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(54) **SECURITY DEVICES FOR SECURITY DOCUMENTS**

SICHERHEITSVORRICHTUNGEN FÜR SICHERHEITSDOKUMENTE

DISPOSITIFS DE SÉCURITÉ POUR DOCUMENTS DE SÉCURITÉ

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Description

[0001] The invention relates to improvements in security devices for security documents.

[0002] Security documents, including documents of value and means of identification, including banknotes, passports, identification cards, certificates and the like, are vulnerable to copying or counterfeiting. The increasing availability of colour photocopiers, electronic scanning and other imaging systems, and the improving technical quality of colour photocopiers, has led to an increase in the counterfeiting of such documentation. There is, therefore, a need to continually improve the security features of such documentation to add additional security features or to enhance the perceptions and resistance of simulation to existing features.

[0003] Steps have already been taken to introduce optically variable features into such documentation which cannot be reproduced by a photocopier or an electronic scanner. Since the photocopying process typically involves reflecting high energy light onto an original document containing the image to be copied, one solution is to incorporate one or more features into the document which have a different perception in reflected and transmitted light. Examples of such security features include watermarks, embedded security threads, fluorescent pigments and the like.

[0004] One such security feature which can be applied directly to documents of value is described in GB-A-2268906. This security feature comprises a liquid crystal material applied to a paper or polymer region to produce optical effects which differ when viewed in transmitted and reflected light, in particular where the paper or polymer region includes a watermark.

[0005] Another such security feature, which can be applied to security paper, is described in EP-A-0490825. This security paper has a superficial colour code made up of at least two adjoining surface areas in the form of stripes. The stripes contain different iridescent pigments and exhibit different colours when viewed from different oblique viewing angles.

[0006] In GB-A-2283026 a security feature is described in which a portion of the paper is transparentised with a transparentising resin to which an iridescent substance has been added. Different colour shifts can be seen in the resulting paper as the paper is moved and examined in reflected light. A colour shift can also be seen when the light, under which it is examined, changes from transmitted to reflected light, although no colour change can be seen when the viewing angle is altered under just reflected light.

[0007] One class of security features used in banknotes and the like are those commonly referred to as "*teller assist*" features. These are features that require a simple hand held device to view them. A common teller assist security feature is one based on luminescent materials. Luminescent materials are well known to those skilled in the art, and include materials having fluorescent or phosphorescent properties. The use of luminescent features on security threads has been described in EP-A-303725, EP-A-319157 and WO-A-2006051231, as well as in numerous other patent publications. It is also well known to use other materials that respond visibly to some form of invisible radiation, such as IR responsive, photochromic and thermochromic materials.

[0008] In the security feature described in EP-A-319157, there is present on either or both sides of an elongate security thread a fluorescent material. The security thread comprises a plastics substrate with demetallised indicia on one side thereof, and the fluorescent material present in the plastics substrate or on the surface of said substrate. When viewed under ultraviolet (UV) reflected light from the side of the demetallised indicia, the demetallised indicia are highlighted in the colour of the fluorescent material. In a further example a demetallised security thread is uniformly coated on one side with a layer containing one fluorescent material and uniformly coated on the other side with another fluorescent material of a different colour. When viewed under UV light, each side reflects UV light exhibiting its own particular colour more or less uniformly, although there may be some colour mix in the demetallised areas. In transmitted light, however, the demetallised areas will be perceived as a third colour which will be a mix of the other two colours and markedly distinguishable from them.

[0009] A similar type of security thread is disclosed in WO-A-2006051231. The security thread described in this document comprises an opaque layer with gaps forming indicia supported by a transparent polymeric carrier film. Different fluorescent materials are applied to either side of the security thread such that, in reflection, the two surfaces emit a different colour when exposed to UV light. When viewed in transmission in UV light a third colour (and potentially a fourth colour, depending on which side of the security thread is being viewed), is observed in the gaps in the opaque layer resulting from the combination of the two surface colours.

[0010] The latter two related art examples describe a security feature in which an image is created by gaps in an opaque layer which is visible in transmitted light or on exposure to UV light, with zones fluorescing in two or more colours. A problem with this type of structure is that, in order to achieve multiple coloured fluorescent zones, the fluorescent material must be applied to the opaque materials. In most cases the opaque material is metallic and has a characteristic sheen which, when exposed in a secure document, attracts the attention of the authenticator which is not necessarily desirable. Furthermore, if a fluorescent material is applied to the metallic layer there may be an undesirable reduction in the metallic sheen. This is of particular concern if the fluorescent material is a pigmented lacquer. The superior lightfastness of pigmented fluorescent lacquers compared to organic dyes means that they are the preferred materials in security devices employed in documents, such as banknotes, where the feature must withstand a long lifetime

in circulation.

[0011] AU 734 937 B2 is seen as the closest state of the art; discloses a security device comprising at least one at least partially light transmitting spacer layer, on one side of which are formed first indicia, said first indicia comprising a plurality of repeating elements and being formed from a material which emits a coloured visible light when excited by a form of radiation, and on an opposing side of the spacer layer is an absorbing material, which does not absorb the said radiation, the absorbing material being applied in a pattern comprising a plurality of repeating elements similar to the elements of the first indicia and having gaps between the elements.

[0012] However, there is a continual need to find alternative security features which are difficult to counterfeit and in particular teller assist features which are easy to recognise under the requisite predetermined conditions for authentication purposes.

[0013] The invention therefore comprises a security device comprising at least one at least partially light transmitting spacer layer, on one side of which are formed first indicia, said first indicia comprising a plurality of repeating elements and being formed from a material which emits a coloured visible light when excited by a form of radiation, and on an opposing side of the spacer layer is an absorbing material, which absorbs the said radiation but not visible light, the absorbing material being applied in a pattern comprising a plurality of repeating elements similar to the elements of the first indicia and having gaps between the elements.

[0014] Embodiments of invention will now be described, by way of example only, with reference to the following drawings in which:-

Figure 1a is a cross-sectional side elevation of a security device according to the present invention;

Figure 1b is an underneath plan view of the security device of Figure 1a;

Figure 2 is a cross-sectional side elevation of a security substrate incorporating the security device of claim 1;

Figure 3 is an alternative version of the security device of Figure 1;

Figure 4a and 4b are top and underneath plan views of the security device of Figure 3 respectively showing the absorbing regions and the indicia; and

Figure 5 is a cross sectional side elevation of a security substrate to which a further alternative embodiment of the security device has been applied.

[0015] The security device 10 of the present invention provides a directional teller assist security feature which can be checked easily under ultra violet light. The security device 10 is extremely versatile as the nature of its construction means that it can be applied to security documents in a number of ways.

[0016] Referring to Figure 1, the security device 10 comprises a spacer layer 11 to one surface of which are applied indicia 12,13 and to the other surface are applied regions 14 of an absorbing material.

[0017] The spacer layer 11 is preferably a carrier layer of a substantially transparent polymeric substrate, such as polyethylene terephthalate (PET) or biaxially oriented polypropylene (BOPP). Where the spacer layer 11 is a carrier layer, the device 10 may be formed into an elongate security element, such as a thread or stripe, or a patch for incorporation in or application to a paper or polymer substrate to form a security substrate from which a security document can be formed. When used in this form, the thickness of the spacer layer 11 is typically in the region of 10-40 microns, and more preferably 15-20 microns. Alternatively, the spacer layer 11 may comprise a varnish or the substrate of a security document itself, e.g. a layer of BOPP film forming a polymer banknote. When used in this form the thickness of the carrier layer 11 is typically in the region of 40-120 microns and more preferably 70-90 microns.

[0018] This means that the security device 10 of the present invention can thus be incorporated into or arranged on a security document in any of the conventional formats known in the related art.

[0019] If the spacer layer 11 is a transparent polymeric film it can be incorporated in a paper substrate using the method described in WO-A-0039391 in which one side of a transparent elongate impermeable strip is wholly exposed at one surface of the paper substrate in which it is partially embedded, and partially exposed in apertures at the other surface of the substrate. The apertures formed in the paper can be used as the spacer layer 11 in the present invention.

[0020] In the method described in WO-A-0039391 the indicia 12,13 and the absorbing layer 14 can be applied to the spacer layer 11 during the production of the transparent elongate impermeable strip or after it has been incorporated into the paper substrate.

[0021] Other methods for forming transparent regions in paper substrates are described in EP-A-723501, EP-A-724519, WO-A-03054297 and EP-A-1398174.

[0022] The indicia 12,13 are applied to one side or surface of the spacer layer 11, preferably by a suitable printing process. Typically, the indicia 12, 13 are printed onto the document, preferably by means of a process such as lithography, UV cured lithography, intaglio, letterpress, flexographic printing, gravure printing or screen printing. In a preferred embodiment the indicia 12,13 are simply printed in one process ensuring perfect registration between elements of the indicia 12,13.

[0023] The indicia 12,13 and the absorbing material regions 14 comprise a plurality of substantially similar repeating elements, such as stripes, curves, pixels and the like. Each set of indicia may form an image, for example in the case of the structure shown in Figure 1 each image is divided into strips (indicia) 12 and 13 respectively and then the strips are interlaced. The image preferably provides identifying information and could be any one of symbols, pictorial representations and characters

including alphanumerics and those from non-Roman scripts of which examples include but are not limited to, Chinese, Japanese, Sanskrit and Arabic.

[0024] In the embodiment illustrated in Figures 1a and 1b first indicia 12 comprises a set of stripes which extend transversely from one edge of the spacer layer 11 to an opposing edge and repeat at intervals along the length of the layer 11. Similarly second indicia 13 comprises a set of stripes which also extend transversely from one edge of the spacer layer 11 to an opposing edge and repeat at intervals along the length of the layer 11. A stripe from the first indicia 12 is printed adjacent a stripe from the second indicia 13 with gaps 17 between each pair of stripes. The indicia 12,13 are formed from two different materials, preferably inks, which are colourless in normal daylight but which each emit a different coloured light, e.g. red and green, when excited by a form of radiation, such as UV light.

[0025] Regions 14 of the absorbing material are also preferably applied by a suitable printing process, in register with the indicia 12,13. In this embodiment the absorbing regions 14 comprise transverse stripes (each stripe having a width equal to the width of an adjacent pair of stripes from indicia 12,13) repeating along the length of the spacer layer 11 with gaps 18 between each stripe which match the gaps 17 between the stripes of the indicia 12,13.

[0026] If the inks/materials used for the indicia 12,13 are excitable by UV light, then the absorbing material must be a UV absorbing material. If the inks/materials used for the indicia 12,13 respond to another form of radiation, the absorbing material must be one which absorbs that form of radiation.

[0027] When the example shown in Figure 1 is viewed under a UV lamp from the direction of arrow X (i.e. from the same side as the absorbing material 14) with the lamp 15 held at A, towards one end of the security device 10, a set of stripes in one colour (e.g. red) can be seen. If the stripes are arranged to form an image then a red image would be observed. This occurs as the UV light can only pass through the gaps 18 between the absorbing regions 14 and excite the ink/material used to form the stripes of the first indicia 12, which is closest to the lamp 15. The absorbing regions 14 prevent any radiation from getting to the stripes of the second indicia 13. Since the absorbing regions 14 only absorb UV light, the fluorescent light resulting from excitation of the ink material of indicia 12 is visible through the overlying absorbing regions 14 to provide a red image 20.

[0028] When the lamp 15 is held at position B, at the other end of the device 10, the UV light is now only able to reach the stripes of the second indicia 13, whilst the absorbing regions 14 prevents the UV light from reaching the stripes of the first indicia 12. Thus the fluorescent light resulting from excitation of the ink/material of second indicia 13 now becomes visible through the absorbing regions 14 and a set of green stripes 21 is observed. If the stripes 21 are arranged to form an image then a green image will be observed in this viewing condition.

[0029] The security device 10 thus provides a security feature which fluoresces differently depending on where the lamp 15 is held along the length of the device 10.

[0030] The effect of the security feature is derived from the fact that the UV (or other radiated) light is only able to pass into, and through, the spacer layer 11 at an angle which allows it to reach the elements making up either the first indicia 12 or the second indicia 13, but not both. This limitation is effected by the gaps 18 between the absorbing regions 14. In this embodiment the registration of the indicia 12,13 relative to the absorbing regions 14 is important to create clean fluorescent images. The combined width of the pairs of stripes of the indicia 12,13 is therefore preferably substantially equal to the width of the stripes of the absorbing regions 14. The width of each of the gaps 17,18 between the stripes is preferably substantially the same and the width of the gaps 17,18 is preferably substantially the same as the width of each of the stripes of the indicia 12, 13.

[0031] In one preferred embodiment the indicia 12,13 and absorbing regions 14 are litho printed in stripes of 20 to 40 micron widths, which gives a good resolution to the radiating indicia. The use of litho printing enables perfect back to back registration of the absorbing regions 14 and indicia 12,13, which is very difficult for a counterfeiter to achieve.

[0032] In another embodiment of the invention (not illustrated), first and second indicia 12,13 are applied along the length of the security device 10 and third and fourth indicia are applied in a transverse direction across the width of the device 10 to give four different viewing positions. The inks/materials used to form the third and fourth indicia are preferably different from those used in the first and second indicia 12,13 or they may be the same.

[0033] In yet another embodiment of the present invention (see Figure 2), the security device 10 is formed directly on a security substrate from which a security document is to be formed, such as a polymer banknote; the spacer layer 11 being provided by a layer of transparent BOPP film which forms the base substrate of the banknote. Each surface of the BOPP film is coated with a layer of white ink 16 with registered gaps which form windows 19. The absorbing regions 14 and indicia 12,13 are applied to the film which provides the spacer layer 11 within the windows 19. The security feature gives the same two views as described in relation to Figures 1a and 1b.

[0034] To further improve the effect of the security feature, a UV scattering layer, such as a titanium dioxide loaded varnish, is coated on the spacer layer 11 before the absorbing regions 14 are applied.

[0035] In yet another embodiment of the invention as shown in Figure 3, no gaps are provided between the elements of indicia 12, 13. The elements of the absorbing regions 14 are applied to the reverse side of the spacer layer 11, but at a slightly offset angle to the indicia 12, 13.

[0036] Figure 4a shows the absorbing regions 14 slightly offset to the vertical boundary of the spacer layer 11 and Figure 4b shows the equivalent view for the indicia 12, 13 which are parallel to the vertical boundary of the spacer 11. This example could of course be reversed with the indicia 12, 13 offset to the vertical boundary of the spacer 11 and absorbing regions 14 parallel to the vertical boundary of the spacer 11. Alternatively both the absorbing regions 14 and the indicia 12,13 could be offset to the vertical boundary of the spacer layer 11, but in this case they would be offset by a different degree.

[0037] As the lamp 15 is moved along the length of the security device 10, the alternating fluorescent stripes (red and green) of the indicia 12,13 appear to move along the length of the device 10 are also similar to a barber's pole. In this embodiment, the indicia 12, 13 are not registered with respect to the bands of the absorbing layer 14 and the width of the stripes of the indicia 12, 13 do not correlate to either the gaps 18 or the width of the stripes of the absorbing regions 14. In a preferred construction the width of the bands are 10μm to 1000μm and more preferably 10μm to 100μm, and the preferred range of offset angle is 0-15° and more preferably 0-5°.

[0038] A preferred method for forming the example in Figure 3 is illustrated in Figure 3b. In this case indicia 12 in the form of stripes are applied onto one side of the spacer layer 11 and then a continuous block of the ink ultimately forming the second indicia 13 is applied so as to cover the indicia 12 and the exposed regions of the spacer 11. The security device 10 will have the same optical effect as the security device viewed of Figure 1 when viewed in the direction of the arrow X as long as first indicia 12 is sufficiently opaque under UV illumination to block out the effect of indicia 13.

[0039] It should be noted that, whilst some embodiments of the invention utilise two sets of indicia 12,13, in others only one set of indicia 12 may be present. This is illustrated in Figure 3c, where the security device 10 comprises just one set of indicia 12. However, when viewed a second set of stripes is formed by the omission of any material in this region. In this case as the UV lamp 15 is moved along the length of the security device 10, a set of fluorescent stripes with a single colour alternate with a set of colourless strips both of which appear to move along the length of the device 10, again similar to a barber's pole.

[0040] Although it is preferred that the spacer layer 11 is transparent, it may be translucent and it may be coloured. If it is translucent, however, it must not interfere with the fluorescing indicia 20, 21.

[0041] In yet another embodiment of the invention, inks are selected for the indicia 12, 13 which are visible in normal light. In a further embodiment the inks used to form indicia 12 and 13 may appear the same colour in normal light but emit different colours when excited by a form of radiation. Suitable inks include those cited in EP-A-1567358 and WO-A-9840223.

[0042] Suitable UV absorbing inks include a UV barrier coating supplied by Sun Chemical with the product code NMHR-70-20669. A suitable UV absorbing compound which could be applied to conventional inks is a hydroxyphenyl triazine class of UV absorber sold under the name Tinuvin® 400 by Ciba®.

[0043] The security feature may also be combined with a machine readable feature, such as a magnetic ink, and in particular a transparent magnetic ink such as those described in GB-A-2387812 and GB-A-2387813. Alternatively a machine readable aspect may be provided by the introduction of separate machine-readable layers. In addition to magnetic materials detectable materials that react to an external stimulus include but are not limited to fluorescent, phosphorescent, infrared absorbing, thermochromic, photochromic, electrochromic, conductive and piezochromic materials.

[0044] It will be further understood by those skilled in the art that the substrate of the present invention may be used in combination with existing approaches for the manufacture of security elements. Examples of suitable constructions that can be used include, but are not limited to, those described in WO-A-03061980, EP-A-0516790, WO-A-9825236, and WO-A-9928852.

[0045] Figure 5 shows a different embodiment of the security device 10 applied to a base substrate 25 to provide a secure substrate for the use in making security documents such as documents of value and means of identification, including bank notes, passports, identification cards, certificates and the like. An aperture 26 is created in a secure substrate 25, for example as described in EP-A-723501, EP-A-724519, WO-A-03054297 and EP-A-1398174. A first polymeric substrate 11a bearing indicia 12,13 (positioned on either surface of first substrate 11a) is applied to the secure substrate 25 such that it over covers the aperture. A second polymeric substrate 11b bearing absorbing layer 14 (positioned on either surface of the second substrate 11b) is than applied to cover the opposite side of the aperture 26. If an adhesive is used to adhere the first and second polymeric substrates 11a, 11b to the secure substrate 25 it is preferred that the adhesive is omitted in the aperture region. The advantage of this embodiment is that the aperture 26 increases the distance between the indicia 12,13 and the absorber 14 and therefore demands on the registrational tolerances and size of the indicia is reduced. In this case illustrated, if the indicia 12,13 and absorber 14 are on the respective inner surfaces, the spacer layer 11 is air.

Claims

1. A security device comprising at least one at least partially light transmitting spacer layer, on one side of which are formed first indicia, said first indicia comprising a plurality of repeating elements and being formed from a material which emits a coloured visible light when excited by a form of radiation, and on an

opposing side of the spacer layer is an absorbing material, which absorbs the said radiation but not visible light, the absorbing material being applied in a pattern comprising a plurality of repeating elements similar to the elements of the first indicia and having gaps between the elements.

2. A security device as claimed in claim 1 further comprising second indicia, said second indicia comprising a layer overlying the first indicia which is present in the gaps between the repeating elements of the first indicia.

3. A security device as claimed in claim 1 further comprising second indicia, said second indicia comprising a plurality of repeating elements, the elements of the first indicia alternating with the elements of the second indicia, wherein the colour of light radiated by the first indicia is different from that radiated by the second indicia.

4. A security device as claimed in claim 3 in which gaps are provided between a pair of adjacent elements comprising one from each indicia.

5. A security device as claimed in any one of the preceding claims in which the gaps between the elements of the indicia are registered with the gaps between the elements of the absorbing material.

6. A security device as claimed in any one of the preceding claims in which the width of the elements of the indicia are the same.

7. A security device as claimed in claim 1 in which the width of the elements of the absorbing material is equal to a combined width of an element of the first indicia and an adjacent gap.

8. A security device as claimed in any one of claims 3 to 6 in which the width of the elements of the absorbing material is equal to a combined width of an element from each of the indicia.

9. A security device as claimed in any one of the preceding claims in which the elements of the absorbing material and/or the indicia extend transversely across the spacer layer.

10. A security device as claimed in any one of the preceding claims in which the stripes of the absorbing material are parallel and in register with the elements of each of the indicia.

11. A security device as claimed in any one of the preceding claims in which the elements of the absorbing material are at an angle to the elements of the indicia, the angle lying in the range 0-15°, and preferably in the range 0-5°.

12. A security device as claimed in any one of the preceding claims in which the indicia and absorbing material are printed on the spacer layer.

13. A security device as claimed in any one of the preceding claims in which the indicia are formed by a luminescent material or ink, or a photochromic or thermochromic material.

14. A security device as claimed in any one of the preceding claims further comprising a scattering layer coated on the spacer layer.

15. A security device as claimed in any one of the preceding claims in which the spacer layer comprises a carrier layer, or is provided by a security substrate, or is formed by a layer of varnish.

16. A security device as claimed in any one of the preceding claims in which the spacer layer is formed by a layer of polymer film.

17. A security substrate comprising the security device of any one of the preceding claims and a base substrate to which the security device is applied.

18. A security substrate comprising a base substrate in which the security device of any one of claims 1 to 16 has been incorporated.

19. A security substrate comprising a security device as claimed in any one of claims 1 to 16 and a transparent film coated with a layer of white ink with registered gaps which form windows, in which windows are visible the security device.

20. A security substrate comprising the security device as claimed in any one of claims 1 to 16 and a base substrate having at least one aperture extending through the base substrate, in which covers the aperture on one or both sides of the base the security device substrate.

Patentansprüche

1. Sicherheitseinrichtung, welche mindestens eine zumindest teilweise lichtdurchlässige Abstandsschicht aufweist, auf deren einen Seite erste Markierungen ausgebildet sind, wobei diese ersten Markierungen eine Vielzahl sich wiederholender Elemente umfassen und aus einem Werkstoff gebildet sind, welcher farbiges sichtbares Licht abgibt bzw. aussendet, wenn er durch eine Form von Strahlung angeregt wird, und wobei auf der gegenüberliegenden Seite der Abstandsschicht ein absorbierender Werkstoff

angeordnet ist, welcher die besagte Strahlung, jedoch nicht sichtbares Licht absorbiert, wobei der absorbierende Werkstoff in einem Muster aufgebracht wird, welches eine Vielzahl von sich wiederholenden Elementen ähnlich den Elementen der ersten Markierungen einschließt und Lücken zwischen den Elementen aufweist.

2. Sicherheitseinrichtung nach Anspruch 1, welche des Weiteren zweite Markierungen umfasst, wobei die zweiten Markierungen eine die ersten Markierungen überdeckende Schicht aufweisen, welche in den Lücken zwischen den sich wiederholenden Elementen der ersten Markierungen vorhanden ist.

3. Sicherheitseinrichtung nach Anspruch 1, welche des Weiteren zweite Markierungen umfasst, wobei die zweiten Markierungen eine Vielzahl von sich wiederholenden Elementen aufweist, wobei sich die Elemente der ersten Markierungen mit den Elementen der zweiten Markierungen abwechseln, **dadurch gekennzeichnet, dass** sich die Farbe des von den ersten Markierungen abgestrahlten Lichts von der Farbe des von den zweiten Markierungen abgestrahlten Lichts unterscheidet.

4. Sicherheitseinrichtung nach Anspruch 3, in welcher Lücken zwischen einem Paar benachbarter Elemente vorgesehen sind, wobei das Paar jeweils eine von beiden Markierungen umfasst.

5. Sicherheitseinrichtung nach einem der vorhergehenden Ansprüche, in welcher die Lücken zwischen den Elementen der Markierungen an die Lücken zwischen den Elementen des absorbierenden Werkstoffs angepasst sind.

6. Sicherheitseinrichtung nach einem der vorhergehenden Ansprüche, in welcher die Breite der Elemente der Markierungen identisch ist.

7. Sicherheitseinrichtung nach Anspruch 1, in welcher die Breite der Elemente des absorbierenden Werkstoffs einer addierten Breite eines ersten Elements der ersten Markierungen und einer banachbarten Lücke entspricht.

8. Sicherheitseinrichtung nach einem der Ansprüche 3 bis 6, in welcher die Breite der Elemente des absorbierenden Werkstoffs einer addierten Breite eines Elements von beiden Markierungen entspricht.

9. Sicherheitseinrichtung nach einem der vorhergehenden Ansprüche, in welcher sich die Elemente des absorbierenden Werkstoffs und/oder die Markierungen quer über die Abstandsschicht erstrecken.

10. Sicherheitseinrichtung nach einem der vorhergehenden Ansprüche, in welcher die Streifen des absorbierenden Werkstoffs parallel zueinander sind und sich mit den Elementen der beiden Markierungen decken.

11. Sicherheitseinrichtung nach einem der vorhergehenden Ansprüche, in welcher die Elemente des absorbierenden Werkstoffs in einem Winkel zu den Elementen der Markierungen angeordnet sind, wobei der Winkel im Bereich von 0-15° liegt, und vorzugsweise im Bereich von 0-5°.

12. Sicherheitseinrichtung nach einem der vorhergehenden Ansprüche, in welcher die Markierungen und der absorbierende Werkstoff auf die Abstandsschicht gedruckt sind.

13. Sicherheitseinrichtung nach einem der vorhergehenden Ansprüche, in welcher die Markierungen von einem leuchtenden Werkstoff oder leuchtender Tinte gebildet sind, oder von einem photochromen oder thermochromen Werkstoff.

14. Sicherheitseinrichtung nach einem der vorhergehenden Ansprüche, welche des Weiteren eine auf die Abstandsschicht aufgetragene Streuschicht aufweist.

15. Sicherheitseinrichtung nach einem der vorhergehenden Ansprüche, in welcher die Abstandsschicht eine Trägerschicht umfasst, oder mit einem Sicherheitssubstrat versehen ist, oder durch eine Lackschicht gebildet ist.

16. Sicherheitseinrichtung nach einem der vorhergehenden Ansprüche, in welcher die Abstandsschicht durch eine Schicht aus Polymerfilm gebildet ist.

17. Sicherheitssubstrat, welches die Sicherheitseinrichtung nach einem der vorhergehenden Ansprüche aufweist, sowie ein Basissubstrat, an welchem die Sicherheitseinrichtung angebracht ist.

18. Sicherheitssubstrat, welches ein Basissubstrat aufweist, in welchem die Sicherheitseinrichtung nach einem der Ansprüche 1 bis 16 eingebaut worden ist.

19. Sicherheitssubstrat, welches eine Sicherheitseinrichtung nach einem der Ansprüche 1 bis 16 und einen transparenten Film aufweist, welcher mit einer Schicht weisser Tinte mit angepassten Lücken, welche Fenster bilden, beschichtet ist, wobei die Sicherheitseinrichtung in den Fenstern sichtbar ist.

20. Sicherheitssubstrat, welches die Sicherheitseinrichtung nach einem der Ansprüche 1 bis 16 und ein Basissubstrat aufweist, welches mindestens eine sich durch das Basissubstrat erstreckende Öffnung

umfasst, wobei die Sicherheitseinrichtung die Öffnung auf einer oder beiden Seiten des Basissubstrats bedeckt.

Revendications

1. Dispositif de sécurité comprenant au moins une couche d'espacement transmettant au moins partiellement la lumière, sur un côté de laquelle des premières marques sont formées, lesdites premières marques comprenant une pluralité d'éléments répétitifs et étant formées à partir d'un matériau qui émet une lumière visible colorée lorsqu'il est excité par une forme de rayonnement, et un matériau absorbant se trouve sur un côté opposé de la couche d'espacement, lequel absorbe ledit rayonnement mais pas la lumière visible, le matériau absorbant étant appliqué en un motif comprenant une pluralité d'éléments répétitifs similaires aux éléments des premières marques et comportant des espaces entre les éléments.

2. Dispositif de sécurité selon la revendication 1, comprenant en outre des deuxièmes marques, lesdites deuxièmes marques comprenant une couche recouvrant les premières marques qui est présente dans les espaces entre les éléments répétitifs des premières marques.

3. Dispositif de sécurité selon la revendication 1, comprenant en outre des deuxièmes marques, lesdites deuxièmes marques comprenant une pluralité d'éléments répétitifs, les éléments des premières marques alternant avec les éléments des deuxièmes marques, dans lequel la couleur de la lumière rayonnée par les premières marques est différente de celle rayonnée par les deuxièmes marques.

4. Dispositif de sécurité selon la revendication 3, dans lequel des espaces sont prévus entre une paire d'éléments adjacents comprenant un élément de chaque marque.

5. Dispositif de sécurité selon l'une quelconque des revendications précédentes, dans lequel les espaces entre les éléments des marques sont alignés avec les espaces entre les éléments du matériau absorbant.

6. Dispositif de sécurité selon l'une quelconque des revendications précédentes, dans lequel les largeurs des éléments des marques sont identiques.

7. Dispositif de sécurité selon la revendication 1, dans lequel la largeur des éléments du matériau absorbant est égale à une largeur combinée d'un élément des premières marques et d'un espace adjacent.

8. Dispositif de sécurité selon l'une quelconque des revendications 3 à 6, dans lequel la largeur des éléments du matériau absorbant est égale à une largeur combinée d'un élément de chacune des marques.

9. Dispositif de sécurité selon l'une quelconque des revendications précédentes, dans lequel les éléments du matériau absorbant et/ou les marques s'étendent transversalement en travers de la couche d'espacement.

10. Dispositif de sécurité selon l'une quelconque des revendications précédentes, dans lequel les bandes du matériau absorbant sont parallèles et alignées avec les éléments de chacune des marques.

11. Dispositif de sécurité selon l'une quelconque des revendications précédentes, dans lequel les éléments du matériau absorbant sont selon un angle par rapport aux éléments des marques, l'angle étant dans la plage 0 à 15°, et de préférence dans la plage de 0 à 5°.

12. Dispositif de sécurité selon l'une quelconque des revendications précédentes, dans lequel les marques et le matériau absorbant sont imprimés sur la couche d'espacement.

13. Dispositif de sécurité selon l'une quelconque des revendications précédentes, dans lequel les marques sont formées par un matériau ou une encre luminescent, ou un matériau photochromique ou thermochromique.

14. Dispositif de sécurité selon l'une quelconque des revendications précédentes, comprenant en outre une couche de dispersion déposée sur la couche d'espacement.

15. Dispositif de sécurité selon l'une quelconque des revendications précédentes, dans lequel la couche d'espacement comprend une couche de support, ou est réalisée par un substrat de sécurité, ou est formée par une couche de vernis.

16. Dispositif de sécurité selon l'une quelconque des revendications précédentes, dans lequel la couche d'espacement est formée par une couche de film de polymère.

17. Substrat de sécurité comprenant le dispositif de sécurité selon l'une quelconque des revendications précédentes et un substrat de base auquel le dispositif de sécurité est appliqué.

18. Substrat de sécurité comprenant un substrat de base dans lequel le dispositif de sécurité selon l'une quelconque des revendications 1 à 16 a été incorporé.

19. Substrat de sécurité comprenant un dispositif de sécurité selon l'une quelconque des revendications 1 à 16 et un film transparent revêtu d'une couche d'encre blanche avec des espaces alignés qui forment des fenêtres, dans lesquelles fenêtres le dispositif de sécurité est visible.

20. Substrat de sécurité comprenant le dispositif de sécurité selon l'une quelconque des revendications 1 à 16 et un substrat de base comportant au moins une ouverture s'étendant à travers le substrat de base, dans lequel le dispositif de sécurité recouvre l'ouverture sur l'un des côtés ou les deux du substrat de base.

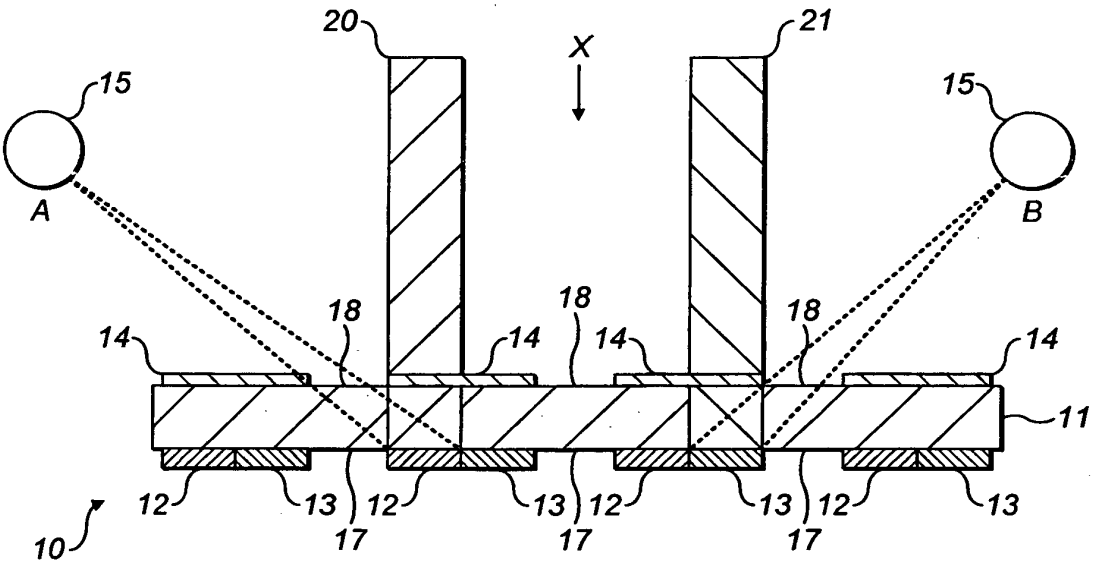


FIG. 1a

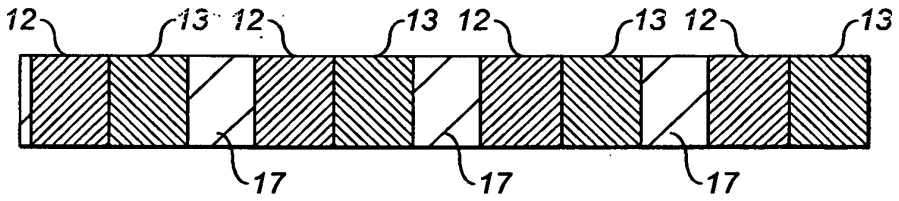


FIG. 1b

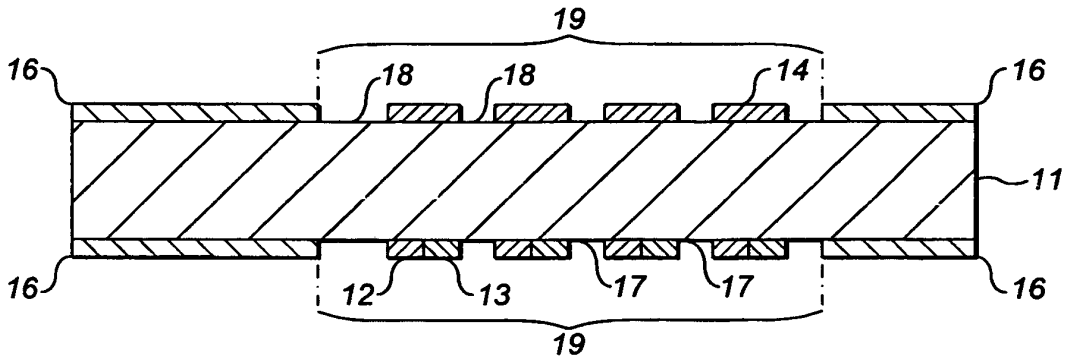


FIG. 2

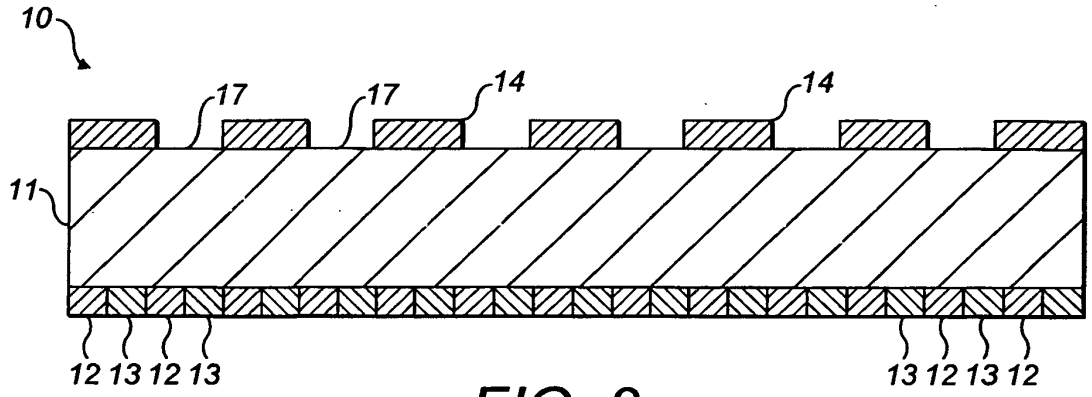


FIG. 3a

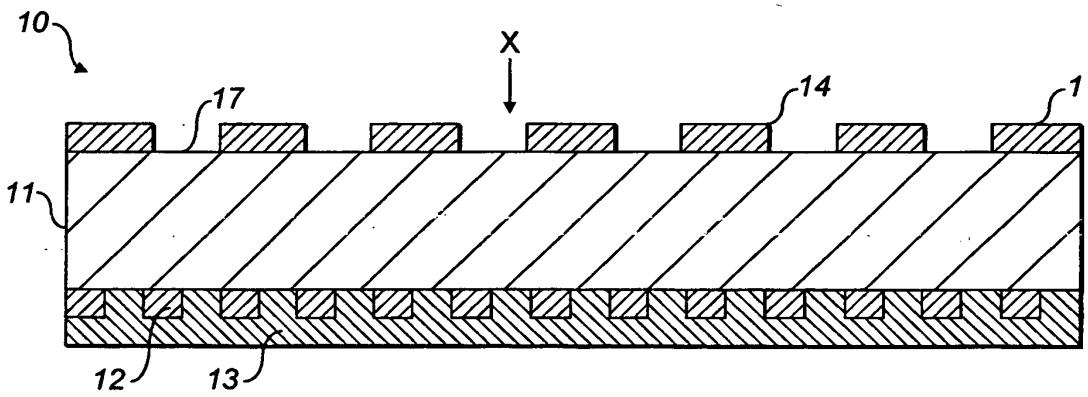


FIG. 3b

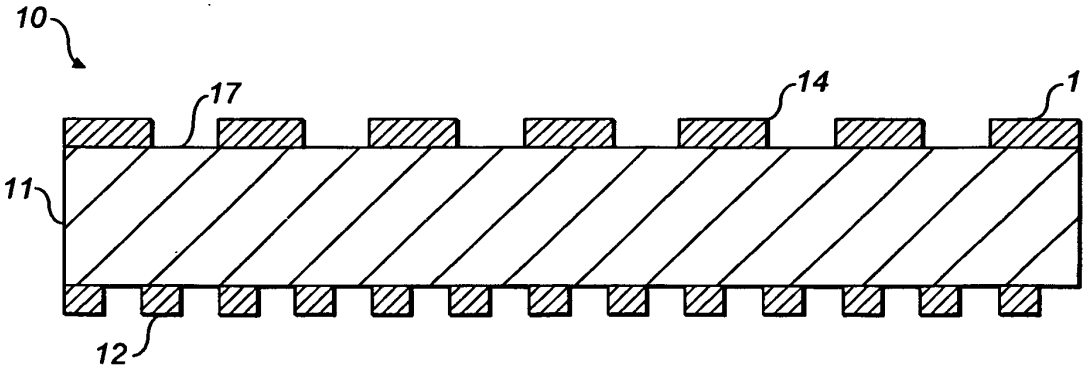


FIG. 3c

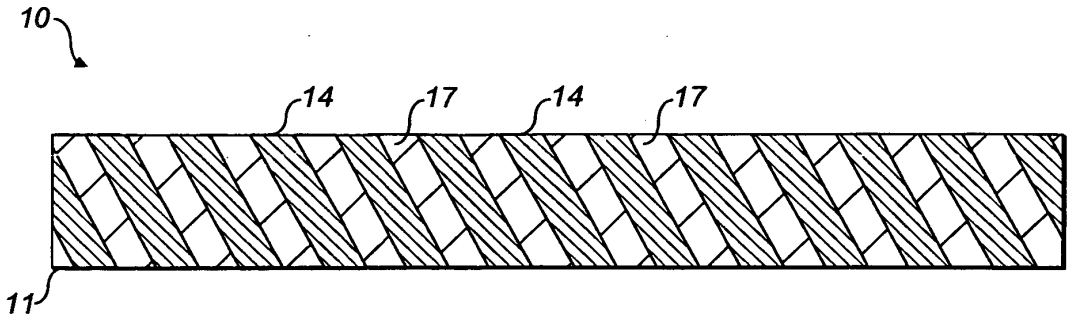


FIG. 4a

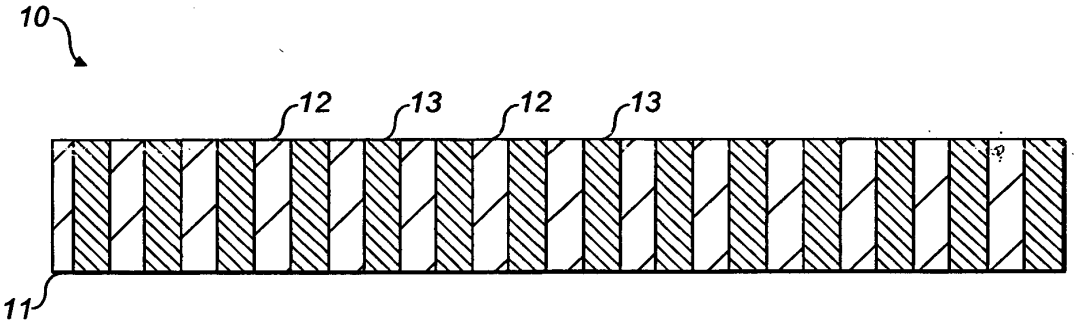


FIG. 4b

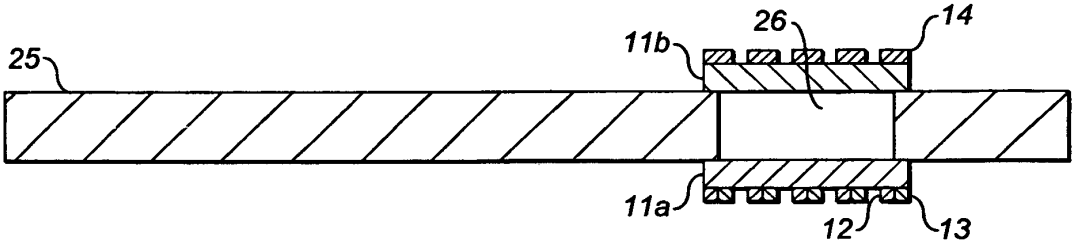


FIG. 5

REFERENCES CITED IN THE DESCRIPTION

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