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(54) **Security document.**

(57) A simple and elegant anti-forgery device is provided for plastics material security documents, such as credit cards and the like, by the provision of a security document in the form of a plastics material card, such as an identity card, credit card or bank cheque guarantee card, which card carries a rainbow-printed design.

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SECURITY DOCUMENT

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This invention relates to security documents, e.g. documents which are of value themselves, which represent value or which provide information of value. The copying of such documents is, of course, of great interest to the forger, and strenuous efforts have been made for many years to make the forger's task as difficult as possible.

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In particular, this invention relates to security documents in the form of plastics materials cards such as, for example, identity cards, bank cheque guarantee cards and credit cards (although the invention is not, of course, limited to such specific examples).

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As is well known, there is, particularly in the United States, a problem regarding the fraudulent production of bank cards and the like. The printing on existing bank cards of all types has tended to be fairly straightforward and there is, therefore, a particular need to provide a feature or features which presents the forger with a virtually insoluble problem in this area.

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The use of rainbow printing, i.e. a fine design printed in a gradation of different colours, has been well known for security documents such as bank notes for many years. However, there has been absolutely no suggestion hitherto that such a technique could assist in the forgery problem for bank cards and the like. Indeed, efforts in this direction have so far involved the use of many

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complex ideas and techniques e.g. the use of security magnetic strips, embossed designs, and even the incorporation of holograms. Cards carrying holograms are now widely available , e.g. in the USA and UK. There is, of course, no reason at all why such features cannot be incorporated on the present invention, but the essence of the invention is based upon the surprising and sudden realisation that the provision of rainbow printing actually upon security documents in the form of plastics material cards does provide a relatively simple anti-forgery mechanism using present technologies.

According to the present invention there is provided a security document in the form of a plastics material card which carries a rainbow-printed design. The above card is preferably in the form of a laminar structure comprising a printed plastics core with plastics material on both surfaces of the core. Either or both of the core surfaces may bear rainbow printing and usually such printing will be in the form of close register fine line patterns.

The technique for rainbow printing of fine line patterns on paper materials has, as indicated, been known for many years and involves, inter alia, the use of a printing machine having a number of adjacent ink feed areas which take different coloured inks. Reference may be made, for example, to British Patent Specification No. 402028, the contents of which are incorporated herein by reference. In applying such techniques to the printing of plastics material cards all that is necessary is for the man of ordinary skill to make the same adaptations to the known rainbow printing technique of paper as are made already in conventional printing on plastics as opposed to paper, e.g. conventional printing of one colour designs on

existing credit cards and the like. Once the concept is appreciated it will be readily seen that the use of rainbow printing in a plastics material security document greatly increases the problems of the forger.

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The use of rainbow printing as a security feature on paper documents such as banknotes is a well known technique using a conventional offset wet or dry lithographic press, but the ink reservoir, or duct, is fitted additionally with divisions known as fillets which enable inks of different colours to be placed side by side across the printing width.

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The fillets must form a very tight seal so that no intermixing occurs between adjacent inks in the duct, which would result in a progressive loss of colour purity. The press is then run in a conventional manner with the plate being inked, and the resultant image transferring successively to a rubber blanket and then to paper. The image appears on the paper not in one colour but in a series of bands of colour across the printing width. The boundary between the bands is not a sharp colour change but a gradual transition from one colour to another over a width typically of 15 mm. The width of the transition area can be varied by a very fine adjustment of the oscillating roller incorporated in the ink train of the press, but the amount of oscillation must be kept small so as to prevent cross contamination of colour.

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Successful rainbow printing of consistent quality calls for very high skill on the part of the press operator, accurate settings on the press, and a high level of consistency and compatibility on the part of the inks used.

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Normally on security documents a printing press with two or more units is used, each unit printing a rainbow image. The lateral positions of the fillets are selected to be different on each unit which increases the range of colour that appears on the finished document. This delicate range of colours, normally coupled with designs that call for very close register between the units produce a result which is extremely difficult to reproduce by photographic or colour separation techniques.

It is interesting to speculate why rainbow printing techniques have not hitherto been applied to the printing of plastics material security items such as credit cards and cheque guarantee cards. There may be two reasons why such an application has not been thought of. The first relates to the supposed difficulty of printing on plastic; plastic is non-absorbent and achieving good drying and adhesion poses considerable problems, particularly upon the ink. Such problems are well understood by the skilled man. However, the additional requirements imposed upon the ink by the needs of rainbow printing at first sight might appear to make the operation very much more difficult and indeed the need for skill on the part of the press operator and tight control of the process cannot be overemphasised. In essence, however, the present invention is based upon the discovery that, provided the same adaptations to rainbow printing techniques (as they are normally applied to paper) are made in adapting normal printing techniques to printing on plastics materials, the use of rainbow printing techniques sets no impossible problems to the skilled man but can present the forger lacking such skills with real difficulties. The other factor is that quite simply credit or cheque card manufacturers have not thought of using techniques well known in the different art of paper security printing. It

is this combination of disparate arts in a simple and unexpected way which lies at the core of the invention.

As indicated, rainbow printing on plastics demands special inks. To the normal requirements of compatability between inks on the same duct are added appropriate drying and adhesion characteristics. In addition the pigments used in the inks must withstand the temperatures and pressures of lamination. However, provided the change on lamination is controllable, the use of pigments that bleed or change colour on lamination can be used as an additional security feature since the resultant appearance of the finished card cannot be matched unless the correct pigments and lamination conditions are used. Provided the above constraints are met there is no reason why the other features such as arranging for some inks to fluoresce and or show responses to specific wavelengths of light should not be incorporated, even to the extent of invisible rainbow printing where inks are used which are invisible under normal light but which become visible in different colours under ultra violet light.

The nature of the rainbow printed pattern on the present security documents and the distribution of rainbow printing and the choice of colours are, of course, matters which can be left to individual preference. Particularly close register rainbow fine line patterning can be employed in an area on the document where it is desired to incorporate embossed information in a conventional manner known in the art. It is also desirable that the colours used in rainbow printing be carefully selected to render photographic separation extremely difficult.

It has already been made apparent that the present invention is not restricted to bank cards or credit cards

(indeed any security document involving authentication is appropriate in the present invention, e.g. identity cards, cash machine withdrawal cards, passes and the like, which is in plastics card form). However, credit cards and bank
5 cheque guarantee cards are a very important application of the present invention and in both of these cases the card will generally carry a signature panel. This panel may itself carry printed items and these may be printed with solvent sensitive and/or erasable inks designed to show
10 clearly any attempt at alteration or at erasure of the signature. The printing on the signature panel may also be rainbow printed, e.g. in the form of a micro-pattern design. It is preferred that the signature panel be a paper-based material permanently bonded to the card
15 surface.

A magnetic security area or strip may be incorporated on the card or, indeed, a plurality of such areas or strips. Machine readable coded information may be
20 incorporated in this magnetised material in a manner well known in the art.

In general, the intaglio printing process has for many years been used as a security feature on paper
25 documents such as banknotes. In concept the process is simple: a plate is engraved by hand and/or machine; the engraving is filled with ink; paper is pressed against the plate and as the paper is peeled away the ink is removed from the engraving. Once the ink is dry it preserves a
30 record of the engraving in terms of area, contour and depth. Although simply described, the resulting print can have a high level of security. This comes from:

1 The skill of the engraver and/or engraving machine in
35 producing a detailed design that is both complex and

easily recognisable.

2. The formulation of ink to incorporate several pigments such that only an exact duplication of the pigment mix can give an identical result of the whole range of ink film thicknesses.
3. The very high pressures involved which demand very complex, massive and expensive printing equipment which is only available to established security printers.

The transfer of ink from engraving to the paper occurs because during the period of impression the paper is compressed into the engravings and the ink is forced into the pores between the fibres of the paper. As the pressure is removed the resulting adhesion to the paper overcomes any adhesion of the ink to the engraving. If an attempt is made to intaglio print on to less compressible and essentially non-porous substrates, very little ink transfer occurs. The only plastics materials that have been successfully intaglio printed are those made with a fibrous structure similar to paper or which offer considerable compressibility combined with improved adhesion.

Since, in the past, the materials used for making plastics material cards were non-porous, intaglio printing has never been considered as a printing process for them. Also, with plastics cards it has been customary for all printing to be under a laminate film which would deprive intaglio printed designs of one of their major characteristics, tactile feel.

However, as indicated earlier plastics cards are now available where the signature strip is made of paper. The principal advantage of this is that the paper absorbs the ink of a signature and deletion becomes much more difficult. Since such paper strips are on the surface intaglio printing can be applied to part of the strip to enhance the security both of the card and of the strip. The invention includes cards thus modified.

The strip is hot-press laminated to the plastic of the card and the intaglio print must withstand the heat and pressure involved. This means that the ink must not soften under heat and the pigments must not bleed or change colour under heat unless a controlled colour change under heat is used as an additional security feature.

The design used for the intaglio printing on a signature strip is, of course, limited by the space available but may incorporate a transitory or a "latent" image. Thus, in more general terms it is another important aspect of the present invention to incorporate on a bank card of the type referred to above in general, on at least one surface of such card, an area (e.g. of paper) which is intaglio-printable and which bears intaglio printing providing a transitory visual effect. In general, intaglio-inked patterns are constituted by ink elements which are appreciably raised above the level of the surface bearing the printing. In other words, such elements have substantial depth. When an intaglio printed design is viewed from a number of different angles, at some of those angles the individual inked lines sometimes at least partially occlude the spaces between them. This results in the printing appearing perceptively more intense at such angles than when seen from other angles where occlusion does not occur. The intensity of this

effect is dependent, of course, on the pattern depth and arrangement. Advantage can be taken of these properties of intaglio printing to produce transitory images. In general, an intaglio printed pattern can be provided which includes at least one image area and a "background" area, individual pattern elements in the image area differing from pattern elements in the background area to produce a contrast between the image area and the background area as viewed from a first angle but with the contrast altering (or perhaps disappearing) as the angle of view alters. It is possible to achieve such effects, inter alia, where the contrast relates to respective pattern intensities or differing colouring depending upon the angle of view. This "latent image" effect and its production is described in full in British Patent Specification No. 1390302, the contents of which are incorporated herein by reference. The provision of such printing on security documents in the form of plastics material cards is novel and inventive in its own right and provides a useful anti-forgery device for such cards.

It is a most important aspect of the present invention to provide a security document in the form of a plastics material card which carries not only rainbow printing but also an intaglio printed latent image as described above and in British Patent Specification No. 1390302, a copy of which is filed herewith.

The tactile feel and visibility of the latent image, on e.g. a signature strip laminated to a card, can vary dramatically with the pressure and temperature conditions of lamination. It has been found that if high pressure is applied before the plastics material softens, the intaglio print loses much of its characteristics. This is because the plastics material takes up the contours of the

5 intaglio print, despite the thickness of the paper. If the pressure is applied only after the plastics material is soft the resulting strip gives a greatly improved tactile feel and latent image visibility because the paper is pressed into the plastics material so as to be almost flat.

10 The present security documents may also carry one or more holograms and reference is made to the report issued by American Bank Note Company in 1983 containing examples of such holograms and referring thereto. Holograms may be provided in the form of holographic image-bearing films mounted on individual foil carriers, each carrier being mounted on the plastics material card. The reader is also
15 directed to British Patent Specification No. 2129739 dealing with another technique for using holograms, the contents of which specification are incorporated herein by reference.

20 It is also envisaged that the present security documents may carry at least some printing in fluorescent inks invisible under ordinary lighting conditions.

25 Hidden graphics may be included as a further security feature, e.g. printing may be incorporated which includes a word and/or sign which is of such a character that it signifies that the document when copied may not be genuine, both the word and/or the sign and surrounding area comprising a plurality of continuous lines, the lines
30 forming the word and/or sign being at an angle to the lines forming the surrounding area and the width and spacing of the lines being selected so that the word and/or sign is not readily visible in the document but is readily visible in a copy of the document made on a copier
35 employing a light source for scanning the document.

Reference is made to British Patent Specification No. 2018197, the contents of which are incorporated herein by reference.

5 Of course, the present security documents may include
a range of other security features. An example is the use
of optical fibres through the card, possibly a plurality
of fibres arranged in a specific pattern. Reference may
be made, for example, to British Patent Specification No.
10 1319210, the contents of which are incorporated herein by
reference. Other examples are the use of fine white line
patterning around any densely printed lettering or simple
device printing, such as a bank identification device or
name, and the use of a feature indicating that the card is
15 void (perhaps a printed indication using the word "void"
itself) if an attempt should be made to remove any
signature panel present by the use of mechanical or solvent
means.

20 Generally, cards in accordance with the present
invention are produced by methods standard in the art from
thermoplastics materials which will permit heat embossing
and/or hot pressing for the incorporation of, e.g. a
signature strip and/or hologram.

25 Given the above information the man or skill in the
art will readily see how the present invention can be put
into practice. Variations and modifications within the
scope of the invention will, of course, be apparent and
30 the invention is to be interpreted as including such
variations or modifications.

CLAIMS:

1. A security document in the form of a plastics material card, such as an identity card, credit card or bank cheque guarantee card, which card carries a rainbow-
5 printed design.
2. A document as claimed in claim 1, wherein the card is in the form of a laminar structure comprising a central core of plastics material carrying rainbow printing on one or both surfaces thereof and an outer layer of plastics
10 material on each surface of the core.
3. A document as claimed in claim 1 or claim 2, wherein the rainbow printed design comprises a close register fine line pattern.
4. A document as claimed in any one of claims 1 to
15 3, wherein the card carried a signature panel, optionally of a paper-based material.
5. A document as claimed in claim 4, wherein the signature panel carries printing which has been effected with solvent sensitive and/or erasable inks.
- 20 6. A document as claimed in claim 4 or claim 5, wherein the signature panel has rainbow printing thereon, optionally in the form of a micro-pattern design.
7. A document as claimed in any one of claims 1 to 6, wherein the card incorporates on a surface thereof a
25 magnetic security area, optionally as a magnetic strip.
8. A document as claimed in any one of claims 1 to 7, wherein on at least one surface of the card there is an area which is intaglio-printable, such as an area of a paper-based material, which carries intaglio printing
30 preferably providing a transitory visual effect.
9. A document as claimed in any one of claims 1 to 8, which carries at least one hologram, optionally as a holographic image-bearing film mounted on a foil carrier, the carrier being mounted on the plastics material card.
- 35 10. A document as claimed in any one of claims 1 to

9 which carries at least some printing in fluorescent ink invisible under ordinary lighting conditions.

11. A document as claimed in any one of claims 1 to 10, wherein printing is incorporated which includes a word and/or sign which is of such a character that it signifies that the document when copied may not be genuine, both the word and/or the sign and surrounding area comprising a plurality of continuous lines, the lines forming the word and/or sign being at an angle to the lines forming the surrounding area and the width and spacing of the lines being selected so that the word and/or sign is not readily visible in the document but is readily visible in a copy of the document made on a copier employing a light source for scanning the document.

12. A document as claimed in any one of claims 1 to 11 also incorporating an optical fibre security device.

13. A security document in the form of a plastics material card, such as an identity card, credit card or bank cheque guarantee card, which card carries on at least one surface thereof an area which is intaglio-printable and on which an intaglio printed design is provided which exhibits a transitory visual effect dependent upon the angle of view of such design.