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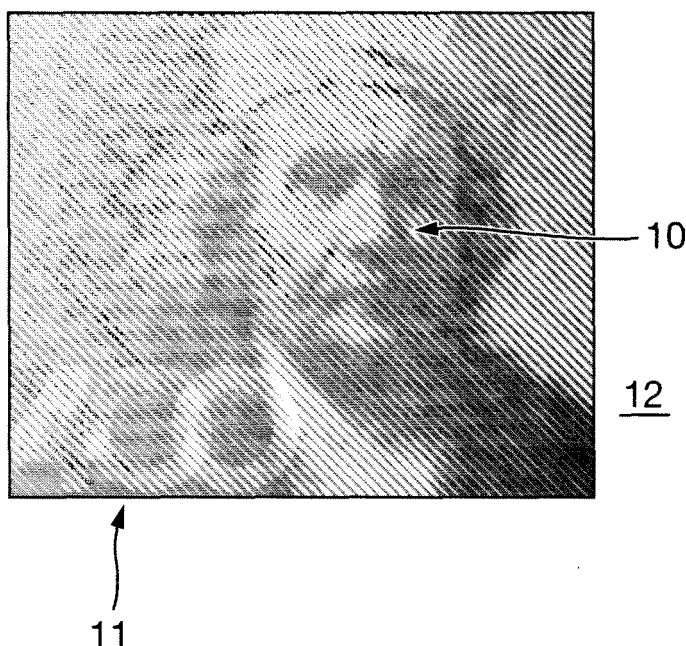
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(54) **Printed security feature**

(57) A printed security feature comprises at least two printed workings (1,2), each working having a different, gradual variation in tone and/or saturation. A raised im-

age is overprinted on the printed workings (1,2) in a substantially opaque ink that has a lightness value that is higher than the highest lightness value of the colours of the underlying printed workings.

Fig.4.



Description

[0001] The invention relates to a printed security feature, for example for use on security articles including security documents such as banknotes, travellers cheques and the like.

[0002] There is a continuing need to develop new security features to defeat counterfeiters but which are readily verifiable by users, particularly untrained or semi-trained users.

[0003] Examples of known security features which we have developed recently are described in WO-A-2005/004644 and WO-A-01/66360. With the increasing sophistication of counterfeiters and copying equipment, there is a need to develop yet further and higher security features.

[0004] In accordance with a first aspect of the present invention, a printed security feature comprises at least two printed workings, each working having a different, gradual variation in tone and/or saturation; and a raised image over-printed on the printed workings in a substantially opaque ink that has a lightness value that is higher than the highest lightness value of the colours of the underlying printed workings.

[0005] In accordance with a second aspect of the present invention, a method of manufacturing a printed security feature comprises printing at least two workings on a substrate, each working having a different gradual variation in tone and/or saturation; and printing a raised image on the printed workings in a substantially opaque ink that has a lightness value that is higher than the highest lightness value of the colours of the underlying printed workings.

[0006] The key aspect of this idea is to use the printed workings to provide a complex "heavy" background combined with a raised image in a substantially opaque ink with a higher lightness value than the background, such as a pale, lightly coloured or preferably white ink. A substantially opaque ink is one which masks the underlying printed workings such that they are not visible with the naked eye.

[0007] The raised image is used to bring out the highlights of the image against the heavy background which provides the shade. This is the opposite to conventional security printing where the underlying printed working provides the highlights and the raised print the shade. The resulting image exhibits the brightness and subtle colour effects of the underlying workings as well as the sharpness and tactility of the raised print. This provides a secure and memorable image because the, often seemingly non-printed, lightly coloured regions have an unexpected depth. The use of two printed workings enables the background to have an increased complexity over a single working. A counterfeiter might attempt to copy this by applying two printed workings in register such that a blank area is left in the form of the raised image. However, by using two printed workings to create complex tonal and/or saturation variations, it is practically impossible to register the two workings such that a negative image is created which has a resolution of a printed intaglio image.

[0008] In this specification, the reference to "saturation" relates to the quantity of ink per unit area. Also, the reference to "variation in tone" relates to a variation in one or more of the hue, purity or lightness of a colour.

[0009] In some cases, at least one of the printed workings has a varying colour or tone and may be provided with a rainbow variation.

[0010] In the preferred embodiments, the variation in tone and/or saturation occurs in different directions, preferably orthogonally, in the two printed workings. This leads to a very complex background colour which is particularly difficult to counterfeit.

[0011] Preferably, at least one of the printed workings presents an apparent tonal variation by varying its saturation and this is most easily achieved by using a screened working. Thus, by varying the screen spacing, for example in a stepwise manner, the saturation variation and hence an apparent variation in tone is achieved.

[0012] As will be appreciated, it is possible to vary the tone or the saturation or both of each printed working.

[0013] A particularly convenient screen is one which is defined by parallel printed lines, the spacing between lines varying across the working. Where both printed workings are screened using sets of parallel lines, preferably the workings are overprinted with their respective screen line directions orthogonally arranged.

[0014] Non-linear screens are also envisaged. For example, a circular or sinusoidal screen could be used while screen lines do not have to be continuous and could comprise dots. In this case, the saturation or apparent tonal variation could be achieved by varying the dot spacing in one or more directions. The screen can be regular or stochastic.

[0015] Indeed, the term "screen" should be construed broadly to encompass many different shapes of screen elements.

[0016] The printed workings are typically printed using the same printing process although different processes could be used. The printed processes are typically chosen from litho, gravure, screen, flexo, inkjet, laser, tonal transfer or digital printing.

[0017] The printed working colours typically have lightness values L^* less than 80, preferably less than 70, while typically the lightness value L^* of the substantially opaque ink is at least 90. Preferably, the difference in lightness value L^* between the substantially opaque ink and the highest lightness value of the colours of the underlying printed workings is at least 10.

[0018] The raised image is preferably an intaglio image although other methods for generating a raised image could be used such as thermographic printing. As explained above, the raised image is preferably printed with a white or lightly

coloured ink which provides a contrast with the strongly coloured background. This gives the finished image an unusual appearance, particularly when the raised image is printed with an ink having a colour substantially the same as that of an underlying substrate. This gives the appearance of seemingly non-printed lightly coloured regions having a depth which is unexpected.

[0019] The raised image can be formed as a screened image or a line working in a conventional manner.

[0020] The raised image can take any form including pictorial images for example portraits, symbols for example stars, and alphanumeric characters and combinations thereof. The designs can be defined by patterns comprising solid or discontinuous regions which may include for example line patterns, fine filigree line patterns, dot structures and geometric patterns. Possible characters include those from non-Roman scripts of which examples include but are not limited to, Chinese, Japanese, Sanskrit and Arabic.

[0021] We also provide a security article having a printed security feature according to the first aspect of the invention. The security article is typically a security document such as a banknote, travellers cheque, certificate of authenticity, stamp, bond, tax disc, fiscal stamp, secure label, passport or voucher.

[0022] The security feature can be printed directly on the document or provided on a label which is then adhered to a document or other security article.

[0023] An example of a security feature and method according to the present invention will now be described with reference to the accompanying drawings, in which:-

Figures 1A-1D illustrate schematically different stages in producing an example of a security feature according to the invention;

Figures 2 and 3 illustrate examples of individual printed workings; and,

Figure 4 illustrates the printed workings of Figures 2 and 3 when overprinted and subsequently overprinted with an intaglio image.

[0024] The principle behind one example of the present invention is illustrated in Figures 1A-1D. Figure 1A illustrates a first, lithographic printed working 1 on a substrate 2. The printed working has a flat tint which has been screened with a linear screen, the lines of the screen running vertically as can be seen in Figure 1A. In fact, the spacing between the vertical lines varies gradually from left to right although this is not illustrated in Figure 1A. The result of this is a variation in saturation from left to right. This working 1 is printed in a strong dark colour and the print is somewhat heavier than for normal lithography. Typically for a lithographically printed working on a security document the % of ink coverage would be up to 50% but for the current invention the ink coverage would typically be greater than 60% in the most saturated regions of each lithographic working. Referring to the CIELAB colour measurement scale the lightness values (L^*) of the lithographic working would typically be less than 80 and preferably less than 70.

[0025] Figure 1 B illustrates a second lithographically printed working 3. This printed working is in a different colour or tone from the working 1 and again the tone is the same across the working but the working has been screened with a set of screen lines extending from left to right, the screen line spacing gradually varying from top to bottom (although this is not shown in Figure 1 B). The ink coverage for this lithographic working 3 is also preferably greater than 60% in the most saturated regions.

[0026] Figure 1C illustrates the effect of overprinting the workings 1,3 with the respective screen lines orthogonally arranged, as shown at 4. The result is a substantially solid area of lithographic printing with a strong but varying tone and saturation across its full area in both left to right and top to bottom directions.

[0027] The final raised printed image formed by intaglio printing on the background 4 is illustrated at 5 in Figure 1 D. This intaglio printing has been printed in a white or lightly coloured ink and this colour is substantially the same as that of the substrate 2 or in other words the background outside the workings 1,3. Examples of suitable pigments for producing the substantially opaque white ink are set out in Table 1 below.

TABLE 1

Titanium Dioxide RHD2 (ex British Oxide)
Zinc Oxide, Lithopone (both Colour Pigments Manufacturer's Association Inc.)
Micro Mica (Norwegian Talc Ltd)
Barytes (Viatron Industries Ltd)

[0028] Figure 2 illustrates a practical example of the working 3 shown in Figure 1 B. In this case, a flat tint, for example dark green ink with CIELAB value of L^*50 , $a^*-9.6$ and $b^*-2.66$, is horizontally screened with a linear screen of parallel lines. The spacing between the lines increases in steps from right to left so that the right hand side of the working appears dark and the left hand side light.

[0029] Figure 3 illustrates a working corresponding to Figure 1A in which a colour different from that used for the

working in Figure 2, for example orange ink with CIELAB value of L*72, a*20.12 and b*47.8, is printed as a flat tint but screened with a vertical set of parallel lines, the line spacing increasing in a stepwise manner from bottom to top. Thus, the bottom of the working appears dark and the top light.

[0030] Figure 4 illustrates the result of overprinting the workings of Figures 2 and 3, with their screen directions orthogonally arranged and subsequently printing a raised image by intaglio on the overprinted workings. In this case, the raised image includes a portrait 10 and numerals 11. It can be seen that the raised image has been intaglio printed in an ink which is similar to the surrounding background 12 (white) so as to give the impression of an unprinted image. An example of the colour of this intaglio ink is L*90.19, a*-4.55 and b*5.65. However, the fact that this has been printed on a strongly coloured lithographic background provides the seemingly unprinted raised image with a depth which is unexpected.

Claims

1. A printed security feature comprising at least two printed workings, each working having a different, gradual variation in tone and/or saturation; and a raised image overprinted on the printed workings in a substantially opaque ink that has a lightness value that is higher than the highest lightness value of the colours of the underlying printed workings.
2. A security feature according to claim 1, wherein the variation in tone and/or saturation occurs in different directions, preferably mutually orthogonally, in the two printed workings.
3. A security feature according to claim 1 or claim 2, wherein at least one of the printed workings is a screened working.
4. A security feature according to claim 3, wherein the at least one working has a saturation variation provided by varying the screen spacing, for example in a stepwise manner.
5. A security feature according to claim 4, wherein the screen is defined by parallel printed lines, the spacing between lines varying across the working.
6. A security feature according to claim 5, the feature having two screened, printed workings with their respective screen line directions orthogonally arranged.
7. A security feature according to any of the preceding claims, wherein each printed working has a different colour.
8. A security feature according to any of the preceding claims, wherein at least one of the printed workings has a varying colour or tone.
9. A security feature according to claim 8, wherein the colour or tone of said at least one printed working varies in a rainbow manner.
10. A security feature according to any of the preceding claims, wherein the printed workings are generated by litho, gravure, screen, flexo, inkjet, laser, tonal transfer or digital printing.
11. A security feature according to any of the preceding claims, wherein the raised image is generated by intaglio printing.
12. A security feature according to any of the preceding claims, wherein the raised image is printed with a white or lightly coloured ink.
13. A security feature according to any of the preceding claims, wherein the printed workings are provided on a substrate presenting a background colour substantially the same as that of the raised ink.
14. A security feature according to any of the preceding claims, wherein the raised image is formed as a screened image or a line working.
15. A security feature according to any of the preceding claims, wherein the raised image is selected from the group comprising portraits, symbols for example stars, and alphanumeric characters and combinations thereof.
16. A security feature according to any of the preceding claims, wherein the printed working colours have lightness

values L^* less than 80, preferably less than 70.

5 **17.** A security feature according to any of the preceding claims, wherein the lightness value L^* of the substantially opaque ink is at least 90.

18. A security feature according to any of the preceding claims, wherein the difference in lightness value L^* between the substantially opaque ink and the highest lightness value of the colours of the underlying printed workings is at least 10.

10 **19.** A security feature according to any of the preceding claims, wherein the substantially opaque ink includes a pigment selected from Titanium Dioxide RHD2, Zinc Oxide, Lithopone, Micro Mica and Barytes.

20. A security article provided with a printed security feature according to any of the preceding claims.

15 **21.** An article according to claim 20, wherein the security feature is printed directly on the article.

22. An article according to claim 20, wherein the security feature is provided on a label adhered to the article.

20 **23.** A security article according to any of claims 20 to 22, wherein the security article comprises a security document such as a banknote, travellers cheque, certificate of authenticity, stamp, bond, tax disc, fiscal stamp, secure label, passport or voucher.

25 **24.** A method of manufacturing a printed security feature, the method comprising printing at least two workings on a substrate, each working having a different gradual variation in tone and/or saturation; and printing a raised image on the printed workings in a substantially opaque ink that has a lightness value that is higher than the highest lightness value of the colours of the underlying printed workings.

25. A method according to claim 24 for manufacturing a security feature according to any of claims 1 to 20.

Fig.1(A)

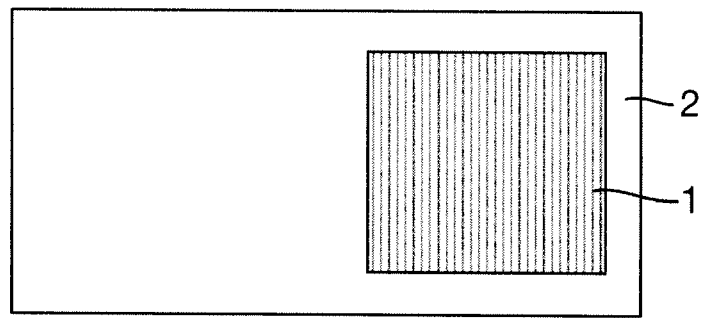


Fig.1(B)

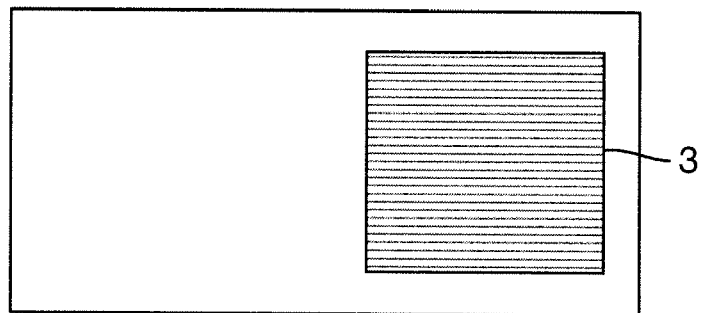


Fig.1(C)

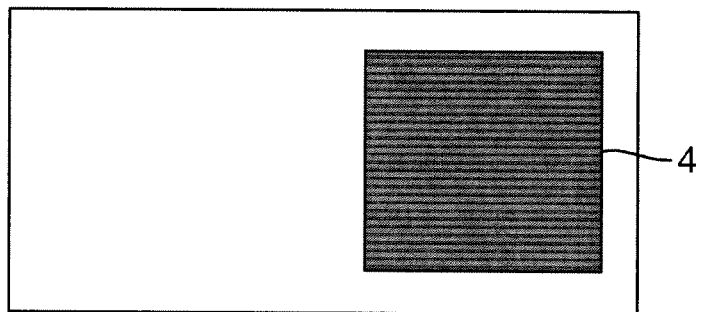


Fig.1(D)

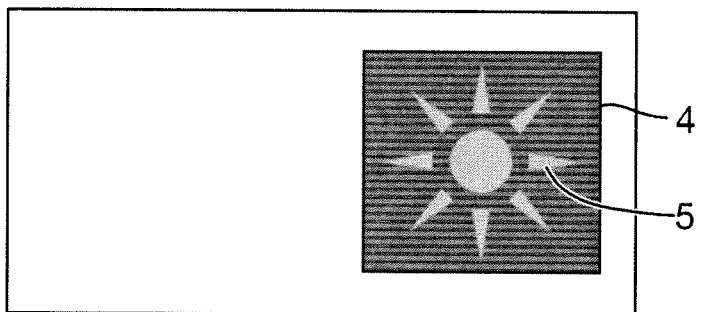


Fig.2.

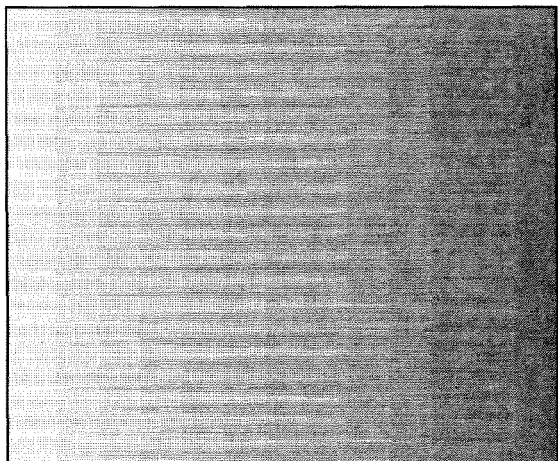
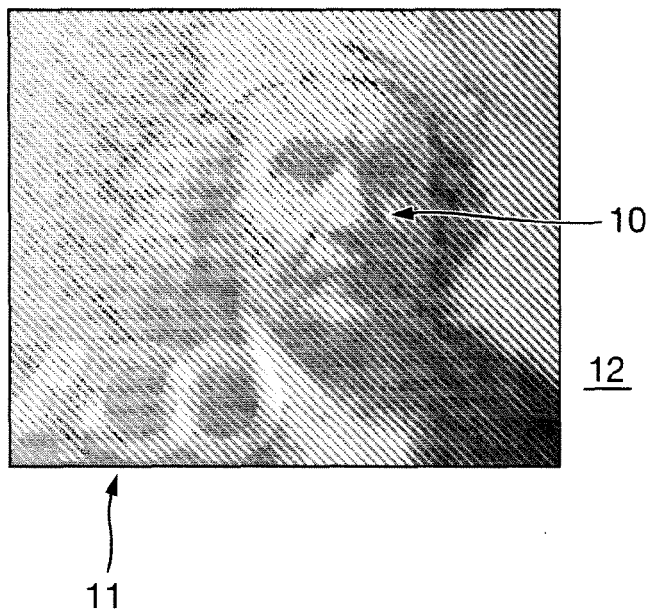


Fig.3.



Fig.4.



REFERENCES CITED IN THE DESCRIPTION

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