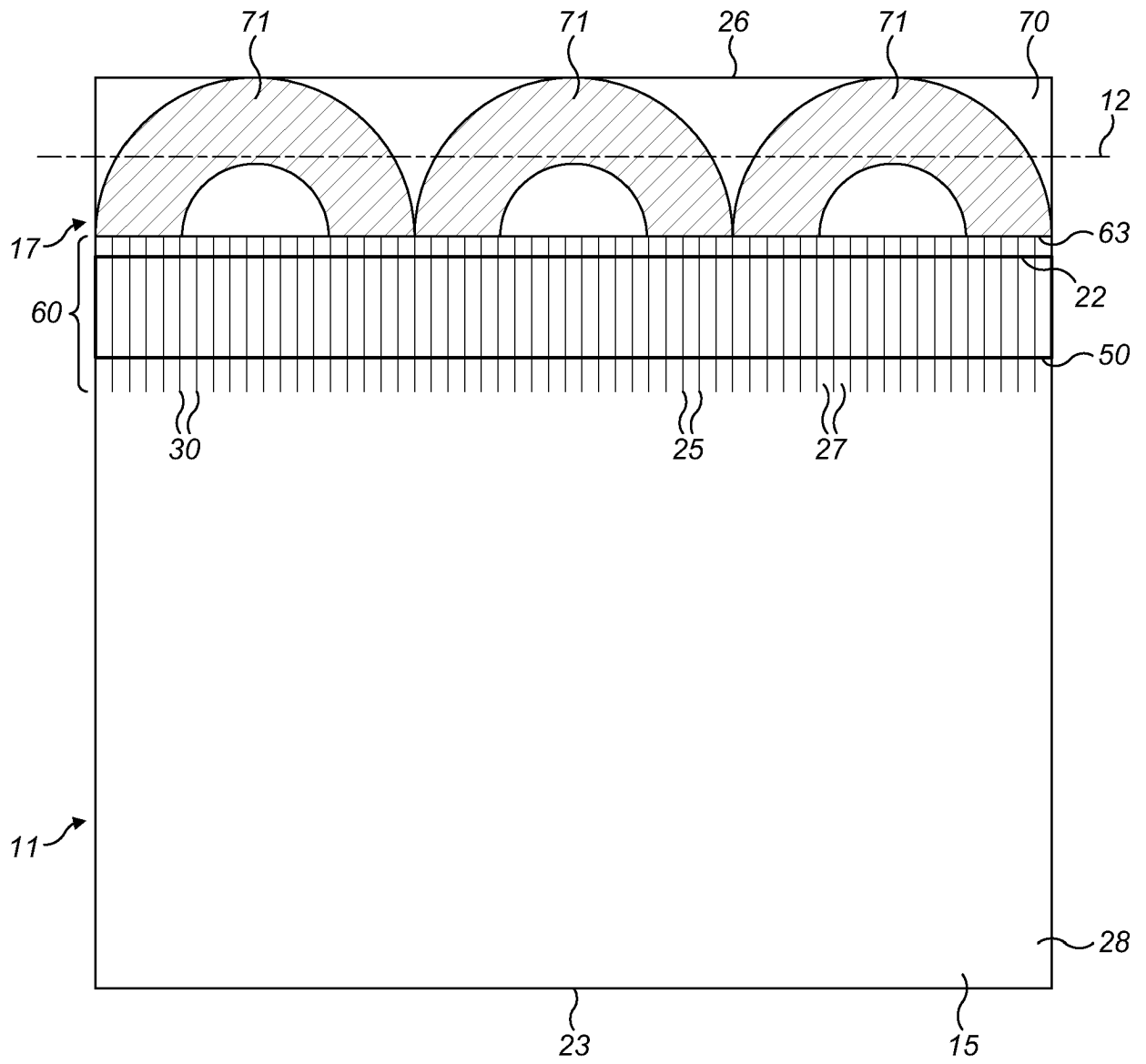


FIG. 5

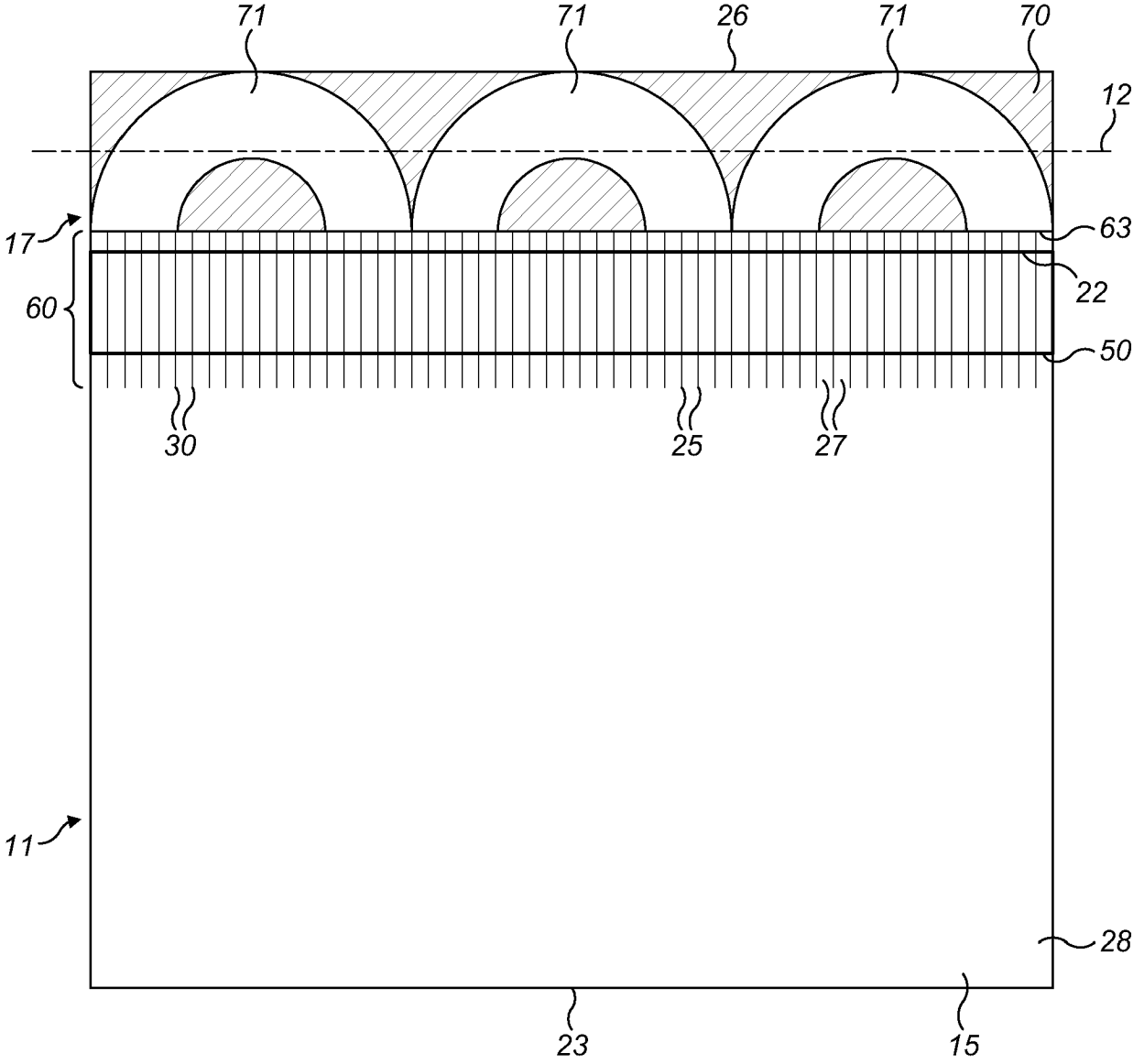


FIG. 6

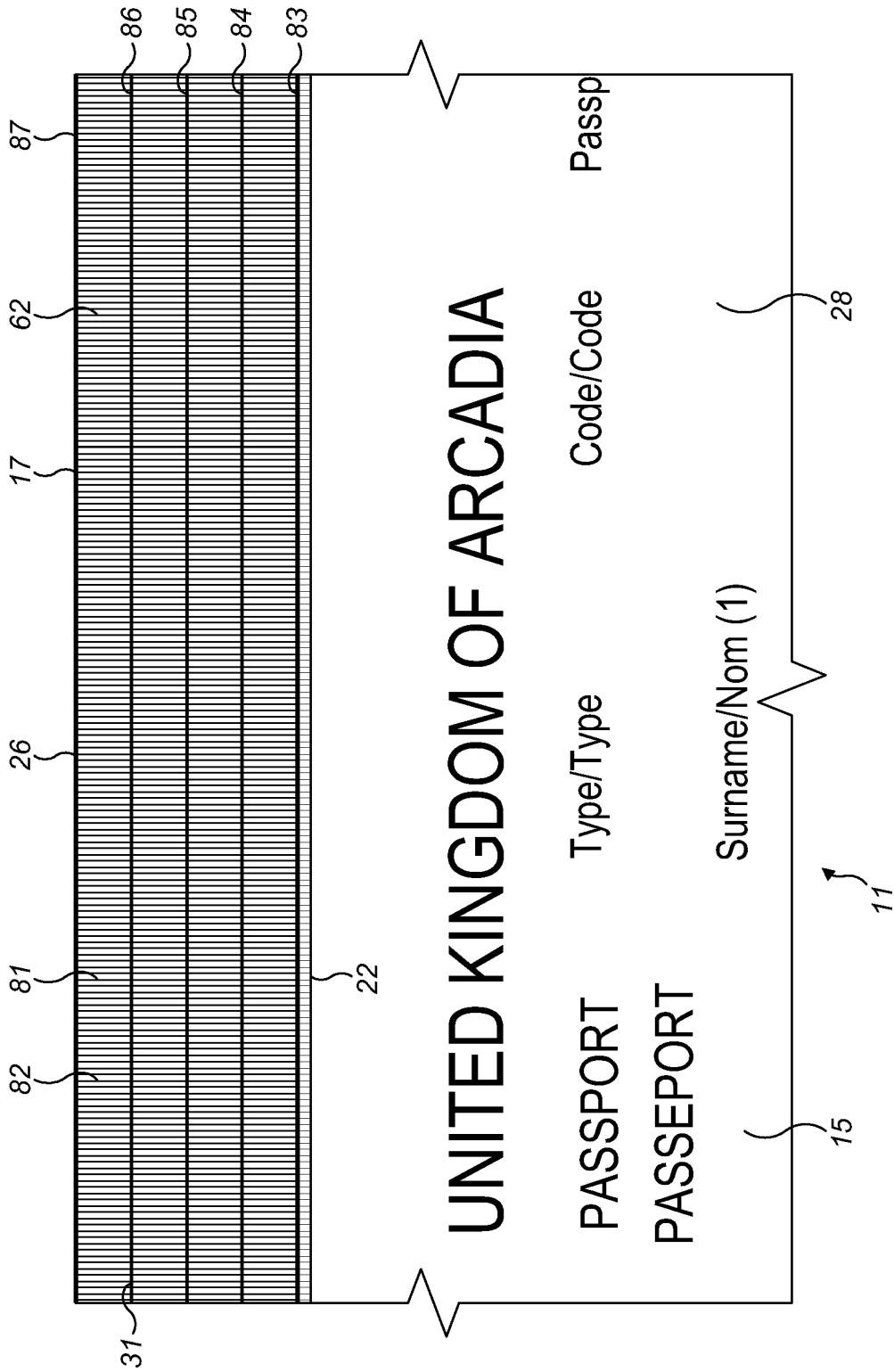


FIG. 7

REFERENCES CITED IN THE DESCRIPTION

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