Description

This invention relates to rendering documents resistant to photocopying, and inter alia provides a useful anti-photocopying paper.

The present day ready availability of photocopiers has given rise to the problem of rendering documents or portions thereof resistant to photocopying. It is now unduly easy for a person to make an unauthorized photocopy of a document carrying confidential information, unless the document is resistant to photocopying. Various attempts have been made to render documents resistant to photocopying by covering information on a document with a transparent film which permits the information to be seen by the human eye but which prevents an adequate photocopy being made. United States patents Nos. 3,887,742 and 4,118,122 disclose proposals of this kind but for one reason or another, neither of these proposals provides a satisfactory solution to the problem of rendering documents resistant to photocopying.

Our United States patent application Serial No. 443,819 filed November 23rd 1982, and corresponding European Patent Application No. 82306493.6 (EP—A—111597) discloses and claims (inter alia) an antiphotocopying paper which has substantial advantages over the prior art. The antiphotocopying paper which is the subject of European Patent Application No. 82306493.6 has a colour with a reflection spectral response of less than about 10% for all light with a wavelength below about 600 nanometres (600 millimicrons) and yet which is sufficiently visually contrasting with information, when the information is typed thereon or otherwise applied thereto, to enable the information to be read by the human eye when the paper is viewed under white light.

We have now discovered an even more improved manner of rendering documents resistant to photocopying.

In accordance with this further invention, a document has information appearing thereon, with at least a portion of the information being located on a portion of a front face of the document, characterised by said front face portion being coloured so as to produce, in a copying machine being substantially sensitive below 650 nm, a reflection spectral response sufficiently low to render the document portion incapable of being photocopied in an information-readable manner, that is to say with the information having a similar low reflection spectral response, and said document portion being capable of transmitting visible light from the rear face to the front face to cause sufficient contrast between the relatively non-translucent information and the information free background to enable the information to be read by a human eye viewing the front face of the document when visible light is transmitted through the document from the rear face to the front face thereof, said reflection spectral response being substantially zero for light with a wavelength below about 625 nm.

In this specification the word 'about' when used to qualify a wavelength is to be understood as meaning ±5 nm. Additionally one millimicron of wavelength is the same as one nanometer of wavelength.

Preferably the reflection spectral response is substantially zero for light with a wavelength below about 650 nm, and more preferably substantially zero for light with a wavelength below about 700 nm.

The portion of the document carrying information which is not to be photocopied preferably has a transmission factor averaging 3% in the visible light range. Advantageously, the transmission factor ranges from substantially zero for light with a wavelength of about 450 nm to about 5% for light with a wavelength of about 700 nm. Usually, the information will be in a substantially black relatively non-translucent colour.

Thus, in accordance with the present invention, the document is particularly resistant to photocopying since photocopies require the document to have an adequate reflection spectral response for light of wavelengths to which the photocopier responds. Most photocopiers do not respond to light with a wavelength above about 625 nm (625 µm), and are most unlikely to respond to light with a wavelength above about 650 nm (650 µm). A document in accordance with the present invention therefore is very effectively resistant to photocopying.

On the other hand, a document in accordance with the present invention can be very easily read by means of visible light transmitted through the document from the rear. The visible light may simply be daylight or other ambient light or may be a light which is specifically intended for reading a document in accordance with the present invention. The low reflection spectral response may be provided by applying a suitable ink to a suitable paper or by applying a suitable pre-manufactured colour film to a suitable paper.

One embodiment of the present invention will now be described by way of example, with reference to the accompanying drawings, of which:

Figure 1 is a graph showing the reflection spectral response and transmission factor of anti-photocopying paper in accordance with one embodiment of the invention, and also showing the average spectral response of the human eye and a typical spectral response of a photocopier, and

Figure 2 is a graph showing the readability of information on the paper when viewed by means of reflected incident light and by means of transmitted light.

Referring first to Figure 1, a document comprises a sheet of coloured paper having a transmission factor indicated by the line T and a reflection spectral response indicated by the line T and a reflection spectral response indicated by the line R. Figure 1 also shows the typical spectral response of the human eye by the line E and a possible spectral response of a photocopier by the line P.

It will be noted that the line P indicates that the spectral response of the photocopier decreases to zero at a wavelength of about 650 nm (650 µm), with a cut-off at about 625 nm (625 µm), the term 'cut-off' being usually applied to the wavelength at which the spectral response has fallen to less than about 10%.

The transmission factor T of the paper increases substantially linearly from zero at a wavelength of about 450 nm (450 µm) to about 5% at a wavelength of about 700 nm (700 µm), therefore averaging about 3% over the visible light range encompassed by the line E. Above the visible light range, the transmission factor increases substantially linearly to about 10% for light with a wavelength of about 1,000 nm (1,000 µm).

The reflection spectral response R is very low (substantially zero) below about 700 nm (700 µm), i.e. less than about 1%, and is also of this order at wavelengths above 700 nm (700 µm) up to about 1000 nm (1,000 µm).

The paper may for example be that sold by Kimberley Clark Corporation under the trade mark UV ULTRA II covered on the front face with matt finished 'black' ink (such as produced by Cal/Ink Limited or Sinclair & Valentine Limited) to give the required transmission factor.

Information is then typed, printed or otherwise applied in black or similar dark colour on the front face of the paper so that it is relatively non-translucent. Any kind of information may of course be applied, including printed, written or drawn text, graphs or illustrations. Frequently, the information may be applied to the paper by means of a photocopier from an original document which is not resistant to photocopying. In such a case, anti-photocopying paper in accordance with the invention will be used as the copy paper in a photocopying machine, with the result that the information will appear on the paper as baked black carbon deposits.

If an attempt is made to photocopy the resultant document, the photocopy will be unreadable because the information on the photocopy will not be distinguishable from the background. In other words, the photocopy will show the background in the same colour as the information since the reflection spectral response of the paper is substantially zero below about 700 nm (700 µm).

On the other hand, if the document is illuminated from behind, either by positioning the document so that ambient daylight or artificial light or special artificial light passes therethrough from behind, the information can be easily read by the human eye when viewed from the front because the black or substantially black information will be sufficiently contrasting with the background which is lightened by the transmitted light.

Figure 2 shows the relative eye response when viewing the document. Line 1 shows the eye response to viewing by light transmitted through the paper, and line 2 shows the eye response to viewing by reflected incident light. When viewing by transmitted light, the transmitted light is easily seen in contrast to the information, particularly at wave-lengths to which the human eye is most responsive as indicated by line E in Figure 1. With reflected light, the eye merely perceives the paper to be substantially black and substantially indistinguishable from the information.

The invention is of course applicable to any security documents, including lottery tickets, show and sports events tickets, postal and fiscal stamps, stock shares and bond certificates, credit cards, personal and bank cheques, travellers cheques and bank notes.

Claims

1. A document having information appearing thereon, with at least a portion of the information being located on a portion of a front face of the document, characterised by said front face portion being coloured so as to produce, in a copying machine being substantially sensitive below 650 nm, a reflection spectral response sufficiently low to render said document portion incapable of being photocopied in an information-readable manner, and said document portion being capable of transmitting visible light from the rear face to the front face to cause sufficient contrast between the relatively non-translucent information and the information-free background to enable the information to be read by a human eye viewing the front face of the document when visible light is transmitted through the document from the rear face to the front face thereof, said reflection spectral response being substantially zero for light with a wavelength below about 625 nm.

2. A document according to claim 1, wherein said reflection spectral response is substantially zero for light with a wavelength below about 700 nm.

3. A document according to claim 1 or claim 2, wherein said document portion has a transmission factor averaging about 3% in the visible light range.

4. A document according to any one of claims 1 to 3, wherein said document portion has a transmission factor ranging from substantially zero for light with a wavelength of about 450 nm to about 5% for light with a wavelength of about 700 nm.

5. A document according to any one of claims 1 to 4, wherein said information is of a substantially black relatively non-translucent colour.

6. A method of rendering a document with information thereon resistant to photocopying, said method comprising providing said information on a portion of a front face of the document, characterised by said front face portion being coloured so as to produce, in a copying machine being sensitive below 650 nm, a reflection spectral response sufficiently low to render said document portion incapable of being photocopied in an information-readable manner, and said document portion being capable of trans-

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Information is then typed, printed or otherwise applied in black or similar dark colour on the front face of the paper so that it is relatively non-translucent. Any kind of information may of course be applied, including printed, written or drawn text, graphs or illustrations. Frequently, the information may be applied to the paper by means of a photocopier from an original document which is not resistant to photocopying. In such a case, anti-photocopying paper in accordance with the invention will be used as the copy paper in a photocopying machine, with the result that the information will appear on the paper as baked black carbon deposits.

If an attempt is made to photocopy the resultant document, the photocopy will be unreadable because the information on the photocopy will not be distinguishable from the background. In other words, the photocopy will show the background in the same colour as the information since the reflection spectral response of the paper is substantially zero below about 700 nm (700 µm).

On the other hand, if the document is illuminated from behind, either by positioning the document so that ambient daylight or artificial light or special artificial light passes therethrough from behind, the information can be easily read by the human eye when viewed from the front because the black or substantially black information will be sufficiently contrasting with the background which is lightened by the transmitted light.

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The invention is of course applicable to any security documents, including lottery tickets, show and sports events tickets, postal and fiscal stamps, stock shares and bond certificates, credit cards, personal and bank cheques, travellers cheques and bank notes.

Claims

1. A document having information appearing thereon, with at least a portion of the information being located on a portion of a front face of the document, characterised by said front face portion being coloured so as to produce, in a copying machine being substantially sensitive below 650 nm, a reflection spectral response sufficiently low to render said document portion incapable of being photocopied in an information-readable manner, and said document portion being capable of transmitting visible light from the rear face to the front face to cause sufficient contrast between the relatively non-translucent information and the information-free background to enable the information to be read by a human eye viewing the front face of the document when visible light is transmitted through the document from the rear face to the front face thereof, said reflection spectral response being substantially zero for light with a wavelength below about 625 nm.

2. A document according to claim 1, wherein said reflection spectral response is substantially zero for light with a wavelength below about 700 nm.

3. A document according to claim 1 or claim 2, wherein said document portion has a transmission factor averaging about 3% in the visible light range.

4. A document according to any one of claims 1 to 3, wherein said document portion has a transmission factor ranging from substantially zero for light with a wavelength of about 450 nm to about 5% for light with a wavelength of about 700 nm.

5. A document according to any one of claims 1 to 4, wherein said information is of a substantially black relatively non-translucent colour.

6. A method of rendering a document with information thereon resistant to photocopying, said method comprising providing said information on a portion of a front face of the document, characterised by said front face portion being coloured so as to produce, in a copying machine being sensitive below 650 nm, a reflection spectral response sufficiently low to render said document portion incapable of being photocopied in an information-readable manner, and said document portion being capable of trans-

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mitting visible light from the rear face to the front face to cause sufficient contrast between the relatively non-translucent information and the information-free background to enable the information to be read by a human eye viewing the front face of the document when visible light is transmitted through the document from the rear face to the front face thereof, said reflection spectral response being substantially zero for light with a wavelength below about 625 nm.

7. A method according to claim 6, wherein said reflection spectral response is substantially zero for light with a wavelength below about 700 nm.

8. A method according to claim 6 or claim 7, wherein said document portion has a transmission factor averaging about 3% in the visible light range.

9. A method according to any one of claims 6 to 8, wherein said document portion has a transmission factor ranging from substantially zero for light with a wavelength of about 450 nm to about 5% for light with a wavelength of about 700 nm.

10. A method according to any one of claims 6 to 9, wherein said information is of a substantially black relatively non-translucent colour.

11. Anti-photocopying paper having a front face coloured so as to produce, in a copying machine being substantially sensitive below 650 nm, a reflection spectral response sufficiently low to render the document incapable of being photocopied in an information-readable manner, after information has been typed or otherwise applied to said front face, and said paper being capable of transmitting visible light from the rear face to the front face to cause sufficient contrast between the relatively non-translucent information and the information-free background to enable the information to be read by a human eye viewing the front face of the document when visible light is transmitted through the document from the rear face to the front face thereof, said reflection spectral response being substantially zero for light with a wavelength below about 625 nm.

12. Paper according to claim 11, wherein said reflection spectral response is substantially zero for light with a wavelength below 700 nm.

13. Paper according to claim 11 or claim 12, wherein said document portion has a transmission factor averaging about 3% in the visible light range.

14. Paper according to any one of claims 11 to 13, wherein said document portion has a transmission factor ranging from substantially zero for light with a wavelength of about 450 nm to about 5% for light with a wavelength of about 700 nm.

15. Paper according to any one of claims 11 to 14, wherein said information is of a substantially black relatively non-translucent colour.

Patentansprüche

1. Dokument mit darauf sichtbarer Information, mit mindestens einem Informationsabschnitt, der auf einem Vorderseitenabschnitt des Dokumentes angeordnet ist, dadurch gekennzeichnet, daß der Vorderseitenabschnitt Koloriert ist, so daß er in einem Kopiergerät, das im wesentlichen unterhalb 650 nm lichtempfindlich ist, eine Reflexionsspektralempfindlichkeit erzeugt, die ausreichend niedrig ist, um den Dokumentenabschnitt für das Fotokopieren in einer informationslesbaren Art und Weise ungeeignet zu machen, und der Dokumentenabschnitt geeignet ist, sichtbares Licht von der Rückseite zur Vorderseite durchzulassen, um einen ausreichenden Kontrast zwischen der relativ nicht durchscheinenden Information und dem informationsfreien Hintergrund zu bewirken, um zu ermöglichen, daß die Information mittels des auf die Vorderseite des Dokumentes schauenden menschlichen Auges gelesen werden kann, wenn sichtbares Licht durch das Dokument von dessen Rückseite zu dessen Vorderseite durchtritt, wobei die Reflexionsspektralempfindlichkeit für Licht mit einer Wellenlänge unter etwa 625 nm im wesentlichen Null ist.

2. Dokument nach Anspruch 1, wobei die Reflexionsspektralempfindlichkeit im wesentlichen Null ist für Licht mit einer Wellenlänge unter etwa 700 nm.

3. Dokument nach Anspruch 1 oder 2, wobei der Dokumentenabschnitt einen Lichtdurchlaßgrad von durchschnittlich 3 % im sichtbaren Lichtbereich besitzt.

4. Dokument nach einem der Ansprüche 1 bis 3, wobei der Dokumentenabschnitt einen Lichtdurchlaßgrad hat, der sich von im wesentlichen Null für Licht mit einer Wellenlänge von etwa 450 nm bis etwa 5 % für Licht mit einer Wellenlänge von etwa 700 nm erstreckt.

5. Dokument nach einem der Ansprüche 1 bis 4, wobei die Information in einer im wesentlichen schwarzen relativ nicht lichtdurchlässigen Färbung vorliegt.

6. Verfahren, um ein Dokument mit auf diesem befindlicher Information fotokopierwiderstandsfähig zu machen, wobei das Verfahren beinhaltet, die Information auf einem Bereich der Vorderseite des Dokumentes vorzusehen, dadurch gekennzeichnet, daß der Vorderseitenabschnitt koloriert ist, so daß er in einem Kopiergerät, das im wesentlichen unterhalb 650 nm lichtempfindlich ist, eine Reflexionsspektralempfindlichkeit erzeugt, die ausreichend niedrig ist, um den Dokumentenabschnitt für das Fotokopieren in einer informationslesbaren Art und Weise ungeeignet zu machen, und der Dokumentenabschnitt geeignet ist, sichtbares Licht von der Rückseite zur Vorderseite durchzulassen, um einen ausreichenden Kontrast zwischen der relativ nicht durchscheinenden Information und dem informationsfreien Hintergrund zu bewirken, um zu ermöglichen, daß die Information mittels des auf die Vorderseite des Dokumentes schauenden menschlichen Auges gelesen werden kann, wenn sichtbares Licht durch das Dokument von dessen Rückseite zu dessen Vorderseite durchtritt, wobei die Reflexionsspektralempfindlichkeit für Licht mit einer Wellenlänge unter etwa 625 nm im wesentlichen Null ist.

7. Verfahren nach Anspruch 6, wobei die

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Reflexionsspektralempfindlichkeit im wesentlichen Null ist für Licht mit einer Wellenlänge unter etwa 700 nm.

8. Verfahren nach Anspruch 6 oder 7, wobei der Dokumentenabschnitt einen Lichtdurchlaßgrad von durchschnittlich 3 % im sichtbaren Lichtbereich besitzt.

9. Verfahren nach einem der Ansprüche 6 bis 8, wobei der Dokumentenabschnitt einen Lichtdurchlaßgrad hat, der sich von im wesentlichen Null für Licht mit einer Wellenlänge von etwa 450 nm bis etwa 5 % für Licht mit einer Wellenlänge von etwa 700 nm erstreckt.

10. Verfahren nach einem der Ansprüche 6 bis 9, wobei die Information in einer im wesentlichen schwarzen relativ nicht lichtdurchlässigen Färbung vorliegt.

11. Nicht fotokopierbares Papier, dessen Vorderseite so koloriert ist, daß es in einem Kopiergerät, das im wesentlichen unterhalb 650 nm lichtempfindlich ist, eine Reflexionsspektralempfindlichkeit erzeugt, die ausreichend niedrig ist, um das Dokument für das Fotokopieren in einer informationslesbaren Art und Weise ungeeignet zu machen, nach dem die Information auf der Vorderseite maschinengeschrieben oder in anderer Weise aufgetragen wurde, und das Papier geeignet ist, sichtbares Licht von der Rückseite zur Vorderseite durchzulassen, um einen ausreichenden Kontrast zwischen der relativ nicht durchscheinenden Information und dem informationsfreien Hintergrund zu bewirken, um zu ermöglichen, daß die Information mittels des auf die Vorderseite des Dokumentes schauenden menschlichen Auges gelesen werden kann, wenn sichtbares Licht durch das Dokument von dessen Rückseite zu dessen Vorderseite durchtritt, wobei die Reflexionsspektralempfindlichkeit für Licht mit einer Wellenlänge unter etwa 625 nm im wesentlichen Null ist.

12. Papier nach Anspruch 11, wobei die Reflexionsspektralempfindlichkeit im wesentlichen Null ist für Licht mit einer Wellenlänge unter etwa 700 nm.

13. Papier nach Anspruch 11 oder 12, wobei der Dokumentenabschnitt einen Lichtdurchlaßgrad von durchschnittlich 3 % im sichtbaren Lichtbereich besitzt.

14. Papier nach einem der Ansprüche 11 bis 13, wobei der Dokumentenabschnitt einen Lichtdurchlaßgrad hat, der sich von im wesentlichen Null für Licht mit einer Wellenlänge von etwa 450 nm bis etwa 5 % für Licht mit einer Wellenlänge von etwa 700 nm erstreckt.

15. Papier nach einem der Ansprüche 11 bis 14, wobei die Information in einer im wesentlichen schwarzen relativ nicht lichtdurchlässigen Färbung vorliegt.

Revendications

1. Document porteur d'information y apparaissant, une partie au moins de l'information étant située sur une partie d'un recto du document, caractérisé en ce que ladite partie de recto est colorée de façon à donner, dans une machine à copier sensiblement sensible au-dessous de 650 nm, une réponse spectrale de réflexion assez faible pour rendre ladite partie de document inapte à une photocopie permettant la lecture de l'information, et ladite partie de document étant capable de transmettre la lumière visible du verso au recto pour faire apparaître entre l'information relativement non translucide et le fond exempt d'information un contraste suffisant pour permettre la lecture de l'information par l'oeil humain examinant le recto du document quand de la lumière visible est transmise à travers le document du verso au recto de celui-ci, ladite réponse spectrale de réflexion étant sensiblement nulle pour de la lumière à longueur d'onde inférieure à environ 625 nm.

2. Document selon la revendication 1, dans lequel ladite réponse spectrale de réflexion est sensiblement nulle pour de la lumière à longueur d'onde inférieure à environ 700 nm.

3. Document selon la revendication 1 ou 2, dans lequel ladite partie de document a un facteur de transmission qui est en moyenne d'environ 3 % dans le domaine de la lumière visible.

4. Document selon l'une quelconque des revendications 1 à 3, dans lequel ladite partie de document a un facteur de transmission compris entre une valeur sensiblement nulle poure de la lumière à longueur d'onde d'environ 450 nm et environ 5% pour de la lumière à longueur d'onde d'environ 700 nm.

5. Document selon l'une quelconque des revendications 1 à 4, dans lequel ladite information est d'une couleur sensiblement noire relativement non translucide.

6. Méthode pour rendre un document porteur d'information résistant à la photocopie, cette méthode comprenant l'application de ladite information sur une partie d'un recto du document, caractérisée en ce que ledit recto est coloré de façon à provoquer, dans une machine à copier sensible au-dessous de 650 nm, une réponse spectrale de réflexion assez faible pour rendre ladite partie de document inapte à une photocopie permettant la lecture de l'information, et ladite partie de document étant capable de transmettre de la lumière visible du verso au recto pour établir un contraste suffisant entre l'information relativement non translucide et le fond exempt d'information pour permettre la lecture de l'information par un oeil humain observant le recto du document quand de la lumière visible est transmise à travers le document du verso au recto de celui-ci, ladite réponse spectrale de réflexion étant sensiblement nulle pour de la lumière à longueur d'onde inférieure à environ 625 nm.

7. Méthode selon la revendication 6, dans laquelle ladite réponse spectrale de réflexion est sensiblement nulle pour de la lumière à longueur d'onde inférieure à environ 700 nm.

8. Méthode selon la revendication 6 ou la revendication 7, dans laquelle ladite partie de document a un facteur de transmission qui est d'environ 3 % dans le domaine de la lumière visible.

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9. Méthode selon l'une quelconque des revendications 6 à 8, dans laquelle ladite partie de document a un facteur de transmission allant d'une valeur sensiblement nulle pour de la lumière à longueur d'environ 450 nm à environ 5% pour de la lumière à longueur d'onde d'environ 700 nm.

10. Méthode selon l'une quelconque des revendications 6 à 9, dans laquelle ladite information est d'une couleur sensiblement noire non translucide.

11. Papier antiphotocopie présentant un recto coloré de façon à provoquer, dans une machine à copier sensiblement sensible au-dessous de 650 nm, une réponse spectrale de réflexion suffisamment faible pour rendre le document inapte à une photocopie permettant la lecture de l'information, après application d'information par dactylographie ou autrement sur ledit recto, et ledit papier étant apte à transmettre de la lumière visible du verso au recto pour provoquer entre l'information relativement non translucide et le fond exempt d'information un contraste suffisant pour permettre la lecture de l'information par un oeil humain observant le recto du document quand de la lumière visible est transmise à travers le document du verso au recto de celui-ci, ladite réponse spectrale de réflexion étant sensiblement nulle pour de la lumière à longueur d'onde inférieure à environ 625 nm.

12. Papier selon la revendication 11, dans lequel ladite réponse spectrale de réflexion est sensiblement nulle pour de la lumière à longueur d'onde inférieure à environ 700 nm.

13. Papier selon la revendication 11 ou la revendication 12, dans lequel ladite partie de document a un facteur de transmission qui est un moyenne d'environ 3 % dans le domaine de la lumière visible.

14. Papier selon l'une quelconque des revendications 11 à 13, dans lequel ladite partie de document a un facteur de transmission compris entre une valeur sensiblement nulle pour de la lumière à longueur d'onde d'environ 450 nm et environ 5 % pour de la lumière à longueur d'onde d'environ 700 nm.

15. Papier selon l'une quelconque des revendications 11 à 14, dans lequel ladite information est d'une couleur sensiblement noire relativement non translucide.

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