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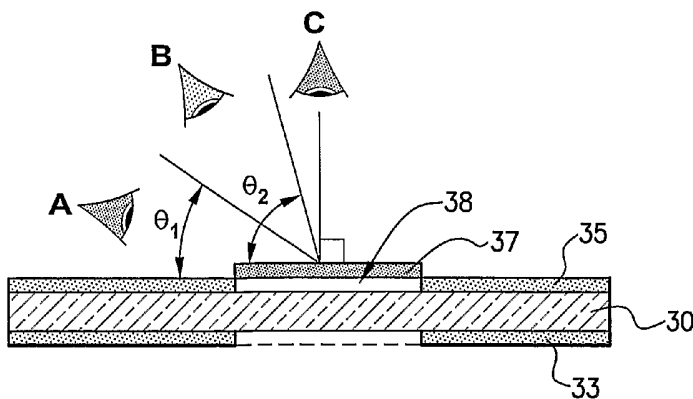
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(54) Title: SECURITY DOCUMENTS INCORPORATING COLOUR SHIFTING INKS



(57) Abstract: A security document or device is provided which includes at least one area formed from a transparent plastics material which is exposed on at least one side to form a window (38) or half-window (18), and at least one colour shifting ink composition (20; 37) applied in at least part of the window (38) half-window (18). The colour shifting ink provides at least one colour shift between a first colour and a second distinct colour depending upon the viewing angle.



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## SECURITY DOCUMENTS INCORPORATING COLOUR SHIFTING INKS

### FIELD OF THE INVENTION

This invention relates to security documents or tokens, such as banknotes  
5 or the like, and is particularly concerned with providing a security document with  
an overt optically variable security device that is readily discernible but which is  
difficult to copy or counterfeit.

### BACKGROUND TO THE INVENTION

A security document including a sheet like substrate having a transparent  
10 area or "window" formed from a portion of transparent plastics material has  
previously been proposed. The window formed in the security document is  
particularly suited for incorporating a security device such as an embossed image  
or an optically variable device, such as a diffraction grating or hologram.

Security devices are required to attest to the authenticity of the security  
15 document. The devices are required to prevent counterfeiting of security  
documents and in the case of overt security devices, should be easily and quickly  
identifiable on the document. A further requirement for security documents is that  
they are cost effective to produce and are durable enough to withstand everyday  
use, such as the use encountered by banknotes.

20 It is desirable to provide a security document which includes a readily  
visible security device.

It is also desirable to provide a security document which includes an overt  
security device that is difficult to counterfeit yet relatively inexpensive to produce  
and durable.

### 25 SUMMARY OF THE INVENTION

According to one aspect of the invention, there is provided a security  
document or device including at least one area formed from a transparent plastics  
material which is exposed on at least one side to form a window or half-window,  
and

30 at least one colour shifting ink composition including a transparent organic  
pigment applied in at least part of the window or half-window, wherein the colour

shifting ink composition provides at least one colour shift between a first colour and a second distinct colour depending upon the viewing angle.

Advantageously, the present invention provides a security document which provides an overt feature which may be quickly and easily identified by tilting or  
5 rotating the document to vary the viewing angle to observe the colour shifting effect.

Preferably, the colour shifting ink composition includes a major proportion of an optically variable pearlescent interference pigment, such as KW Pearl Pigments produced by Kunwei Pearl Pigment Co. Ltd, and a minor proportion of a  
10 transparent organic pigment. The interference pigment and particles of the transparent organic pigment may be mixed with a transparent binder or resin to form the colour shifting ink composition which is suitable for application to a substrate in a printing process.

We have found that such an ink composition, when applied to a  
15 transparent substrate, can exhibit unusual colour shifting properties. For instance, an area of the transparent substrate covered by the colour shifting ink composition can appear a metallic colour, eg gold or silver, when viewed in reflection at certain viewing angles , and may appear a distinct colour, eg blue or pink, when viewed at other viewing angles. Also, the colour shifting effects may  
20 vary depending upon whether the colour shifting ink composition is viewed against different backgrounds, eg a light colour, such as white, or a dark colour, such as black.

The colour shifting ink is preferably formed from a formulation including from about 10% to about 30% of a pearl lustre interference pigment (for example,  
25 interference pigments produced by the Kunwei Pearl Pigment Co. Ltd), from about 0.5% to about 10% of an organic pigment, eg phtalocyanine blue, and from about 60% to 90% of transparent binder or resin. Preferably, the pearl lustre interference pigments have a particle size from about 5µm (microns) to about 200µm (microns).

30 In a preferred embodiment, the colour shifting ink composition is applied in a region overlapping the window or half window and a surrounding or adjacent opaque area, wherein the composition applied to the opaque area appears the

same colour at all viewing angles, so that there is a colour contrast between the ink composition applied to the window and to the surrounding or adjacent opaque area at certain viewing angles.

For example, the colour shifting ink applied to the window or half window  
5 may appear substantially the same colour as the surrounding or adjacent opaque area at some viewing angles and a second distinct colour at other viewing angles.

According to one preferred embodiment, there is provided a security document or device which has a transparent window formed from plastics material at least partly surrounded by or adjacent to an opaque area, and a colour  
10 shifting ink composition is applied in a region overlapping the window and the opaque area, wherein the ink composition applied to the opaque area appears the same colour at all viewing angles and the ink composition applied to the transparent window provides a colour shift between a first colour and a second distinct colour depending upon the viewing angle.

15 In one embodiment, the security document or device comprises a transparent plastics substrate, and at least one opacifying coating applied to a surface on at least one side of the substrate in such a manner as to leave a region of the substrate uncovered to form the window or half-window.

The window may be a full window region which is not covered by the at  
20 least one opacifying coating on both sides of the substrate in the full window region. In those case, an image formed by the at least one colour shifting ink composition in the full window may be translucent and is visible in transmission from both sides of the security document or device. However, the colour shifting properties of the image may only be observable when viewed in reflection at  
25 different viewing angles against an opaque background.

Alternatively, the at least one colour shifting ink composition may be at least partly applied in a half-window region which is completely covered by at least one opacifying coating on one side of the substrate, but which is not covered by an opacifying coating on the opposite side of the substrate. An image  
30 formed by the colour shifting ink composition in the half-window region may be translucent and visible in transmission from both sides of the security document or device, but with the colour shifting properties of the image only visible from the

side of the security document or device which is not covered by the opacifying coating in the half-window region.

In one embodiment, the colour shifting ink composition is applied to a surface on one side of the transparent substrate and is at least partly covered by an opacifying coating on that side of the substrate with an area of the opposite side of the substrate being uncovered by the opacifying coating so as to form a half-window through which the colour shifting ink composition is visible from the uncovered side.

An advantage of this embodiment is that the opacifying coating applied over the colour shifting ink assists in providing a more durable security feature.

In a particularly preferred embodiment, the security document is a flexible security document and may include self-verifying means for verifying the security document. The self verifying means may include a substantially plain area (ie having only one colour, eg white or black) such that when the security document is bent or folded, the window is brought into register with the substantially plain area such that the colour shifting effects can be viewed against the plain coloured background. The document may also include two or more different coloured substantially plain areas at different locations so that different effects are viewed when the window is brought into register with the different coloured plain areas. For example, one of the plain areas may be a light colour, such as white or yellow, and the other substantially plain area may be a dark colour, such as black or dark blue.

According to a further aspect of the invention there is provided a flexible security document having a transparent window formed from plastics material and at least one substantially plain area (eg of a single colour) at another laterally spaced area of the document, wherein a colour shifting ink composition is applied to the transparent window, such that when the security document is bent or folded to bring the document into register with the substantially plain area, colour shifting effects of the colour shifting ink composition can be viewed in reflection against the background of the substantially plain opaque area to form a composite image.

The security document or device may include two or more colour shifting inks applied to different parts of the window, half-window or surrounding area.

The two or more inks may exhibit a substantially similar first colour, but when viewed from a second angle, exhibit two distinct second colours. For example, when viewed at a first angle, a composite security device may appear to be red in colour, however, when viewed from a second angle, different parts of the security device may appear in different distinct colours, eg half blue and half yellow.

In the case that the security document includes two or more different colour shifting inks forming a composite image, the security document may include a further layer of opacifying ink applied over the region(s) where the colour shifting inks join. Applying a further layer may disguise any misalignment of the colour shifting inks.

According to yet another aspect of the invention, there is provided a security document or device which has a window or half-window of transparent plastics material, and a composite image formed from at least two different colour shifting ink compositions applied to the window or half-window, wherein the colour shifting ink compositions exhibit different colour shifting effects depending upon the viewing angle.

According to another aspect of the invention, there is provided a method of producing a security document or device which includes the steps of:

providing a sheet-like substrate of transparent plastics material having first and second surfaces on opposite sides of the substrate;

applying at least one opacifying coating on said first surface of the substrate in such a manner as to leave a region of the substrate uncovered to form a window; and

applying at least one colour shifting ink composition including a transparent organic pigment in at least part of the window region of the substrate, wherein the colour shifting ink composition provides a colour shift between a first colour and a second distinct colour depending upon the viewing angle.

The method may also include the step of applying an opacifying layer of ink on said second surface of the substrate in such a manner as to leave a region of the substrate uncovered which is in register with the window formed on the first surface of the substrate to form a full window in which the at least one colour shifting ink composition is applied.

An alternative method may include the step of applying at least one opacifying coating on said second surface in at least part of the window region to form a half-window which is uncovered by opacifying coating on the first surface on one side of the substrate and covered by opacifying coating on the second surface on the opposite side of the substrate, the at least one colour shifting ink composition being at least partly applied in the half-window region.

The at least one colour shifting ink composition may be applied either before or after the step or steps of applying the at least one opacifying coating to form the full window or half-window. However, in a preferred method of forming a half-window the at least one colour shifting ink composition is applied to the second surface of the substrate before the opacifying coating is applied to the second surface to cover the colour shifting ink composition on the second surface.

The at least one colour shifting ink composition may be applied to at least one of the surfaces of the substrate to overlap the window or half-window region and a surrounding or adjacent opaque area formed by the opacifying coating or coatings.

The method above may be used to produce a self-verifying security document or device when the sheet-like substrate is formed from a flexible plastics material. In this case the method may further include the step of applying at least one substantially plain opaque ink or coating to at least one surface of the substrate at a location spaced laterally from the window region to form a self-verifying means which enables the colour shifting effects of the at least one colour shifting ink composition to be observed in reflection when the flexible sheet is bent, folded or twisted to bring the window into register with the substantially plain opaque ink or coating.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

In order that the present invention may be more readily understood, various embodiments thereof will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a sectional view through a part of a security document in accordance with one embodiment of the present invention;

Figure 2 is a sectional view through a part of a security document in accordance with another embodiment of the present invention;

Figures 3a and 3b are schematic diagrams showing different types of colour shift between a first colour and a second distinct colour depending upon the viewing angle;

Figure 4a is a view of a security document from a first angle;

Figure 4b is a view of the security document in Figure 4a from a second angle;

Figure 5a is a view of a security document from a first angle;

Figure 5b is a view of the security document in Figure 5a from a second angle;

Figure 6a is a view of a security document from a first angle; and

Figure 6b is a view of the security document in Figure 6a from a second angle.

## 15 DETAILED DESCRIPTION OF THE DRAWINGS

Referring now to Figure 1, there is shown a security document 1 comprising a sheet-like substrate 10 of clear plastics material having a first, lower surface 11 and a second, upper surface 12, a layer 13 of opacifying ink applied on the first, lower surface 11 of the substrate 10, a layer of opacifying ink 15 applied on the second, upper surface 12 of the substrate 10, and a colour shifting ink 20 on the lower surface 11 of the substrate 10.

As shown in Figure 1, the opacifying layer of ink 15 is not applied over the entire upper surface 12 of the substrate 10 and thus leaves an area of the second, upper surface 12 which is not covered by opacifying ink to form a "half-window" 18 on one side of the substrate substantially in the region of the security device 20 which is applied to the first, lower surface 11 of the substrate 10.

The substrate 10 of clear plastics material preferably is formed from a transparent polymeric material which may be made up of at least one bi-axially-oriented polymeric film. The substrate may comprise a single layer film of polymeric material. Alternatively, the substrate may comprise a laminate of two or more layers of transparent bi-axially-oriented polymeric film of the type described



in Australian Patent No. AU-A-87665/82, the contents of which are incorporated herein by reference.

5 The opacifying layers of ink 13 and 15 may comprise any one or more of a variety of opacifying inks which can be used in the printing of banknotes or other security documents. For example, the layers of opacifying ink may comprise pigmented coatings comprising a pigment, such as titanium dioxide, dispersed within a binder or carrier of heat-activated cross-linkable polymeric material as described in Patent Specification No. AU-A-87665/82.

10 The colour shifting ink composition includes a major proportion of an optically variable pearlescent interference pigment, such as KW Pearl Pigments produced by Kunwei Pearl Pigment Co Ltd, and a minor proportion of a transparent organic pigment. The interference pigment and particles of the transparent organic pigment are mixed with a transparent binder or resin to form the colour shifting ink composition which is suitable for application to a substrate  
15 in a printing process.

The colour shifting ink 20 in the region of the half-window 18 exhibits a colour shifting effect when viewed in reflection from the upper side of the substrate such that a first colour, the colour of the pearlescent interference pigment such as gold or green is seen at certain viewing angles, and when the document is tilted or rotated a second distinct colour, eg blue, is seen at other  
20 viewing angles. When the colour shifting ink 20 in the half window area is viewed in transmission, no colour changing effects can be seen, though an image formed by the colour shifting ink may be discernible as being a slightly different shade of colour to the surrounding area. As shown in Figure 1, the colour shifting ink 20 extends partly into the area 22 surrounding the half-window 18. These parts  
25 of the image exhibit no colour shifting effects whether viewed in reflection or transmission, but may appear a slightly different shade from the first colour of the pearlescent interference pigment in the half-window area 18.

Figure 2 shows a security document 3 comprising a sheet-like substrate 30  
30 of clear plastics material having a first, lower surface 31 and a second, upper surface 32, a layer 33 of opacifying ink applied on the first, lower surface 31 of the substrate 30, a layer of opacifying ink 35 applied on the second, upper surface 32

of the substrate 30, and a colour shifting ink 37 on the lower surface 31 of the substrate 30.

As shown in Figure 2, the opacifying layers of ink 33 and 35 are not applied over the entire surfaces 31 and 32 of the substrate 30 and thus leave an area of the surfaces 31 and 32 which is not covered by opacifying ink to form a "window" 38 on the substrate 30.

The substrate 30 is preferably formed by one of the same materials as the substrate 10 in Figure 1. Similarly, the opacifying layer may be formed from one of the opacifying inks described above.

The colour shifting ink 37 in the region of the transparent window 38 exhibits a colour shifting effect when viewed in reflection against an opaque background. At certain viewing angles, a first colour, the colour of the pearlescent interference pigment eg gold or green is seen, and at other viewing angles a distinct second colour, the colour of the organic pigment, eg blue or pink, is seen. When the colour shifting ink 37 is viewed in transmission, no colour shifting effect is observed at different viewing angles, only the first colour is seen.

As shown in Figure 2, the colour shifting ink 37 extends partly into the opaque area 34 surrounding the transparent window 38. These parts 34 of the image formed by the colour shifting ink 37 exhibit no colour shifting effects when viewed in reflection or transmission, but may appear a slightly different shade of the first colour of the pearlescent interference pigment in the window 38.

Figure 3a is a schematic diagram showing the colour shift between a first colour 36 and a second distinct colour 39 depending upon the viewing angle varying from  $\theta_1$  to  $\theta_2$ . A security document formed from a substrate 30 is shown including an optically variable security device formed from the colour shifting ink 37. When the security device 37 is viewed from the angle  $\theta_1$  the viewer sees a first distinct colour, e.g. blue. Upon rotating the security document through the angle  $\theta_2$  the viewer sees a second distinct colour, e.g. green.

A slightly different type of colour shift is shown in Figure 3b. In this case, the colour shifting ink composition 37 is applied in a window or half-window region 38 of the transparent plastics substrate 30 to which opacifying coatings 33, 35 are applied in such a manner to form the window or half-window region.

When the image formed by the colour shifting ink composition 37 is viewed from position A at low viewing angles,  $\theta_1$ , eg at angles of incidence less than about  $30^\circ$ , the viewer sees a first colour, eg red. However, as the viewing angle increases to  $\theta_2$ , when the image is viewed from position B, eg within a range of viewing angles from about  $30^\circ$  to about  $80^\circ$ , the viewer sees the second distinct colour, eg gold. When the viewing angle increases further to position C approximately perpendicular to the plane of the substrate, the colour seen by the viewer reverts to the first distinct colour (eg red).

Figure 4a shows a plan view of a security document 40 which includes a security device 41 in the form of the numeral 50. When the device 41 is viewed from a first angle, the device appears as a first distinct colour 42. The security device 41 is formed from a colour shifting ink applied to a window or half-window 44, eg as described with reference to Figure 1 or Figure 2. However, as shown in Figure 4b, when viewed from a second angle, the device 41 exhibits a second distinct colour 43.

Figure 5a shows another embodiment of the present invention in which a security document 50 includes a composite security device or image 51 in the area of a window or half-window 53. The composite device or image 51 is formed in two parts, 51a and 51b formed from different colour shifting inks, and includes an uninked area 52. When the device or image 51 is viewed from a first angle, the two parts of the device 51a and 51b, appear as substantially the same colour, eg red. However, when the security document is rotated through an angle  $\theta$ , in the manner described with reference to Figure 3a the device or image 51 exhibits second and third distinct colours, eg gold and purple, as shown in Figure 5b. The two colour shifting inks of the composite device or image 51 could also exhibit colour shifting effects which vary in similar manner to Figure 3b, with the different colour shifting inks exhibiting a substantially similar colour, eg red, when viewed in reflection from a substantially perpendicular viewing angle, the colour shifting inks exhibiting two different distinct colours, eg gold and purple, as the viewing angle moves from the perpendicular and the colour shifting inks exhibit the substantially similar first colour (red) at low viewing angles.

The security document 50 may also include self-verifying means, in the form of at least one substantially plain area 54, for verifying the security document. The document may be verified by being bent or folded such that the device 51 is brought into register with the area 54. In this position, the device 51 appears to be the first distinct colour.

The device may include a further opacifying layer shown as 55 in Figure 5b applied over the parts 51a and 51b of the device 51 where the two parts meet. Applying the further opacifying layer 55 allows any misalignment of the two halves 51a and 51b to be disguised.

A further embodiment of the invention is shown in Figure 6a, in which the security document 60 includes a composite security device 61. The device is formed in two parts, 61a and 61b from different colour shifting inks applied in a window or half window, and includes an uninked area 62. When the device 61 is viewed from a first angle, the two parts of the device 61a and 61b, appear as two distinct colours. When the security document is rotated through an angle  $\theta$ , the device 61 exhibits third and fourth distinct colours as shown in Figure 6b.

As shown in Figures 6a and 6b, the security document 60 may also include self-verifying means, in the form of a substantially plain area 64, for verifying the security document. The document may be verified by being bent or folded such that the device 61 is brought into register with the area 64. In this position, the device 61 appears as the first and second colours.

The device may include a further opacifying layer 66 applied over the parts 61a and 61b of the device 61 when the two parts meet (shown as 65 on Figure 5). Applying the further layer will allow any misalignment of the two parts 61a and 61b to be disguised.

It will be appreciated that various modifications may be made to the security documents and methods described above without departing from the scope and spirit of the present invention. For example, it is possible for the security document or device to include both full window areas and half-window areas, as well as surrounding or adjacent opaque areas with the colour shifting ink overlapping the window, the half-window and opaque areas, so that different colour shifting effects can be viewed in the different areas. It is also possible in

some embodiments for the window or half-window area to be provided in a security document formed primarily from a paper or fibrous substrate, with the window or half-window area consisting of transparent plastics material inserted into an opening in the paper or fibrous substrate.

- 5 In a further modification (not shown) a composite image may be printed in two or more colour shifting inks in a series of dots, rather than solid areas. This enables parts of a composite image exhibiting different colour shifting effects to be intertwined in some parts of the image and separate in other parts of the image.

## CLAIMS

1. A security document or device including at least one area formed from a transparent plastics material which is exposed on at least one side to form a window or half window, and
- 5 at least one colour shifting ink composition including a transparent organic pigment applied in at least part of the window or half-window, wherein the colour shifting ink composition provides at least one colour shift between a first colour and a second distinct colour depending upon the viewing angle.
2. A security document or device according to claim 1 wherein the at
- 10 least one colour shifting ink composition includes a major proportion of an optically variable interference pigment, and a minor proportion of a transparent organic pigment.
3. A security document or device according to claim 2 wherein the colour shifting ink composition includes a transparent binder or resin.
- 15 4. A security document or device according to claim 3 wherein the colour shifting ink composition includes
- a pearl lustre interference pigment in an amount falling substantially in the range from about 10% to about 30%,
- an organic pigment in an amount falling substantially in the range from
- 20 about 0.5% to about 10%, and
- a transparent binder or resin in an amount falling substantially in the range from about 60% to about 90%.
5. A security document or device according to any one of claims 2 to 4 wherein the pearlescent interference pigment includes particles of a size falling
- 25 substantially in the range from about 5 microns ( $\mu\text{m}$ ) to about 200 microns ( $\mu\text{m}$ ).
6. A security document or device according to any one of the preceding claims wherein the at least one colour shifting ink composition is applied in a region overlapping the window or half-window and a surrounding or adjacent opaque area, wherein the composition applied to the opaque area
- 30 appears the same colour at all viewing angles, and the composition applied to the window or half-window appears substantially the same colour as the surrounding

opaque area at some viewing angles and a second distinct colour at other viewing angles.

7. A security document or device according to any one of the preceding claims wherein the colour shifting ink composition in the window or  
5 half-window appears a first colour when viewed in reflection at a substantially perpendicular viewing angle, a second distinct colour when the viewing angle changes from the perpendicular, and reverts back to the first colour at low viewing angles.

8. A security document or device according to any one of the  
10 preceding claims comprising a transparent plastics substrate, and at least one opacifying coating applied to a surface on at least one sides of the substrate in such a manner to leave a region of the substrate uncovered to form the window or half-window.

9. A security document or device according to claim 8 wherein the at  
15 least one colour shifting ink composition is at least partly applied in a half-window region of the substrate which is completely covered by at least one opacifying coating on one side of the substrate, but which is not covered by an opacifying coating on the opposite side of the substrate.

10. A security document or device according to claim 9 wherein an  
20 image formed by the colour shifting ink composition in the half-window region is translucent and visible in transmission from both sides of the security document or device, with the colour shifting properties of the image only visible from the side of the security document or device which is not covered by the opacifying coating in the half-window region.

25 11. A security document or device according to claim 9 or claim 10 wherein the at least one colour shifting ink composition is applied to a surface on one side of the transparent substrate and is at least partly covered by an opacifying coating on that side of the substrate with a corresponding area of the opposite side of the substrate being uncovered by an opacifying coating so as to  
30 form a half-window through which the colour shifting ink composition is visible from the uncovered side.

12. A security document or device according to any one of claims 8 to 11 wherein the at least one colour shifting ink composition is at least partly applied in a full window region of the substrate which is not covered by the at least one opacifying coating on both sides of the substrate in the full window region.

13. A security document or device according to claim 12 wherein an image formed by the colour shifting ink composition in the full window is translucent and visible in transmission from both sides of the security document, but with the colour shifting properties of the image only being observed at different viewing angles when viewed in reflection against an opaque background.

14. A security document or device according to claim 13 wherein the security document or device is flexible and includes self-verifying means at another location on the document spaced apart from the window for verifying or observing the colour shifting properties of the image formed by the colour shifting ink in the window.

15. A security document or device according to claim 14 wherein the self-verifying means includes a substantially plain opaque area such that when the flexible security document or device is bent, folded or twisted to bring the window into register with the substantially plain opaque area, the colour shifting effects of the image formed by the colour shifting ink composition in the window can be viewed in reflection against the substantially plain opaque area.

16. A flexible security document or device having a transparent window formed from plastics material and at least one substantially plain opaque area at another laterally spaced location of the security document or device, wherein at least one colour shifting ink composition is applied to the transparent window, such that when the flexible security document or device is bent, folded or twisted to bring the window into register with the substantially plain opaque area, colour shifting effects of the colour shifting ink composition can be viewed in reflection against the background the substantially plain opaque area.

17. A security document or device according to claim 15 or claim 16 including at least two different coloured substantially plain opaque areas whereby different colour shifting effects of the colour shifting ink composition can be



viewed when the window is brought into register with the different coloured substantially plain opaque areas.

18. A security document or device according to claim 17 wherein one of the different coloured substantially plain opaque areas is a light colour, such as white, and the other different coloured substantially plain opaque area is a dark colour, such as black.

19. A security document or device according to any one of the preceding claims wherein two or more different colour shifting inks are applied to different parts of the window or half-window to form a composite image.

20. A security document or device according to claim 19 wherein the different colour shifting inks exhibit a substantially similar first colour when viewed at some viewing angles but which exhibit two distinct colours when viewed at other viewing angles.

21. A security document or device according to claim 20 wherein the different colour shifting inks exhibit the substantially similar first colour when viewed in reflection from a substantially perpendicular viewing angle, the colour shifting inks exhibit two different distinct colours as the viewing angle moves from the perpendicular and the colour shifting inks exhibit the substantially similar first colour when viewed in reflection at low angles of incidence.

22. A security document or device according to claim 19 wherein the different colour shifting inks exhibit different distinct first colours at a first set of viewing angles and each of the colour shifting inks exhibit different distinct colours when viewed at a second set of viewing angles.

23. A security document or device according to any one of claims 19 to 22 wherein a layer of opacifying ink is applied over a region where the two or more different colour shifting inks meet to disguise any misalignment of the colour shifting inks.

24. A security document or device according to any one of the preceding claims wherein the document includes a full window, a half-window region surrounding or adjacent to the full window and an opaque area surrounding or adjacent to the half-window region, and the at least one colour

shifting ink composition extends across the full window, the half-window and the opaque area.

25. A method of producing a security document or device including the steps of:

5 providing a sheet-like substrate of transparent plastics material having first and second surfaces on opposite sides of the substrate,

applying at least one opacifying coating on said first surface in such a manner as to leave a region of the substrate uncovered to form a window; and

10 applying at least one colour shifting ink composition including a transparent organic pigment in at least part of the window region of the substrate, wherein the colour shifting ink composition provides at least one colour shift between a first colour and a second distinct colour depending upon the viewing angle.

26. A method according to claim 25 further including the step of applying at least one opacifying coating on said second surface on the opposite  
15 side of the substrate in such a manner as to leave the window region uncovered on both sides of the substrate, thereby forming a full window in which the at least one colour shifting ink composition is applied.

27. A method according to claim 25 further including the step of applying at least one opacifying coating on said second surface in at least part of  
20 the window region to form a half-window which is uncovered by specifying coating on the first surface on one side of the substrate and covered by opacifying coating on the second surface on the opposite side of the substrate, the at least one colour shifting ink composition being at least partly applied in the half-window region.

25 28. A method according to claim 27 wherein the at least one colour shifting ink composition is applied to the second surface of the substrate before the opacifying coating is applied to the second surface to cover the colour shifting ink composition on the second surface.

29. A method according to any one of claims 25 to 28 wherein the at  
30 least one colour shifting ink composition is applied to at least one of the surfaces of the substrate to overlap the window or half-window region and a surrounding or adjacent opaque area formed by the opacifying coating or coatings.

30. A method according to any one of claims 25 to 29 wherein at least two different colour shifting ink compositions are applied to different parts of the window or half-window region to form a composite image.

5 31. A method according to any one of claims 25 to 30 wherein the sheet-like substrate is formed from a flexible plastics material and further including the step of applying at least one substantially plain opaque ink or coating to at least one surface of the substrate at a location spaced laterally from the window region to form a self-verifying means which enables the colour shifting effects of the at least one colour shifting ink composition to be observed in  
10 reflection when the flexible sheet is bent, folded or twisted to bring the window into register with the substantially plain opaque ink or coating.

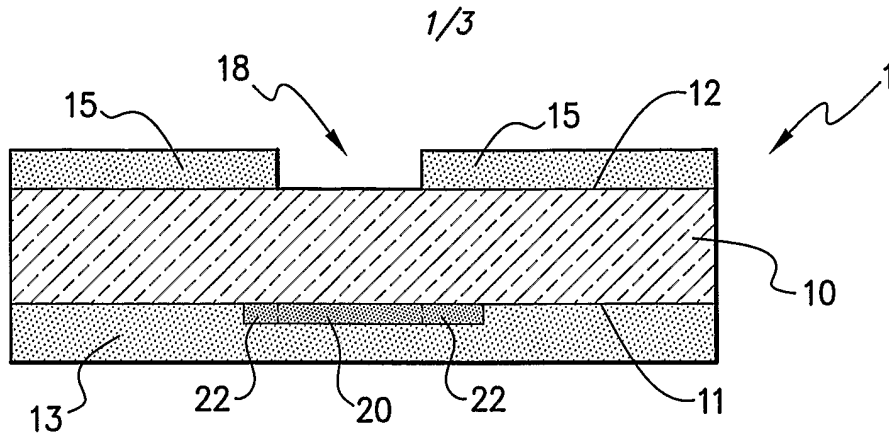


Fig. 1

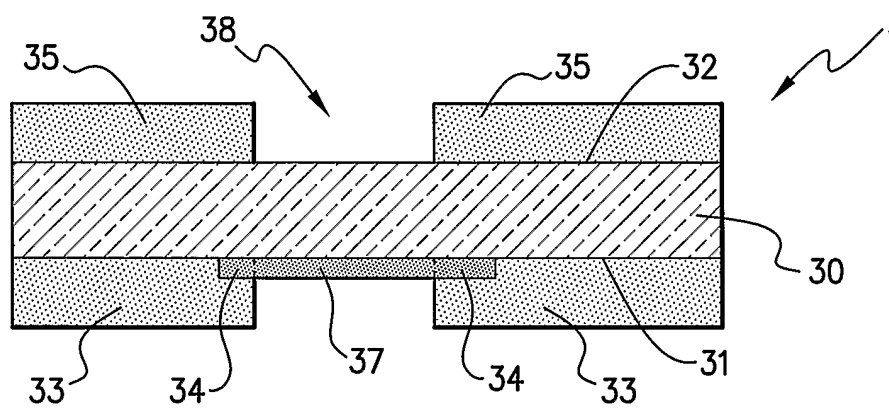


Fig. 2

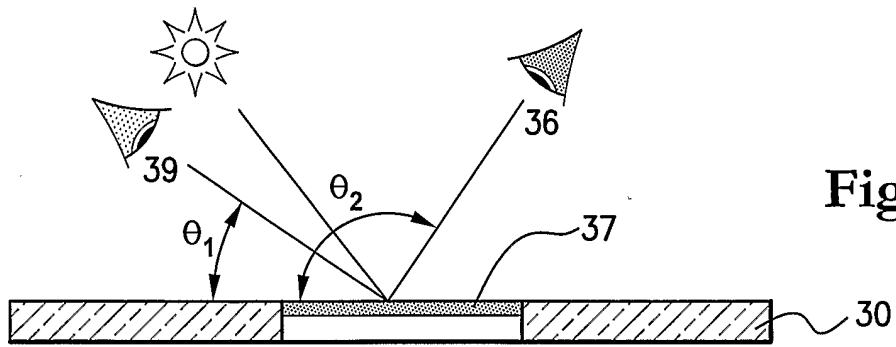


Fig. 3a

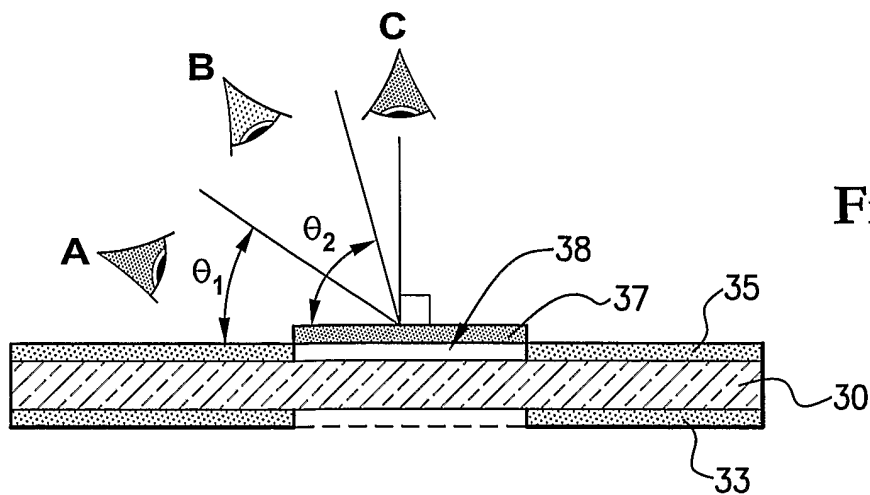


Fig. 3b

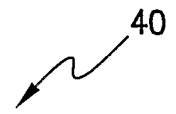
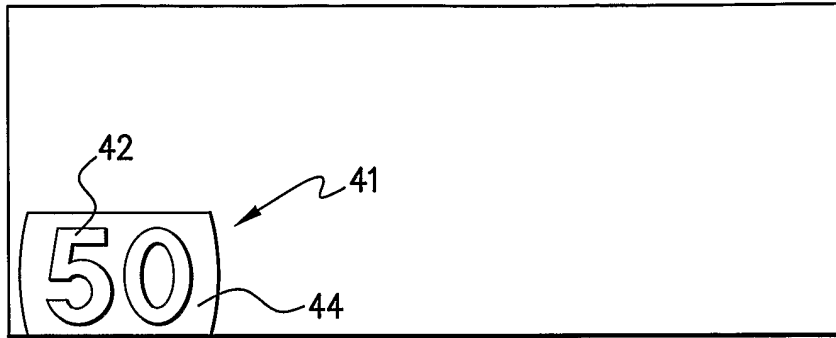


Fig. 4a

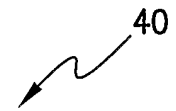
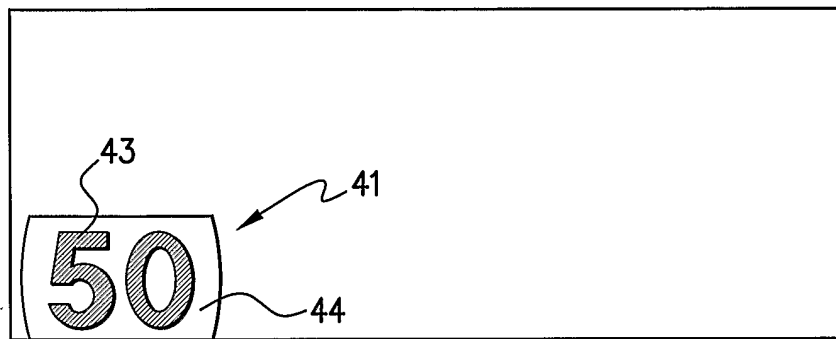


Fig. 4b

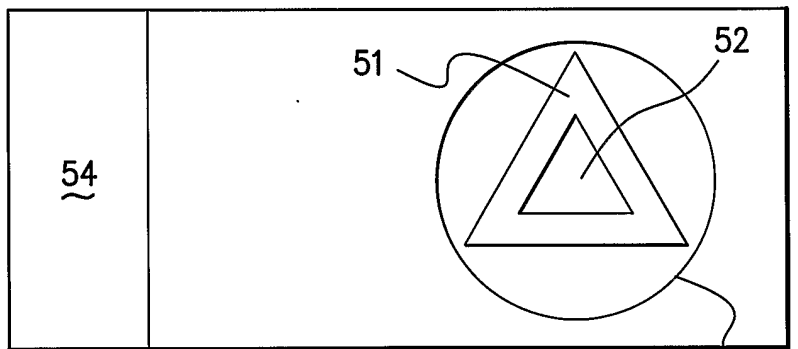


Fig. 5a

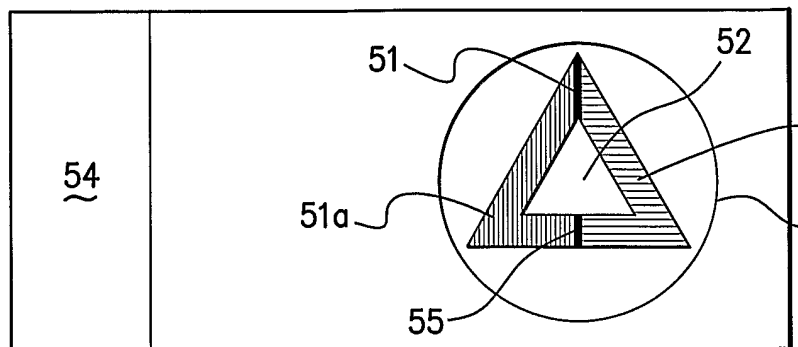


Fig. 5b

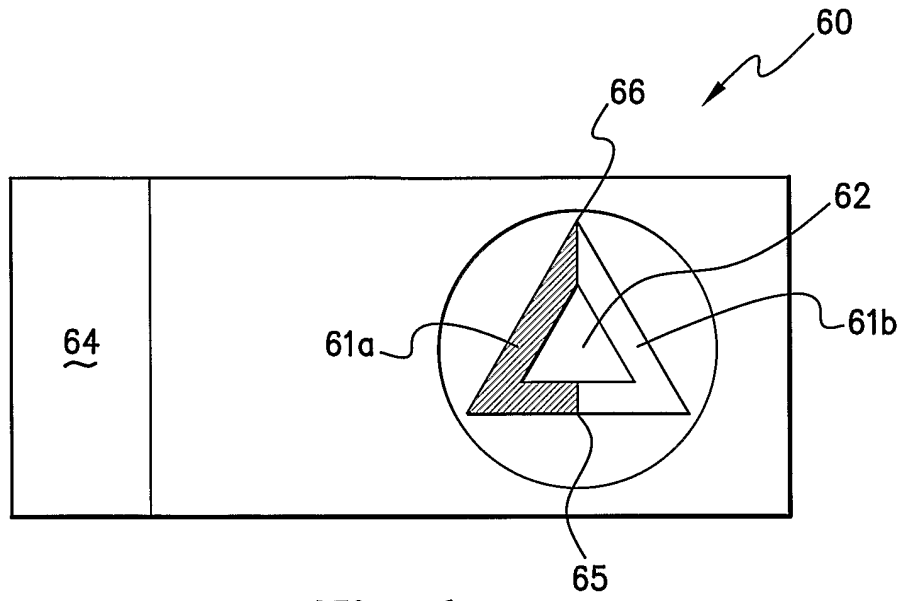


Fig. 6a

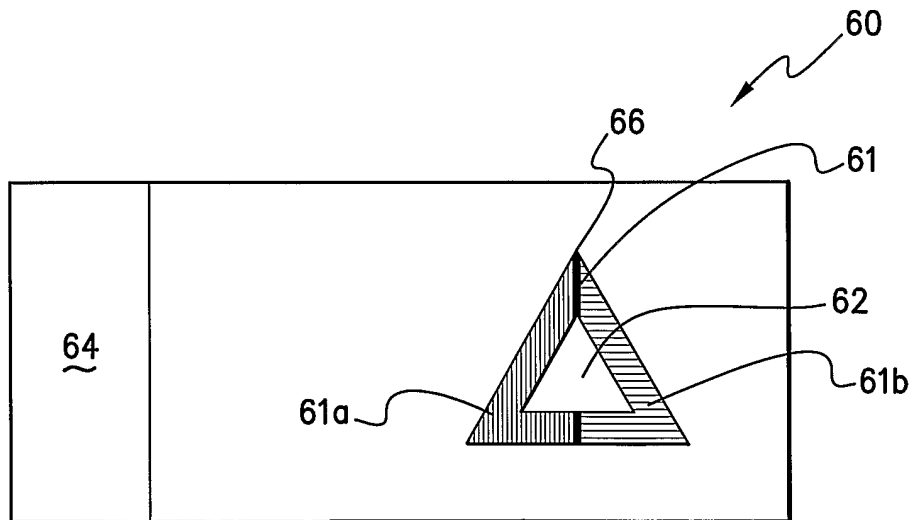


Fig. 6b

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU2006/000845

## A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

**B42D 15/00** (2006.01)      **B44F 1/12** (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**DWPI:** B42D B44F B41M BANK SECURITY CREDIT TOKEN DOCUMENT MONEY CASH CLEAR TRANSPARENT TRANSLUCENT WINDOW ASPECT ANGLE ORIENT POSITION TILT ROTATE INCLINE COLOR COLOUR OPTICAL INK PIGMENT LUSTRE VARY VARIABLE SHIFT INTERFER CHANGE TRANSFORM**JAPIO:** B42D 15/00 B44F COLOUR COLOR SHIFT CHANGE: **USPTO:** COLOUR OR COLOR SHIFTING SHIFT INK SECURITY**ESPACE:** A42D 15/00C2, 15/00C4, 15/10D, TRANSPARENT SHIFT SHIFTING

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 1995/015856 A1 (AGFA GEVERT et al) 15 June 1995 Abstract and claims	1, 16, 25
A	WO 1998/013211 A1 (RESERVE BANK OF AUSTRALIA) 2 April 1998 Claims and figures	1, 16, 25
A	WO 2001/002192 A1 (SECURENCY PTY LTD) 11 January 2001 Claims	1, 16, 25

 Further documents are listed in the continuation of Box C See patent family annex

* Special categories of cited documents:		
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"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family	
"P" document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search  
08 August 2006

Date of mailing of the international search report

16 AUG 2006

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## INTERNATIONAL SEARCH REPORT

International application No.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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A	US 2002/0163179 A1 (DUBNER et al) 7 November 2002 Abstract	1, 16, 25
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A	EP 1447234 A1 (KBA-GIORI S.A.) 18 August 2004 Figures	1, 16, 25



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Information on patent family members

International application No.

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This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.							
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