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(54) **A SECURITY PRODUCT, A FILM AND A METHOD OF MANUFACTURE OF A SECURITY
PRODUCT**

SICHERHEITSPRODUKT, FILM UND VERFAHREN ZUR HERSTELLUNG EINES
SICHERHEITSPRODUKTS

PRODUIT DE SECURITE, FILM ET PROCEDE DE FABRICATION D'UN PRODUIT DE SECURITE

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EP-A- 0 310 707 **EP-A- 0 407 550**

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Description

The present invention relates to security products such as security threads for security paper such as banknotes, security strips mounted in or on a surface of a security document or a security card and security patches used on security documents. Such security products are used to enable authentication of a document, card, banknote and other such security articles. The present invention also relates to film which can be cut to form security products. The present invention also relates to a method of manufacture of a security products suitable for use with security paper such as banknotes and other security articles.

Our GB-A-1127043 describes security products, such as security threads, comprising magnetic material. Such devices allow banknotes and other documents to be authenticated on high speed used note sorting machines and other devices by verification of the presence of the magnetic component.

Also, our GB-A-1585533 describes other security products which combine a machine verifiable layer of magnetic material with another layer of a non-magnetic metal or luminescent substance, such other layer being in itself machine-detectable. Banknotes containing security devices conforming to the above two patents have been in widespread use for many years; accordingly, there are many banknote sorting machines around the world already fitted with detectors for magnetic security threads as mentioned above.

Furthermore, our EP-B-0319157 describes security paper containing a security thread which is predominantly metallised but has clear regions, at least some of which are wholly surrounded by metal, forming a repeating pattern, e.g. in the form of the characters of an alphabet. This is a strong public security feature and has been adopted by the banknote issuing authorities in many countries; this feature has become known in the art as the Cleartext feature. Furthermore, US-A-4652015 describes paper with a security thread with isolated characters of metal; security paper of this type has been used for a recent issue of the United States currency.

There is increasing interest from banknote issuing authorities in combining into the same security product the benefits of a strong public security feature with the covert properties of a machine-readable feature. In particular, there is a need to combine the very strong public security of the Cleartext feature described in EP-B-0319157 with the magnetic properties of the devices described in our two above-mentioned GB-A-1127043 and GB-A-1585533 such that the resultant security product is directly compatible with the widely established magnetic thread detectors already in use around the world.

The security product of PCT application WO-A-92/11142 is an attempt to provide this combination. A security product conforming to this specification has been used commercially. A central region of the security product has a metallic appearance with clear regions forming characters; on either side of this central strip in the width direction, there are layers of magnetic material with obscuring coatings to provide the necessary magnetic component. This is, however, a generally unsatisfactory means of achieving the combination of the appearance of Cleartext with the required magnetic properties. The resultant thread is wide (2.0 mm or more) which presents processing problems to both the papermaker and banknote printer. The magnetic properties are satisfactory, but the requirement to place the magnetic layers on either side of the central region means that the latter must be relatively narrow with respect to the overall thread width and results in characters which are small - typically 0.7 mm high - and therefore not easily legible. Additionally, the structures of the products described in WO 92/11142 are very complex and present substantial lateral registration problems in depositing the various layers; misregister of even 0.1 mm or so can allow the presence of the dark magnetic oxide to be apparent to the naked eye, thus revealing its presence and seriously detracting from the aesthetic appearance of the security thread.

A more satisfactory solution from the points of view of processability, ease of character recognition and aesthetics would be to manufacture a device of the kind described in EP-B-0319157 from a metal which is itself magnetic, such that the size of characters and ratio of character height:thread width of the Cleartext product is maintained, while providing direct compatibility with existing magnetic thread detectors. One means of achieving this is disclosed in Research Disclosure issue 323 page 178 of March 1991. In this disclosure, a magnetic metal is deposited onto a flexible substrate for example by vacuum sputtering; the non-metallised regions are created by selective printing of a resist and subsequent chemical etching. The disclosed magnetic metals may be nickel, cobalt, iron or alloys thereof with a preferred combination of cobalt:nickel in the ratio 85:15. The disadvantage of this method is that vacuum deposition of cobalt:nickel to the necessary thickness is a relatively slow process and somewhat wasteful of cobalt, which is an expensive material. Furthermore, subsequent to this vacuum deposition process, further significant processing is required to etch the characters. The resultant product is therefore relatively expensive.

It is known that films of cobalt:nickel:phosphorous can be prepared by electrodeposition and of cobalt:phosphorous by electrolytic and chemical reduction (Journal of Applied Physics, Vol. 36, No. 3, March 1965, page 948). This paper describes the preparation of films of cobalt:nickel:phosphorous by chemical reduction (electroless plating) using a tin chloride:palladium chloride catalyst. The paper also shows that the magnetic coercivity is strongly dependent upon the nickel content of the alloy. Another paper on the electroless deposition of cobalt:phosphorous films has shown that the coercivity is dependent upon the phosphorous content (Journal of the Electro Chemical Society, April 1966, page 360).

Again, activation of the substrate involves a catalyst based on tin chloride:palladium chloride. In both of the above papers, a continuous magnetic metallic film is generated (continuous on a macro scale).

Electroless deposition of cobalt on polyethyleneterephthalate (PET) sometimes called Mylar (a trade mark), a non-conductive substrate, is described in the Journal of the Electrochemical Society, June 1962, page 485. In the experimental procedure described, Mylar was immersed in an adhesive and then successively in stannous chloride and palladium chloride solutions prior to deposition of the cobalt layer. The resulting film was suitable for use in high-density data storage applications.

US-A-5227223 discloses a process for electrolessly depositing metal on to a pattern of catalytic material printed on to a moving web of polymeric film so as to form electronic circuits on the film or electrical components or micro-engineering components. The process provides metal images having fine dimensions, e.g. as low as 25 μm or less. US-A-5227223 makes mention of several prior specifications which use electroless deposition to produce printed circuits. These prior specifications all discuss the deposition of some metals which are non-magnetic as would be expected in the manufacture of electrical circuits where magnetised components would be disadvantageous. The preferred embodiment of the process of US-A-5227223 uses a nickel bath and deposits nickel onto a substrate by electroless deposition; nickel deposited in such a manner is non-magnetic.

The present invention in a first aspect provides a method of manufacture of a security product suitable for use with security articles such as security paper, wherein a magnetic metal is deposited on a film of polymeric substrate as the substrate passes through a solution containing the magnetic metal, a preparatory operation is carried out on a surface of the substrate prior to immersion of the substrate in the solution, and the substrate with the magnetic metal deposited thereon is cut to produce the security product, characterised in that the preparatory operation ensures that magnetic metal is deposited on the substrate in a chosen pattern such that when the security product is produced by cutting the substrate, the magnetic metal on the security product has a specific pattern and provides both a visually discernible security feature and a magnetically detectable security feature.

The security product produced by the method could be a security thread for incorporation in or for mounting on a surface of security paper such as banknotes, a security strip for a document or a card, a patch (e.g. a square, oval or rectangular section cut from the film) for surface mounting on a document or a card or any other such product.

The present invention in a second aspect provides a security product suitable for incorporation in or for mounting on a surface of security paper, the security product comprising: a polymeric substrate, catalytic material covering at least a portion of one surface of the polymeric substrate, and a layer of electrolessly deposited magnetic metal covering at least a portion of the catalytic material with a depth in the range of 0.01 - 3.0 μm , wherein the layer of magnetic metal has a specific pattern and provides the security product with both a visually discernible security feature and a magnetically detectable security feature, the security product having an average magnetic remanence in the range 0.001 - 0.05 emu cm^{-2} .

For the purposes of this specification the term "magnetic remanence" refers to the remanent moment per unit area (equivalent to the remanent magnetisation-thickness product).

In a third aspect the present invention provides a film which can be cut into security products such as security threads for security paper including banknotes, the film comprising: a polymeric substrate, catalytic material covering at least a portion of one surface of the polymeric substrate, and a layer of electrolessly deposited magnetic metal covering at least a portion of the catalytic material in a layer of magnetic metal with a depth in the range 0.01 μm - 3.0 μm , wherein the layer of magnetic metal has a chosen pattern such that when a security product is cut from the film the layer of magnetic metal provides both a visually discernible security feature and a magnetically detectable security feature and the security product can have a magnetic remanence in the range 0.001 - 0.05 emu cm^{-2} .

The present invention is directed to the production of patterned magnetic/metallic films for use as security products based on the electroless deposition of a magnetic metal layer preferably comprising cobalt with or without nickel, iron and/or phosphorous. The disadvantages of producing this product using a vacuum deposited film have been discussed above. It is advantageous to produce the required pattern in the magnetic metal at the time the metal layer is formed, so that no further processing of the magnetic metal layer is required, other than for example to apply protective/adhesive coatings and to cut a film bearing the magnetic pattern into security products.

As will be seen later the magnetic metal is not deposited evenly over the whole of a security product, thus the figures given for depth of metal are for regions of thread having magnetic metal therein and remanence and coercivity values are given as averages.

The depth of the layer of catalytic material is preferably in the range 0.2 - 0.5 μm .

Where it is stated above and in the claims that the solution contains magnetic metal it should be appreciated that the magnetic metal will be present as ions in the solution and typically a salt will be dissolved in the solution to provide ions (which only take the form of magnetic metal after deposition). Where it is stated above and in the claims that the magnetic metal is deposited on the substrate (or on catalytic material) it should be appreciated that the magnetic metal could be deposited directly or indirectly on the substrate (or directly or indirectly on the catalytic material).

Indeed, in examples given later the magnetic metal is not deposited directly on the substrate but on a catalytic

material provided on the surface of the substrate (and in some examples the metal is not deposited directly on catalytic material, but on a metal deposited on the catalytic material).

Examples of preferred methods of manufacture will now be described, along with preferred embodiments of security thread according to the invention, with reference to the accompanying drawings, in which:

Figure 1 illustrates a first embodiment of security thread,
 Figure 2 illustrates a second embodiment of security thread,
 Figure 3 illustrates a third embodiment of security thread,
 Figure 4 illustrates a fourth embodiment of security thread,
 Figures 5a, 5b and 5c illustrate fifth, sixth and seventh embodiments of security thread,
 Figure 6 illustrates a part printed film ready for slitting into security threads, as provided in an intermediate stage of the method of the present invention,
 Figure 7 is a cross-section through a part of one of the security threads illustrated in figures 1 to 5c,
 Figure 8 is a drawing illustrating a first preferred manufacturing process of the invention,
 Figure 9 is a drawing illustrating a second manufacturing process of the invention,
 Figure 10 is a drawing illustrating a third manufacturing process of the invention,
 Figure 11 is a drawing illustrating a fourth manufacturing process of the invention, and
 Figure 12 is a drawing illustrating a fifth manufacturing process of the invention.

A preferred method of manufacture of security thread is schematically illustrated in Figure 8. Preferably, a suitable clear substrate, typically polyethyleneterephthalate (PET) 12 to 23 μm thick, is dispensed from a roll 50 thereof and then passed through a printing machine 51 where it is printed with a catalyst containing palladium or palladium:tin in a pattern which corresponds to the chosen end pattern of the magnetic metal. It is preferred that a tin-free palladium catalyst is used because it is easier to print than currently available palladium catalyst solutions which contain tin. It is essential to ensure good printing/print adhesion so that the catalytic material does not flake off from the substrate later on in the manufacturing process. The patent specification US-A-5227223 gives in example 1 five different catalytic inks which may be suitable for use in methods according to the present invention. Specific examples of suitable catalytic inks are given in the examples which appear later in this application.

After the catalyst has been printed, the film is dried in a drying machine 52 (which will typically blow air over the film) and optionally treated with heat (in oven 53) or by other known means to optimise or activate the catalytic properties of the catalytic layer. The film is then immersed in a plating bath 54 of liquid of known composition such that electroless deposition of cobalt with or without nickel, iron and/or phosphorous or alloys thereof is formed over the printed catalyst and provides the chosen pattern of magnetic metal. This may be undertaken by conveying a web through the plating bath 54 at a speed commensurate with building up the desired metal thickness (rollers 55 are shown which convey the film through the plating bath). Preferably, the metal thickness is in the region 0.2 μm -0.5 μm , although metal thicknesses outside this range can be achieved as required for a given magnetic detection system, for example 0.01 to 3.00 μm .

To provide adequate magnetic properties the deposited magnetic metal will typically have over 50% cobalt and preferably over 80% cobalt. It is preferred to deposit a magnetic metal which is an alloy of cobalt with phosphorous and/or cobalt phosphide. Variation of the percentage of phosphorous or cobalt phosphide in the deposit enables variation of magnetic properties of the deposit.

After emerging from the plating bath 54, the plated film is rinsed in deionised water by passing the film through a bath 56 of ionised water using rollers 57 to convey the film through the bath 56. The rinsed film is then dried by a drier 58. Protective and/or adhesive coatings are then applied by suitable apparatus 59 (e.g. gravure coating apparatus) to one or both sides of the film, as required. As a matter of practicality it is very important to apply a barrier coating to protect the magnetic metal from subsequent mechanical abrasion and chemical or atmospheric attack; the magnetic metal would otherwise be vulnerable when used on security thread. Most suitable barrier coatings are applied as lacquers or emulsions. Some have the effect of modifying the appearance of the magnetic metal and making it more difficult to copy or simulate the security thread for counterfeiting purposes. Suitable barrier coatings include vinyl copolymers (e.g. copolymers of vinyl chloride and vinyl acetate), polyvinylidene chloride (PVdC), acrylics, polyamides and copolymers of vinylidene chloride and acrylonitrile. These can be applied by several suitable operations (e.g. gravure coating, reverse roll coating) to a preferred dry coating mass of 1 - 3 gm^{-2} . Suitable adhesive coatings include extrusion coatings, e.g. copolymers of ethylene and vinyl acetate and ionomers (e.g. based upon a copolymer of ethylene and methacrylic acid), hot melt adhesives, polyurethanes, polyamide copolymers and emulsions (e.g. copolymers of ethylene and acrylic acid). These materials can provide barrier properties in addition to adhesive properties. They can be applied by several suitable operations, e.g. gravure coating for emulsions and solutions, to a dry mass preferably in the range 3 - 12 gm^{-2} . Other coatings can be applied by extrusion and hot melt techniques.

The film is next cut mechanically (at 60) using known techniques to produce strips with width dimensions typically

0.5-4.0 mm and, more typically, 1.0-2.0 mm, although other widths may be selected, for example 5.0 mm or more. The security thread which results from this mechanical cutting is then incorporated into paper in embedded or windowed form according to known techniques.

The above described method can also be used to produce a security strip for use in a security card where it is typically sandwiched between two layers of a card. Alternatively the security strip can be applied to a surface of a security card.

The method of the present invention can also be used to produce a security patch for application to a surface of a security document or security card. Instead of slitting the film at 60 to form security threads the film can be adhered to a metallic foil using known foil transfer techniques and then a cutting operation can be used to form security patches or security bands for face mounting on a document or card. The catalytic material could be micro embossed on to the substrate in such a way that the magnetic metal can form a hologram (i.e. the magnetic metal would take the place of the aluminium used in known techniques to form holograms). The security patch can be a square, oval, round, rectangular or other shape section cut from the film.

The method described above is a continuous process, but it need not be so. For instance the application of protective and/or adhesive coatings and the mechanical reduction of the film to security product dimensions may take place at a later time and/or in a different location to the plating/rinsing/drying process.

The design of the chosen pattern of the printed catalyst and subsequent magnetic metal layer is chosen in accordance with the end user requirements. Preferably, the specific pattern on a security thread produced by the above described method corresponds to the Cleartext concept as described in EP-B-0319157 and shown in figure 1; which shows a security thread comprising a clear substrate which is covered with a magnetic metal layer 10, with the letters 11 of the word PORTALS being formed from clear metal free regions in the metal layer 10. However, it is also possible to produce discrete metal characters as described in US-A-4652015 and shown in figure 2, in which metal characters 13 are deposited on a clear substrate 12 (the substrate being metal-free apart from the metal forming the letters). It should be appreciated that the lines 36 in figure 2 merely illustrate the edges of the security thread and do not indicate the presence of deposited magnetic metal. The Cleartext design could also be produced in blocks as shown in figure 3, in which the blocks 14 of metal free characters are separated by gaps 15, which extend completely across the width of the thread and define isolated conductive blocks of magnetic metal each with a specified length which is important for radio frequency or microwave detection. It should be appreciated that the lines 37 where they appear in the metal free zones serve only to illustrate the edges of the security thread and do not indicate the presence of deposited magnetic metal. It is further possible to produce designs which combine mixtures of the concepts of the above two specifications, i.e. a thread which has regions of metal characters as described in the US specification and also regions of metal free characters as described in the European specification, as shown in figure 4, in which regions of metal free characters such as 16 are separated by regions of metal characters such as region 17. Again in this embodiment isolated conductive blocks of specified lengths are provided in the regions of metal free characters, which is important for radio frequency and microwave detection. The lines 38 where they appear in the regions of metal characters (e.g. 17) serve only to illustrate the edges of the security thread and not to indicate the presence of deposited metal. The characters will typically be symbols such as alphanumeric characters or characters for written languages such as Japanese, Chinese or Arabic. Alternatively the specific pattern could be in the form of a machine readable code such as a bar code. Figures 5a, 5b and 5c show examples of such a bar code on its own (in figure 5a a region 21 of bar code is shown) and combined with non-coded regions forming a text (in figure 5b a region 23 with metal free characters is shown separated from two bar code regions 22 by gaps 31 and in figure 5c a region with metal characters is shown separating two bar code regions 24). It should be appreciated that the lines 39, 40 and 41 serve only to mark the edges of the security threads and do not indicate the presence of deposited magnetic metal at the edges of the metal free regions or the regions with metal characters. In all forms the pattern intrinsically embodies optically readable information which may be determined by visual inspection and/or by machine.

It will be appreciated that a number of security threads can be manufactured from one film; this is illustrated in figure 6. The film (before cutting at 60) contains several bands 18 called in the art "ribbons". Each ribbon 18 comprises a section of printed text (e.g. section 33) a tracking line (e.g. 20) and an unprinted gap (e.g. 19) between the section of printed text (e.g. 33) and the tracking line (e.g. 20). The dotted lines 34 and 35 indicate the boundaries of the ribbon 18. Whilst for clarity only a small number of lines of text are shown in each text section in the figure 6, in practice a text section typically has twenty to fifty lines of text and a ribbon is typically 30 - 90 mm wide. Tracking lines are not required where there is no requirement for lateral registration between text and thread. Tracking lines may also be omitted where registration during slitting may be achieved by other means, for example by optical tracking of the text. The ribbons are slit from the film and the threads then slit from the ribbons.

The magnetic metal present on a security thread slit from the film provides two security features in that it is visually discernible (e.g. it defines alphanumeric characters) and is magnetically detectable (thereby being suitable for use with known magnetic detectors used for security threads).

Magnetic detection may take place in a number of ways. In the simplest form, only the presence of a magnetic

material in the appropriate region of the security article, e.g. banknote, is determined, by assessing the magnetic remanence required with reference to a lower and optionally an upper threshold limit. Alternatively or additionally, measurement of the coercivity or other magnetic property of the magnetic content of the security thread may be made. The magnetic metal can be desposited as standard MICR (Magnetic Ink Character Recognition) symbols so that the symbols can be recognised by currently available MICR detectors or alternatively symbols such as alphanumeric characters could be recognised by modified MICR detectors. In the claims references to MICR detection apparatus should be construed as covering both standard and modified MICR detection apparatus. A bar code could be desposited and read by detectors designed to read a form of bar code. Other detection systems operate by writing a signal into the magnetic material and subsequently reading it back in a manner analogous to analogue or digital recording; such detectors must be configured to take into account the pattern in which the magnetic metal is present so that there is no unacceptable interference with the recorded/replayed signal.

The magnetic metal can also allow the thread to be detected by other detection techniques making use of the metallic/conductive content (e.g. radio frequency or microwave detection, resonance and capacitive coupling).

The security thread is also suitable for use as magnetic strips in security cards. The security thread is preferably embedded in laminated cards or face mounted and again provides at least a visually discernible security feature and a magnetically detectable security feature. The magnetic metal can be deposited in the form of a bar code and/or a signal recorded using the magnetic metal of the security thread.

In a less preferred manufacturing method illustrated in figure 9, a catalyst layer is applied uniformly at 71 over a PET substrate dispensed from a roll 70 in accordance with known techniques and then dried/activated by drier 72 and oven 73. A barrier coating is then applied at 74 in a pattern over the catalyst layer to isolate the underlying catalyst. The film is then immersed in a plating bath 75 (the film being passed over rollers 76) and metal is electrolessly deposited in the regions not covered by the barrier coating, i.e. the barrier coating must be printed in the reverse image to that of the chosen pattern of magnetic metal. The film bearing catalyst is then rinsed, dried and cut at 77, 78 and 79. Optionally, activation of the catalyst may follow the application of the barrier coating and the process need not be a continuous process.

A different non-preferred method of producing the required end result, illustrated in figure 10, is to print at 81 a conductive ink or coating in a specific pattern onto one side of a suitable substrate dispensed from a roll 80. A web of the substrate is then dried at 82 and then immersed in an electroplating bath 83 using rollers 84 and continual electrical contact is made with the conducting printed pattern, e.g. by means of a conducting roller 85. The conducting ink layer then acts as the cathode for deposition by electroplating from a suitable plating bath 83 for the required magnetic metal/alloy, which is then deposited in the required pattern. The electroplated film is then rinsed in bath 86, dried at 87 and cut at 88.

A further non-preferred method (see figure 11) is to apply at 91 a transparent conducting coating, e.g. of indium oxide, tin oxide or combination thereof to a clear flexible substrate dispensed from a roll 90 such that it is uniformly coated all-over, to provide an electrically resisting barrier coating at 92 in a chosen pattern over the conducting layer and to then deposit magnetic metal by electroplating in a bath 93 in the non-printed regions, with a conducting roller 94 applying a current. The barrier coating pattern must not interfere with electrical contact with the conducting layer during the plating process. The electroplated film is rinsed at 95, dried at 96 and cut at 97.

A top layer of a different metal, including a non-magnetic metal, may be applied over the magnetic metal where the latter is generated by either the electroplating or the electroless technique. In figure 12 a film is dispensed from a roll 100, printed with a catalytic material at 101, dried at 102, the catalytic material is activated in an oven 103 and the film passed through a bath 104 where magnetic metal is electrolessly deposited. Then the magnetic metal plated film is run through an electroplating bath 105 with a suitable cathode connection made by rollers 109 to deposit a top layer of some other metal, such as tin, nickel or copper. Alternatively the bath 105 could be an electroless bath and the film bearing electrolessly deposited magnetic metal could be run through the electroless bath containing non-magnetic metal whilst the film is still wet (it has been found that there is enough catalytic activity present at the surface of the deposited magnetic metal to cause electroless deposition of the non-magnetic metal). Such other metal may be required to provide a modified appearance or other property to the upper surface of the magnetic metal. The film with two metal layers is then rinsed at 106, dried at 107 and cut at 108.

An intermediate layer of non-magnetic metal can be deposited between the catalyst and the magnetic metal, e.g. using the electroless technique described in the previous paragraph, (nickel is a preferred intermediate layer).

Optionally, the clear plastic substrate may have a dye or luminescing agent incorporated in it to provide colour to the film when viewed in the appropriate illumination. Further layers containing dyes, luminescing agents, optically active layers (e.g. thin film, dichroic, holographic/diffractive films) may be added to the basic film to further enhance the visual properties, as disclosed in our EP-B-0319157.

The security thread of the present invention could be designed to allow sensing by equipment commonly used to read magnetic ink text on a cheque, i.e. magnetic ink character recognition apparatus. The signal provided by the magnetic metal on the thread would be particular to the pattern of the magnetic thread.

Security threads could be used for purposes other than for security articles, e.g. for tear tapes and other tamper evidencing devices for containers.

Examples of methods of manufacture of security threads, examples of catalyst inks for use in the methods, examples of uses of security threads made by the methods and examples of methods of detection are now given for purposes of illustration of the invention only:

Examples of Catalyst Inks

Example 1

A catalyst ink is prepared by dissolving 0.08 kg of palladium acetate in a mixture of 1.6 l of water and 0.32 l of concentrated ammonium hydroxide; the molar ratio of ammonia to palladium was 13:7. The palladium solution is added to a solution of polyvinylalcohol (M.W. 125,000, 88 mole percent hydrolysed) in water to produce a catalyst ink comprising 0.24 percent palladium with a viscosity of about 20 cp.

Example 2

An aqueous, catalytic ink comprising palladium and a heat-curing vinyl copolymer is prepared by adding palladium acetate and phosphate ester plasticized vinyl chloride-vinyl acetate copolymer (Geon 590K20 (trade mark)) copolymer from B.F. Goodrich Company to an aqueous solution containing ethylene glycol monobutyl ether, a urethane block copolymer rheology modifier (QR-708 rheology modifier from Rohm & Haas Company as a 35% solution of hydrophobically modified, nonionic, ethylene oxide based urethane block copolymer in 60/40 propylene glycol/water) and polyethylene oxide surfactant (Triton K-100 (trade mark) surfactant from Rohm & Haas Company) providing an ink of the following composition:

vinylchloride copolymer	8.8 weight percent
palladium	1.6 weight percent
ethylene glycol monobutyl ether	3.3 weight percent
Triton K-100	0.9 weight percent
QR-708	1.9 weight percent

Examples of Methods of Manufacture of Security Thread.

Examples of Subsequent Uses of the Security Threads and Examples of Methods of Detection

Example 1

Either of the catalyst inks of the examples given above is then used in a rotogravure printing press and transferred in a chosen pattern from a gravure roll onto a moving web of 23 μm thick polyethylene terephthalate (PET, Hostaphan 4400 (trade mark)) unwound from a roll and travelling at a linear speed of 30 m/min. The printed film is next passed through an air drying oven (air temperature 40°-80°C, residence time about 3 s) to produce a catalytically inert film which is then re-wound. The printed film is next heat-activated by unwinding the catalytically inert film and passing the film at 3 m/min through a further oven with an air temperature of 160 C and residence time 12 s to produce a catalytically-active film which is re-wound. The chosen catalyst pattern is chosen to produce eventually a security thread according to figure 1 with metal deposited in the region 10.

The roll of printed, activated film is next transported to a separate station, unwound and conveyed through an electroless plating bath made from a non-metallic substance and containing a plating solution formed as follows (CAS = Chemical Abstracts Service Registry Number):

- 150 l of distilled water
- 5.10 kg borax i.e. 34 g l⁻¹ (di-sodium tetraborate, Fisons AR grade CAS 1303-96-4)

- 5.10 kg sodium citrate i.e. 34 g l^{-1} (tri-sodium citrate, Fisons AR grade CAS 6132-04-3)
- 2.0 kg glycine i.e. 13.3 g l^{-1} (glycine, Fisons AR grade CAS 56-40-6).

5 The above three components are dissolved in the water at 60 C with air agitation.
The following three components are added to complete the electroless plating bath:

- Cobalt sulphate solution to bring to 1.9 g l^{-1} (cobalt sulphate, Fisons AR grade CAS 10026-24-1)
- 10 - Sodium hypophosphite solution to bring to 13.0 g l^{-1} (sodium hypophosphite monohydrate, Fisons AR grade CAS 10039-56-2)
- Sodium hydroxide solution or sulphuric acid addition to the solution to bring the pH to 9.6.

15 The bath is equipped with PTFE-coated heaters, a pump for continuous filtration of the solution, and an air line for air agitation of the solution prior to plating.

The bath is operated at 70 C, in order to ensure the solubility of the components and to reduce the concentration of dissolved oxygen. Matrix experiments have been conducted in which all the components were varied in a systematic manner and the magnetic properties of the resulting magnetic cobalt layer and the metal deposition rate were measured, showing that the bath could meet the specifications demanded in the production of the magnetic film required for the invention. The exact electroless bath composition, especially of sodium hypophosphite, cobalt sulphate, and glycine had a profound effect on the magnetic properties of the deposited magnetic layer. However, the magnetic properties of the deposited cobalt could be changed in a controlled and understandable manner by varying the chemical components in the bath. A feature of the electroless deposition of cobalt (present as cobalt metal or cobalt phosphide), is that an induction time is observed before plating commences (typically 10-30 s but it can be longer or shorter and is thought to be due to the need to remove excess dissolved oxygen); this is followed by a steady deposition rate of typically 1 nms^{-1} metal thickness.

Increasing the concentration of hypophosphite increases both the magnetic coercivity and metal deposition rate. Increasing the cobalt concentration decreases the coercivity by increasing the size of the metal alloy crystallites; conversely, reducing the cobalt concentration increases the coercivity by reducing the size of the crystallites. Increasing or decreasing the concentration of glycine reduces the coercivity. Nickel sulphate or zinc sulphate can also be added to further modify the deposition rate or the magnetic properties, especially to raise the coercivity to the particular requirement. Experiments have showed that the rate of magnetic metal deposition is constant, so the thickness of the uniform magnetic layer increased linearly with time.

35 After plating, the film is conveyed through a series of rinsing tanks containing deionised water, dried and rewound. The cobalt-based magnetic metal is present on the film in a manner similar to figure 6, with transparent metal-free letters forming the text legend "PORTALS" in the text sections (e.g. 33). The magnetic characteristics of a portion of the film are determined by a B-H Looper; optionally a Vibrating Sample Magnetometer can be used. The portion of the film used in the B-H Looper or Vibrating Sample Magnetometer should be chosen to be of a size sufficient to give an average reading since the presence of the text leads to fluctuations in magnetic properties across the film; a 5 centimetre square area is typically but not exclusively used. Measurements are taken parallel to or transverse to the lines of text, according to the requirements of the magnetic detection system ultimately used to authenticate the security thread.

45 The roll of film is next transported to a coating machine. The roll is next unwound and conveyed through the machine. A barrier coating of a copolymer of vinyl chloride and vinyl acetate is gravure-coated from solution over the magnetic metal to a dry film weight of 2 gm^{-2} and air-dried. The film is next re-wound, returned to the input end of the coating machine and passed through again to apply an adhesive coating of an ethylene/acrylic acid copolymer emulsion on to both sides, giving a dry film weight of 5 gm^{-2} each side.

The film is mechanically cut to ribbons on a ribbon splitter and then the ribbons are mechanically cut by a microslitter to produce security threads 1.4 mm wide; each thread comprised a region of magnetic metal forming 70% of the total area of one side with clear metal-free light-permeable regions comprising 30% of the total area of that side and forming the legend "PORTALS" as shown in figure 1.

In figure 7 there is shown a cross-section through a part of the resulting security thread having magnetic metal deposited on a substrate. The film of polyethyleneterephthalate (PET, Hostaphan 4400) is shown as 29. The catalyst ink printed on the film 29 is shown as a layer 28. The deposited magnetic metal is shown as a layer 27. The barrier coating is shown as a layer 26. The two layers of adhesive are shown as two layers 30.

The individual security threads are incorporated into banknote paper on a cylinder mould machine such that they are wholly enclosed with fibre to form an embedded security thread. After conventional further processing, printing and distribution, banknotes incorporating the security thread are released into circulation. On return to the central bank used

note processing department, the banknotes are fed into a high-speed used note sorting machine. The magnetic content of the security thread is interrogated by a magnetic remanence detector fitted to the sorting machine. Banknotes containing a security thread producing the correct range of remanence signals are directed for re-issue or destruction, according to their condition and fitness for re-issue. Banknotes not containing a security thread producing the correct remanence signal are directed to manual inspection as being potential counterfeits.

Example 2

As example 1 except that the catalyst is gravure-printed in a chosen pattern such that the magnetic metal was deposited in such manner that security threads are produced with isolated metal characters according to figure 2.

Example 3

As example 1 except that an extrusion coating of an ionomer based upon a copolymer of ethylene and methacrylic acid is deposited over both sides to a film weight of 12 gm^{-2} , to form a combined barrier and adhesive layer.

Example 4

As example 1 except that the barrier coating is a copolymer of vinylidene chloride and acrylonitrile to a dry film weight of 2 gm^{-2} .

Example 5

One of the catalyst inks given in the examples above is printed in a Cleartext pattern (to produce security threads as shown in figure 1) onto $23 \text{ }\mu\text{m}$ thick PET film using a flexographic printing press at 21 m/min web speed and air dried. The dry ink pattern is heated for 1 minute in 190°C air to activate the catalyst.

A cobalt electroless bath is prepared from cobalt sulphate heptahydrate, sodium citrate, sodium borohydride, ammonium sulphate, sodium hypophosphite and ammonia to provide an aqueous solution of pH 8.3 of the following composition:

cobalt	0.11 Molar
citrate	0.14 Molar
borohydride	0.31 Molar
sulphate	0.76 Molar
hypophosphite	0.14 Molar

The printed activated film is passed through and immersed for 2 minutes in the cobalt plating bath at 55°C providing a pin hole-free, magnetic cobalt deposit defining a pattern of sharp, metal-free characters.

The film is next further processed as described in example 1.

Example 6

As example 5 except that the security threads is incorporated into paper on a cylinder mould machine in accordance with EP-A-0059056 to produce paper where the thread was exposed in windows on one side of the sheet.

Example 7

As example 6 except that the magnetic detection on the used note sorting machine interrogates both the magnetic remanence and coercivity of the security thread. If either property is found to be outside the pre-set limits, the banknote is directed to manual inspection.

Example 8

As example 5 except that the magnetic metal was deposited in a pattern chosen to enable production of security threads of the type shown in figure 3. During used note sorting, as well as interrogation of the magnetic remanence, a separate radio frequency or microwave detector interrogates the metallic content of the security thread to verify the specific distance of continuous metal between the breaks extending across the full width of the thread.

Example 9

As example 6 except that during used note sorting, a separate metal detector based on capacitive coupling is used to interrogate the metal content of the security thread.

Example 10

As example 1 except that the magnetic metal is deposited in a series of bars which eventually extend across the security thread in a bar code according to figure 5a. During used note sorting, a detector is used to verify both the magnetic remanence of the metallic content of the security thread and the magnetic code formed from the specific pattern in which the magnetic metal was deposited.

Example 11

As example 2 except that a modified MICR-type detector (Magnetic Ink Character Recognition) is used to interrogate the individual characters to verify both their magnetic remanence and individual character design thus verifying the pattern formed from the characters.

Example 12

As example 6 except that a modified MICR-type detector is used to verify the pattern of the magnetic metal and by magnetic means identify the pattern formed from the clear metal-free regions in the security thread.

Example 13

As example 1 except that a magnetic metal is deposited to form a specific pattern on the security thread in which the characters are a mixture of metal and metal-free regions according to figure 4. During used note sorting, an optical detector is used to determine by optical means the pattern of the magnetic metal, complementing the verification of the presence of the metal by the magnetic detector. The optical detection is based on the interruptions in the optical transmission through the banknote in the infra-red region, i.e. the detector is a shadow type detector. In a further variant, the reflected light image of the metallic regions of the security thread is also detected and analysed and compared to the transmitted light image.

Example 14

As example 6 except that the adhesive coatings applied to each side of the thread incorporates a pigment which fluoresced red when placed under a suitable UV excitation lamp.

Example 15

A security thread is manufactured in accordance with example 1. The thread is then laid across a rectangular block of transparent or translucent plasticized polyvinyl chloride (PVC). A clear PVC laminating film is laid over the thread and the whole assembly placed in an embossing press heated to 180 C. After heating/pressing, the security thread is incorporated into a laminated plastic card with embossed information suitable for use as, e.g. an identity card. In order to verify the authenticity of the card, it is transported through a reading device incorporating a magnetic remanence detector such that the magnetic metal content of the security thread passes the detector head.

In a further embodiment, the security thread is encoded with information in a manner analogous to that used to encode magnetic stripes on credit and charge cards etc. The security thread thus combines the functions of such stripes with providing visual security for the general public.

Optionally, a photograph or other identifying device is incorporated within the laminated card.

Example 16

A continuous web of 12 μm thick polyester is unwound from a roll and passed through a coating machine. A layer of catalyst containing palladium was uniformly gravure coated over one side of the film to a dry coating weight of approximately 1 gm^{-2} . The coated film is then passed through a printing machine and a vinyl lacquer flexo-printed over the catalyst layer and dried; the layer is printed in a chosen pattern such that security thread manufactured from the film has regions corresponding to the clear regions identified in figure 1. The web is then passed through a hot air oven at 180°C and the catalyst heat activated.

The web is then passed through a plating bath containing a cobalt solution as described in example 1. A layer of cobalt-based alloy was then electrolessly deposited over the regions of catalyst not covered by the patterned vinyl lacquer which constitutes a barrier to the deposition process. The resultant magnetic metal was thus deposited in a pattern according to figure 1.

Claims

1. A method of manufacture of a security product suitable for use with security articles such as security paper, wherein a magnetic metal is deposited on a film of polymeric substrate as the substrate passes through a solution containing the magnetic metal, a preparatory operation is carried out on a surface of the substrate prior to immersion of the substrate in the solution, and the substrate with the magnetic metal deposited thereon is cut to produce the security product, characterised in that the preparatory operation ensures that magnetic metal is deposited on the substrate in a chosen pattern such that when the security product is produced from the film by cutting the film the magnetic metal on the security product has a specific pattern and provides both a visually discernible security feature and a magnetically detectable security feature.
2. A method as claimed in claim 1 wherein the security product is a security thread produced from the film by a slitting operation, the security thread being suitable for use in security paper such as that used for banknotes.
3. A method as claimed in claim 1 wherein the security product is a security strip cut from the film, the security strip being suitable for incorporation in or for mounting on a surface of a security document or a security card.
4. A method as claimed in claim 1 wherein the security product is a security patch cut from the film, the security patch being suitable for mounting on a surface of a security document or a security card.
5. A method as claimed in any one of the preceding claims wherein the preparatory operation comprises providing a catalytic material on the substrate and wherein the magnetic metal is deposited by an electroless process on portions of the said substrate which are provided with the catalytic material whilst the substrate is immersed in the solution containing the magnetic metal.
6. A method as claimed in claim 5 wherein the catalytic material provided on the substrate comprises palladium.
7. A method as claimed in claim 5 or claim 6 wherein the magnetic metal deposited on the substrate is cobalt or an alloy containing cobalt.
8. A method as claimed in claim 7 wherein the magnetic metal comprises cobalt and phosphorous.
9. A method as claimed in claim 7 or claim 8 wherein a non-magnetic metal is electrolessly deposited directly on the catalyst and the magnetic metal is deposited on top of the non-magnetic metal such that the manufactured security thread comprises a layer of non-magnetic metal intermediate the catalytic material and the magnetic metal.
10. A method as claimed in any one of claims 5 to 9 wherein the catalytic material is provided on the substrate by printing the substrate with a printing solution containing the catalytic material.
11. A method as claimed in claim 10 wherein the printing solution is substantially free of tin.
12. A method as claimed in any one of claims 5 to 11 wherein the polymeric substrate is dispensed as a continuous web by dispensing means, the continuous web is passed through means for depositing the catalyst on the web and then the continuous web bearing catalytic material is passed through a solution containing the magnetic metal.

13. A method as claimed in claim 12 wherein the preparatory operation comprises the uniform application of catalytic material over the surface of the film of substrate, application of a barrier coating over portions of the applied catalytic material, the uncoated catalytic material being such as to provide the resulting chosen pattern, and activation of the catalytic material, and the magnetic material is deposited by an electroless process on only those portions of the catalytic material which are covered by the barrier coating.
14. A method as claimed in any one of the preceding claims wherein the magnetic metal is deposited on the substrate with a depth in the range of 0.01 - 3.0 μm .
15. A method as claimed in any one of claims 1 to 4 wherein the preparatory operation comprises printing the substrate to provide a conductive material on said substrate and the magnetic metal is deposited on the conductive material by electrolysis when the substrate is immersed in the solution.
16. A method as claimed in any one of claims 1 to 4 wherein the preparatory operation comprises coating of the substrate with a transparent conductive layer and applying a coating of an electrical resist in a pattern over the transparent conductive layer, the magnetic metal being deposited in the regions of the conductive layer not covered by the electrical resist when the substrate is immersed in the solution and a current passed through the conductive layer.
17. A method as claimed in claim 16 wherein the substrate is coated with a transparent conductive layer comprising indium oxide, tin oxide or a combination of both.
18. A method as claimed in any one of the preceding claims comprising additionally the step of applying a protective and/or adhesive coating over the magnetic metal.
19. A method as claimed in claim 18 wherein the protective and/or adhesive coating is applied to the magnetic metal prior to cutting the film to form the security product.
20. A method as claimed in any one of the preceding claims wherein the magnetic metal is deposited on a transparent polymeric substrate such that the security product is provided with a visually discernible security feature which is discernible in transmitted light.
21. A method as claimed in any one of the preceding claims wherein the magnetic metal is deposited on the substrate in such a way that the magnetic metal on the security product produced from the film has a specific pattern which can be identified magnetically by detection apparatus.
22. A method as claimed in any one of the preceding claims wherein the magnetic metal is deposited on the substrate in such a way that the security product produced from the film provides a security feature detectable by a metal detector.
23. A method as claimed in any one of the preceding claims wherein the magnetic metal is deposited in a continuous process.
24. A security product suitable for incorporation in or for mounting on a surface of security paper, the security product comprising:
 - a polymeric substrate,
 - catalytic material covering at least a portion of one surface of the polymeric substrate, and
 - a layer of electrolessly deposited magnetic metal covering at least a portion of the catalytic material with a depth in the range 0.01 - 3.0 μm , wherein
 - the layer of magnetic metal has a specific pattern and provides the security product with both a visually discernible security feature and a magnetically detectable security feature, the security product having an average magnetic remanence in the range 0.001-0.05 emu cm^{-2} .
25. A security product as claimed in claim 24 which can be used as a security thread incorporated in security articles including security paper such as that used for banknotes.
26. A security product as claimed in claim 24 which can be used as a security strip mounted on a surface of a security

document or a security card.

27. A security product as claimed in claim 24 which can be used as a security patch mounted on a surface of a security document or a security card.

28. A security product as claimed in any one of claims 24 to 27 wherein the electrolessly deposited magnetic metal comprises cobalt and optionally one or more of nickel, phosphorous or iron or alloys thereof.

29. A security product as claimed in any one of claims 24 to 28 which has a magnetic coercivity in the range of 100-2,000 Oe.

30. A security product as claimed in claim 29 which has a magnetic coercivity in the range of 100-1,000 Oe.

31. A security product as claimed in any one of claims 24 to 30 which has a magnetic remanence in the range of 0.005-0.025 emu cm⁻².

32. A security product as claimed in any one of claims 24 to 31 wherein the catalytic material comprises palladium.

33. A security product as claimed in any one of claims 24 to 32 wherein the catalytic material is substantially free of tin.

34. A security product as claimed in any one of claims 24 to 33 wherein the magnetic metal layer has a depth in the range 0.2-0.5 µm.

35. A security product as claimed in any one of claims 24 to 34 comprising additionally a metal layer which at least partially covers the magnetic metal.

36. A security product as claimed in any one of claims 24 to 35 wherein the catalytic material is printed in the specific pattern on the substrate.

37. A security product as claimed in any one of claims 24 to 36 wherein at least some of the portions of the substrate which are not covered by the magnetic material define the specific pattern which is a visually discernible security feature.

38. A security product as claimed in any one of claims 24 to 37 wherein the specific pattern comprises alphanumeric characters.

39. A security product as claimed in any one of claims 24 to 38 comprising a dichroic layer.

40. A security product as claimed in any one of claims 24 to 39 comprising a holographic layer.

41. A security product as claimed in any one of claims 24 to 40 comprising a diffractive layer.

42. A security product as claimed in any one of claims 24 to 41 wherein the substrate contains therein dye or luminescent material.

43. A security product as claimed in any one of claims 24 to 42 wherein the polymeric substrate is transparent or translucent whereby the visually discernible security feature is a security feature discernible in transmitted light.

44. A security product as claimed in any one of claims 24 to 43 comprising additionally a protective and/or adhesive coating over the magnetic metal.

45. A security product as claimed in any one of claims 24 to 44 wherein the specific pattern intrinsically embodies information.

46. A security product as claimed in claim 45 wherein the specific pattern is a bar code which is machine readable.

47. A security paper comprising a security product as claimed in any one of claims 24 to 45, wherein the security product is a security thread incorporated in the security paper in embedded or windowed form.

48. A banknote comprising security paper as claimed in claim 47.
49. A film which can be cut into security products such as security threads for security paper including banknotes, the film comprising:
- 5 a polymeric substrate,
catalytic material covering at least a portion of one surface of the polymeric substrate, and
a layer of electrolessly deposited magnetic metal covering at least a portion of the catalytic material in a layer
10 of magnetic metal with a depth in the range $0.01\ \mu\text{m} - 3.0\ \mu\text{m}$, wherein
the layer of magnetic metal has a chosen pattern such that when a security product is cut from the film, the
layer of magnetic metal provides both a visually discernible security feature and a magnetically detectable
security feature and the security product can have a magnetic remanence in the range $0.001 - 0.05\ \text{emu cm}^{-2}$.
50. A film as claimed in claim 49 comprising additionally a protective and/or adhesive coating over the magnetic metal.
- 15 51. A film as claimed in claim 49 or claim 50 wherein the electrolessly deposited magnetic metal comprises cobalt and optionally one or more of nickel or phosphorous, or alloys thereof.
52. A film as claimed in any one of the claims 49, 50 or 51 wherein the layer of magnetic metal can provide a security thread slit from the film with a magnetic coercivity in the range of $100 - 2,000\ \text{Oe}$.
- 20 53. A film as claimed in any one of claims 49 to 52 wherein the layer of magnetic metal can provide a security thread slit from the film with a magnetic remanence in the range of $0.005 - 0.025\ \text{emu cm}^{-2}$.
- 25 54. A film as claimed in any one of claims 49 to 53 wherein the catalytic material comprises palladium.
55. A film as claimed in claim 54 wherein the catalytic material is substantially free of tin.
56. A film as claimed in any one of claims 49 to 53 wherein the chosen pattern intrinsically embodies information.

Patentansprüche

1. Verfahren zur Herstellung eines Sicherheitsprodukts geeignet für den Gebrauch in Zusammenhang mit Sicherheitsartikeln wie zum Beispiel Sicherheitspapier, wobei ein magnetisches Metall in einen Film polymeren Substrats abgelagert wird, indem das Substrat durch eine, das magnetische Metall enthaltende Lösung fließt, die Oberfläche des Substrats vor dem Eintauchen in die Lösung vorbehandelt wird, und das Substrat mit dem abgelagerten magnetischen Metall zur Herstellung des Sicherheitsprodukts zerteilt wird, dadurch gekennzeichnet, daß die Vorbehandlung der Substratoberfläche die Ablagerung des magnetischen Metalls auf dem Substrat in einem gewählten Muster sicherstellt, so daß bei der Herstellung des Sicherheitsprodukts durch Zerteilen des Films das magnetische Metall auf dem Sicherheitsprodukt ein spezifisches Muster aufweist und sowohl ein visuell erkennbares als auch ein magnetisch erfaßbares Sicherheitsmerkmal liefert.
- 35 2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß es sich bei dem Sicherheitsprodukt um einen Sicherheitsfaden handelt, der aus dem Film mit Hilfe eines Schlitzverfahrens hergestellt wird, wobei der Sicherheitsfaden für den Gebrauch in Sicherheitspapier wie zum Beispiel in dem für Banknoten verwendeten Papier geeignet ist.
- 45 3. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß es sich bei dem Sicherheitsprodukt um einen Sicherheitsstreifen handelt, der von dem Film abgetrennt wird, wobei sich der Sicherheitsstreifen zum Einbau in oder zum Befestigen an die Oberfläche eines Sicherheitsdokuments oder einer Sicherheitskarte eignet.
- 50 4. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß es sich bei dem Sicherheitsprodukt um einen Sicherheitsfleck handelt, der von dem Film abgetrennt wird, wobei sich der Sicherheitsfleck zum Befestigen an die Oberfläche eines Sicherheitsdokuments oder einer Sicherheitskarte eignet.
- 55 5. Verfahren nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Vorbehandlung das Auftragen eines katalytisch aktiven Stoffes auf das Substrat aufweist, wobei das magnetische Metall durch ein elektroloses Verfahren auf Teilabschnitte des genannten Substrats abgelagert wird, die mit dem katalytisch aktiven Stoff versehen sind, während das Substrat in die das magnetische Material enthaltende Lösung eingetaucht wird.

6. Verfahren nach Anspruch 5, dadurch gekennzeichnet, daß der katalytisch aktive Stoff auf dem Substrat Palladium aufweist.
- 5 7. Verfahren nach Anspruch 5 oder 6, dadurch gekennzeichnet, daß es sich bei dem auf dem Substrat abgelagerten magnetischen Metall um Kobalt oder eine Kobalt-enthaltende Legierung handelt.
8. Verfahren nach Anspruch 7, dadurch gekennzeichnet, daß das magnetische Metall Kobalt und Phosphor aufweist.
- 10 9. Verfahren nach Anspruch 7 oder 8, dadurch gekennzeichnet, daß sich ein nicht-magnetisches Metall in einem elektrolösen Verfahren direkt auf dem katalytisch aktiven Stoff ablagert und sich das magnetische Metall über dem nicht-magnetischen Metall ablagert, so daß der hergestellte Sicherheitsfaden eine Schicht nicht-magnetischen Metalls zwischen dem katalytisch aktiven Stoff und dem magnetischen Metall aufweist.
- 15 10. Verfahren nach einem der Ansprüche 5 bis 9, dadurch gekennzeichnet, daß der katalytisch aktive Stoff auf das Substrat durch Stempeln mit einer den katalytisch aktiven Stoff enthaltenden Stempellösung aufgetragen wird.
11. Verfahren nach Anspruch 10, dadurch gekennzeichnet, daß die Stempellösung im wesentlichen frei von Zinn ist.
- 20 12. Verfahren nach einem der Ansprüche 5 bis 11, dadurch gekennzeichnet, daß das polymere Substrat mit Hilfe eine Spendevorrichtung als fortlaufende Schicht verteilt wird, wobei die fortlaufende Schicht durch eine Vorrichtung für die Ablagerung des katalytisch aktiven Stoffes auf der Schicht geleitet wird und anschließend die katalytisch aktiven Stoff enthaltende Schicht durch eine das magnetische Metall enthaltende Lösung hindurchgeleitet wird
- 25 13. Verfahren nach Anspruch 12, dadurch gekennzeichnet, daß die Vorbehandlung die uniforme Verwendung des katalytisch aktiven Stoffes auf der Oberfläche des Substratfilms aufweist, weiter die Verwendung einer Grenzbeschichtung auf Teilabschnitten des verwendeten katalytisch aktiven Stoffes, der nicht-beschichtete katalytisch aktive Stoff das resultierende gewählte Muster bildet, und für die Aktivierung des katalytisch aktiven Stoffes sorgt, und sich der magnetische Werkstoff in einem elektrolosen Verfahren nur auf den mit einer Grenzbeschichtung versehenen Teilabschnitten ablagert.
- 30 14. Verfahren nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß sich das magnetische Metall auf dem Substrat mit einer Dicke im Bereich von 0.01 bis 3.0 µm ablagert.
- 35 15. Verfahren nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß die Vorbehandlung das Stempeln des Substrats aufweist, um dieses mit einem leitenden Werkstoff zu versehen, und sich das magnetische Metall beim Eintauchen in die Lösung auf dem leitenden Werkstoff mit Hilfe einer Elektolyse ablagert.
- 40 16. Verfahren nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß die Vorbehandlung die Beschichtung des Substrats mit einer transparenten leitenden Schicht und das Auftragen einer elektrischen Sperrschicht in einem Muster auf die transparente leitenden Schicht aufweist, wobei sich das magnetische Metall in den Bereichen der leitenden Schicht ablagert, die nicht mit der elektrischen Sperrschicht bedeckt sind, wenn das Substrat in die Lösung eingetaucht wird und Strom durch die leitende Schicht fließt.
- 45 17. Verfahren nach Anspruch 16, dadurch gekennzeichnet, daß das Substrat mit einer transparenten leitenden Schicht beschichtet ist, welche Indiumoxyd, Zinnoxid oder eine Verbindung von beiden aufweist.
18. Verfahren nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß es zusätzlich den Arbeitsschritt des Auftragens einer Schutz- und/oder Haftschrift auf dem magnetischen Metall aufweist.
- 50 19. Verfahren nach Anspruch 18, dadurch gekennzeichnet, daß die Schutz- und/oder Haftschrift auf das magnetische Metall vor dem Zerteilen des Films zur Herstellung des Sicherheitsprodukts aufgetragen wird.
20. Verfahren nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß das magnetische Metall auf einem transparenten polymeren Substrat abgelagert wird, so daß das Sicherheitsprodukt mit einem visuell erkennbares Sicherheitsmerkmal versehen wird, welches im durchgelassenen Licht erkennbar ist.
- 55 21. Verfahren nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß sich das magnetische Metall auf dem Substrat in der Weise ablagert, so daß das aus dem Film hergestellte Sicherheitsprodukt ein spezifisches

Muster aufweist, welches mit Hilfe eines Detektors magnetisch identifiziert werden kann.

22. Verfahren nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß sich das magnetische Metall auf dem Substrat in der Weise ablagert, so daß das aus dem Film hergestellte Sicherheitsprodukt ein Sicherheitsmerkmal aufweist, das mit Hilfe eines Metalldetektors nachweisbar ist.
23. Verfahren nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß das magnetische Metall in einem fortlaufenden Prozeß abgelagert wird.
24. Sicherheitsprodukt, geeignet für das Einbauen in oder das Anbringen an die Oberfläche von Sicherheitspapier, dadurch gekennzeichnet, daß es folgendes aufweist:
 - ein polymeres Substrat,
 - einen katalytisch aktiven Stoff, der zumindest einen Teil der polymeren Substratoberfläche bedeckt, und
 - eine Schicht eines in einem elektrolosen Verfahren abgelagerten magnetischen Metalls, das zumindest einen Teil des katalytisch aktiven Stoffes mit einer Dicke im Bereich von 0.01 bis 3,0 μm bedeckt, dadurch gekennzeichnet, daß
 - die magnetische Metallschicht ein spezifisches Muster aufweist und ein Sicherheitsprodukt mit einem sowohl visuell erkennbaren als auch mit einem magnetisch nachweisbaren Sicherheitsmerkmal liefert, wobei das Sicherheitsprodukt einen durchschnittlich zurückbleibenden Magnetismus im Bereich von 0.001 bis 0.05 emu cm^{-2} aufweist.
25. Sicherheitsprodukt nach Anspruch 24, dadurch gekennzeichnet, daß es als Sicherheitsfaden in Sicherheitsgegenstände, einschließlich Sicherheitspapier, wie es für Banknoten verwendet wird, eingefügt werden kann.
26. Sicherheitsprodukt nach Anspruch 24, dadurch gekennzeichnet, daß es als Sicherheitsstreifen verwendet werden kann, der an der Oberfläche eines Sicherheitsdokuments oder einer Sicherheitskarte befestigt werden kann.
27. Sicherheitsprodukt nach Anspruch 24, dadurch gekennzeichnet, daß es als Sicherheitsflecken verwendet werden kann, der an der Oberfläche eines Sicherheitsdokuments oder einer Sicherheitskarte befestigt werden kann.
28. Sicherheitsprodukt nach einem der Ansprüche 24 bis 27, dadurch gekennzeichnet, daß das in einem elektrolosen Verfahren abgelagerte magnetische Metall Kobalt und wahlweise einen oder mehrere der Stoffe Nickel, Phosphor oder Eisen oder Legierungen davon aufweist.
29. Sicherheitsprodukt nach einem der Ansprüche 24 bis 28, dadurch gekennzeichnet, daß es eine magnetische Koerzitivkraft im Bereich von 100 bis 2,000 Oe aufweist.
30. Sicherheitsprodukt nach Anspruch 29, dadurch gekennzeichnet, daß es eine magnetische Koerzitivkraft im Bereich von 100 bis 1,000 Oe aufweist.
31. Sicherheitsprodukt nach einem der Ansprüche 24 bis 30, dadurch gekennzeichnet, daß es einen zurückbleibenden Magnetismus im Bereich von 0.005 bis 0.025 emu cm^{-2} aufweist.
32. Sicherheitsprodukt nach einem der Ansprüche 24 bis 31, dadurch gekennzeichnet, daß der katalytisch aktive Stoff Palladium aufweist.
33. Sicherheitsprodukt nach einem der Ansprüche 24 bis 32, dadurch gekennzeichnet, daß der katalytisch aktive Stoff im wesentlichen frei von Zinn ist.
34. Sicherheitsprodukt nach einem der Ansprüche 24 bis 33, dadurch gekennzeichnet, daß die magnetische Metallschicht eine Dicke im Bereich von 0.2 bis 0.5 μm aufweist.
35. Sicherheitsprodukt nach einem der Ansprüche 24 bis 34, dadurch gekennzeichnet, daß es zusätzlich eine Metallschicht aufweist, die zumindest teilweise das magnetische Metall bedeckt.
36. Sicherheitsprodukt nach einem der Ansprüche 24 bis 35, dadurch gekennzeichnet, daß der katalytisch aktive Stoff in dem spezifischen Muster auf das Substrat gestempelt wird.

37. Sicherheitsprodukt nach einem der Ansprüche 24 bis 36, dadurch gekennzeichnet, daß zumindest einige Teile des Substrats, die nicht mit dem magnetischen Werkstoff bedeckt sind, das spezifische Muster, welches ein visuell erkennbares Sicherheitsmerkmal darstellt, definieren.
- 5 38. Sicherheitsprodukt nach einem der Ansprüche 24 bis 37, dadurch gekennzeichnet, daß das spezifische Muster alphanumerische Zeichen aufweist.
39. Sicherheitsprodukt nach einem der Ansprüche 24 bis 38, dadurch gekennzeichnet, daß es eine zweifarbige Schicht aufweist.
- 10 40. Sicherheitsprodukt nach einem der Ansprüche 24 bis 39, dadurch gekennzeichnet, daß es eine holografische Schicht aufweist.
41. Sicherheitsprodukt nach einem der Ansprüche 24 bis 40, dadurch gekennzeichnet, daß es eine ablenkende Schicht aufweist.
- 15 42. Sicherheitsprodukt nach einem der Ansprüche 24 bis 41, dadurch gekennzeichnet, daß das Substrat darin Farb- oder Leuchtstoff aufweist.
- 20 43. Sicherheitsprodukt nach einem der Ansprüche 24 bis 42, dadurch gekennzeichnet, daß das polymere Substrat transparent oder durchscheinend ist, wodurch das visuell erkennbare Sicherheitsmerkmal ein Sicherheitsmerkmal darstellt, das in Durchlicht erkennbar ist.
44. Sicherheitsprodukt nach einem der Ansprüche 24 bis 43, dadurch gekennzeichnet, daß es zusätzlich eine Schutz- und/oder Haftschrift auf dem magnetischen Metall aufweist.
- 25 45. Sicherheitsprodukt nach einem der Ansprüche 24 bis 44, dadurch gekennzeichnet, daß das spezifische Muster wesentliche Information in sich vereinigt.
- 30 46. Sicherheitsprodukt nach Anspruch 45, dadurch gekennzeichnet, daß das spezifische Muster einen Strichcode darstellt, der maschinenlesbar ist.
47. Sicherheitsprodukt nach einem der Ansprüche 24 bis 45, dadurch gekennzeichnet, daß es sich bei dem Sicherheitsprodukt um einen Sicherheitsfaden handelt, der in das Sicherheitspapier in eingelagerter Form oder Fensterform eingefügt ist.
- 35 48. Banknote, die Sicherheitspapier nach Anspruch 47 aufweist.
49. Film, der in Sicherheitsprodukte wie zum Beispiel Sicherheitsfäden für Sicherheitspapiere einschließlich Banknoten zerteilt werden kann, dadurch gekennzeichnet, daß der Film folgendes aufweist:
- 40 ein polymeres Substrat,
einen katalytisch aktiven Stoff, der zumindest einen Teil einer polymeren Substratoberfläche bedeckt, und
eine in einem elektrolosen Verfahren abgelagerte magnetische Metallschicht, die zumindest einen Teil des
45 katalytisch aktiven Stoffes in einer magnetischen Metallschicht mit einer Dicke im Bereich von 0.01 bis 3.0 µm bedeckt, wobei
die magnetische Metallschicht ein gewähltes Muster aufweist, so daß nach Zerteilen des Films in Sicherheitsprodukte die magnetische Metallschicht sowohl ein visuell erkennbares Sicherheitsmerkmal als auch ein
magnetisch nachweisbares Sicherheitsmerkmal liefert und das Sicherheitsprodukt einen zurückbleibenden
50 Magnetismus im Bereich von 0.001 bis 0.05 emu cm⁻² aufweisen kann.
50. Film nach Anspruch 49, dadurch gekennzeichnet, daß er zusätzlich eine Schutz- und/oder Haftschrift auf dem magnetischen Metall aufweist.
- 55 51. Film nach den Ansprüchen 49 und 50, dadurch gekennzeichnet, daß das im elektrolosen Verfahren abgelagerte magnetische Metall Kobalt oder wahlweise einen oder mehrere der Stoffe Nickel oder Phosphor oder Legierungen davon, aufweist.

52. Film nach den Ansprüchen 49, 50 oder 51, dadurch gekennzeichnet, daß die magnetische Metallschicht einen Sicherheitsfaden aufweist, der vom Film mit einer magnetischen Koerzivkraft im Bereich von 100 bis 2,000 Oe abgetrennt wird.
- 5 53. Film nach einem der Ansprüche 49 bis 52, dadurch gekennzeichnet, daß die magnetische Metallschicht einen Sicherheitsfaden aufweist, der vom Film mit einem zurückbleibenden Magnetismus im Bereich von 0.005 bis 0.025 emu cm⁻² abgetrennt wird.
- 10 54. Film nach einem der Ansprüche 49 bis 53, dadurch gekennzeichnet, daß der katalytisch aktive Stoff Palladium aufweist.
55. Film nach Anspruch 54, dadurch gekennzeichnet, daß der katalytisch aktive Stoff im wesentlichen frei von Zinn ist.
- 15 56. Film nach einem der Ansprüche 49 bis 53, dadurch gekennzeichnet, daß das gewählte Muster wesentliche Information in sich vereinigt.

Revendications

- 20 1. Procédé de fabrication d'un produit de sécurité qui peut être utilisé avec des articles de sécurité tels qu'un papier de sécurité, dans lequel un métal magnétique est déposé sur un film d'un substrat polymère lorsque celui-ci passe dans une solution contenant le métal magnétique, une opération préparatoire est exécutée sur une surface du substrat avant l'immersion de celui-ci dans la solution, et le substrat sur lequel le métal magnétique est déposé est découpé pour la production du produit de sécurité, caractérisé en ce que l'opération préparatoire assure le dépôt
- 25 du métal magnétique sur le substrat avec un dessin choisi tel que, lorsque le produit de sécurité est produit à partir du film par découpe du film, le métal magnétique placé sur le produit de sécurité présente un dessin particulier et donne à la fois une caractéristique de sécurité discernable visuellement et une caractéristique de sécurité détectable magnétiquement.
- 30 2. Procédé selon la revendication 1, dans lequel le produit de sécurité est un fil de sécurité produit à partir du film par une opération de tranchage, le fil de sécurité pouvant être utilisé dans un papier de sécurité, par exemple du type utilisé pour les billets de banque.
- 35 3. Procédé selon la revendication 1, dans lequel le produit de sécurité est un ruban de sécurité découpé dans le film, le ruban de sécurité pouvant être incorporé à une surface d'un document de sécurité ou d'une carte de sécurité ou monté sur une telle surface.
- 40 4. Procédé selon la revendication 1, dans lequel le produit de sécurité est un patin de sécurité découpé dans le film, le patin de sécurité pouvant être monté sur une surface d'un document de sécurité ou d'une carte de sécurité.
- 45 5. Procédé selon l'une quelconque des revendications précédentes, dans lequel l'opération préparatoire comprend la disposition d'un matériau catalytique sur le substrat, et le métal magnétique est déposé par un procédé de dépôt chimique sur des parties du substrat qui portent le matériau catalytique alors que le substrat est immergé dans la solution contenant le métal magnétique.
- 50 6. Procédé selon la revendication 5, dans lequel le matériau catalytique placé sur le substrat est le palladium.
7. Procédé selon la revendication 5 ou 6, dans lequel le métal magnétique déposé sur le substrat est le cobalt ou un alliage contenant du cobalt.
- 55 8. Procédé selon la revendication 7, dans lequel le métal magnétique contient du cobalt et du phosphore.
9. Procédé selon la revendication 7 ou 8, dans lequel le métal non magnétique est déposé chimiquement directement sur le catalyseur et le métal magnétique est déposé sur le métal non magnétique afin que le fil de sécurité fabriqué comporte une couche de métal non magnétique placée entre le matériau catalytique et le métal magnétique.
10. Procédé selon l'une quelconque des revendications 5 à 9, dans lequel le matériau catalytique est placé sur le substrat par impression du substrat avec une solution d'impression contenant le matériau catalytique.

11. Procédé selon la revendication 10, dans lequel la solution d'impression est pratiquement dépourvue d'étain.
12. Procédé selon l'une quelconque des revendications 5 à 11, dans lequel le substrat polymère est distribué sous forme d'une feuille continue par un dispositif de distribution, la feuille continue passant dans un dispositif de dépôt du catalyseur sur la feuille continue, puis la feuille continue portant le matériau catalytique passe dans une solution contenant le métal magnétique.
13. Procédé selon la revendication 12, dans lequel l'opération préparatoire comprend l'application uniforme du matériau catalytique à la surface du film du substrat, l'application d'un revêtement de barrage sur les parties du matériau catalytique appliqué, le matériau catalytique non revêtu étant tel qu'il donne le dessin résultant choisi, et l'activation du matériau catalytique, et le matériau magnétique est déposé par une opération de dépôt chimique uniquement sur les parties du matériau catalytique qui sont recouvertes du revêtement de barrage.
14. Procédé selon l'une quelconque des revendications précédentes, dans lequel le métal magnétique est déposé sur le substrat avec une épaisseur de l'ordre de 0,01 à 3,0 μm .
15. Procédé selon l'une quelconque des revendications 1 à 4, dans lequel l'opération préparatoire comprend l'impression du substrat pour la disposition d'un matériau conducteur sur le substrat, et le métal magnétique est déposé sur le matériau conducteur par électrolyse lorsque le substrat est immergé dans la solution.
16. Procédé selon l'une quelconque des revendications 1 à 4, dans lequel l'opération préparatoire comprend le revêtement du substrat d'une couche transparente conductrice et l'application d'un revêtement d'un matériau de réserve électrique avec un dessin sur la couche conductrice transparente, le métal magnétique étant déposé sur les régions de la couche conductrice qui ne sont pas recouvertes du matériau de réserve électrique lorsque le substrat est immergé dans la solution et qu'un courant circule dans la couche conductrice.
17. Procédé selon la revendication 16, dans lequel le substrat est revêtu d'une couche conductrice transparente contenant de l'oxyde d'indium, de l'oxyde d'étain ou une combinaison de ceux-ci.
18. Procédé selon l'une quelconque des revendications précédentes, comprenant en outre une étape d'application d'un revêtement protecteur et/ou adhésif sur le substrat magnétique.
19. Procédé selon la revendication 18, dans lequel le revêtement protecteur et/ou adhésif est appliqué au métal magnétique avant la découpe du film pour la formation du produit de sécurité.
20. Procédé selon l'une quelconque des revendications précédentes, dans lequel le métal magnétique est déposé sur un substrat polymère transparent afin que le produit de sécurité possède une caractéristique de sécurité discernable visuellement qui peut être discernée en lumière transmise.
21. Procédé selon l'une quelconque des revendications précédentes, dans lequel le métal magnétique est déposé sur le substrat de manière que le métal magnétique placé sur le produit de sécurité produit à partir du film possède un dessin prédéterminé qui peut être identifié magnétiquement par un appareil de détection.
22. Procédé selon l'une quelconque des revendications précédentes, dans lequel le métal magnétique est déposé sur le substrat afin que le produit de sécurité produit à partir du film donne une caractéristique de sécurité qui peut être détectée par un détecteur de métaux.
23. Procédé selon l'une quelconque des revendications précédentes, dans lequel le métal magnétique est déposé au cours d'une opération continue.
24. Produit de sécurité qui peut être incorporé à un papier de sécurité ou monté sur une surface du papier de sécurité, le produit de sécurité comprenant :

un substrat polymère,
un matériau catalytique recouvrant une partie au moins d'une première surface du substrat polymère, et
une couche d'un métal magnétique déposé chimiquement, recouvrant une partie au moins du matériau catalytique avec une épaisseur comprise entre 0,01 et 3,0 μm , et
la couche du métal magnétique a un dessin spécifique et donne au produit de sécurité à la fois une caracté-

ristique de sécurité discernable visuellement et une caractéristique de sécurité détectable magnétiquement, le produit de sécurité ayant une rémanence magnétique moyenne comprise entre 0,001 et 0,05 emu.cm⁻².

- 5 25. Produit de sécurité selon la revendication 24, qui peut être utilisé comme fil de sécurité incorporé à des articles de sécurité comprenant un papier de sécurité, tel que le papier utilisé pour les billets de banque.
26. Produit de sécurité selon la revendication 24, qui peut être utilisé comme ruban de sécurité monté sur une surface d'un document de sécurité ou d'une carte de sécurité.
- 10 27. Produit de sécurité selon la revendication 24, qui peut être utilisé comme patin de sécurité monté sur une surface d'un document de sécurité ou d'une carte de sécurité.
- 15 28. Produit de sécurité selon l'une quelconque des revendications 24 à 27, dans lequel le métal magnétique déposé chimiquement contient du cobalt et éventuellement un ou plusieurs éléments choisis parmi le nickel, le phosphore et l'azote et leurs alliages.
29. Produit de sécurité selon l'une quelconque des revendications 24 à 28, ayant un champ coercitif magnétique compris entre 100 et 2 000 Oe.
- 20 30. Produit de sécurité selon la revendication 29, ayant un champ coercitif magnétique compris entre 100 et 1 000 Oe.
31. Produit de sécurité selon l'une quelconque des revendications 24 à 30, ayant une rémanence magnétique comprise entre 0,005 et 0,025 emu.cm⁻².
- 25 32. Produit de sécurité selon l'une quelconque des revendications 24 à 31, dans lequel le matériau catalytique est le palladium.
33. Produit de sécurité selon l'une quelconque des revendications 24 à 32, dans lequel le matériau catalytique est pratiquement dépourvu d'étain.
- 30 34. Produit de sécurité selon l'une quelconque des revendications 24 à 33, dans lequel la couche de métal magnétique a une épaisseur comprise entre 0,2 et 0,5 µm.
- 35 35. Produit de sécurité selon l'une quelconque des revendications 24 à 34, comprenant en outre une couche métallique qui recouvre au moins partiellement le métal magnétique.
36. Produit de sécurité selon l'une quelconque des revendications 24 à 35, dans lequel le matériau de sécurité est imprimé avec un dessin spécifique sur le substrat.
- 40 37. Produit de sécurité selon l'une quelconque des revendications 24 à 36, dans lequel certaines au moins des parties du substrat qui ne sont pas recouvertes par le matériau magnétique délimitent le dessin spécifique qui est une caractéristique de sécurité discernable visuellement.
- 45 38. Produit de sécurité selon l'une quelconque des revendications 24 à 37, dans lequel le dessin spécifique comprend des caractères alphanumériques.
39. Produit de sécurité selon l'une quelconque des revendications 24 à 38, comprenant une couche dichroïque.
40. Produit de sécurité selon l'une quelconque des revendications 24 à 39, comprenant une couche holographique.
- 50 41. Produit de sécurité selon l'une quelconque des revendications 24 à 40, comprenant une couche de diffraction.
42. Produit de sécurité selon l'une quelconque des revendications 24 à 41, dans lequel le substrat contient un colorant ou une matière luminescente.
- 55 43. Produit de sécurité selon l'une quelconque des revendications 24 à 42, dans lequel le substrat polymère est transparent ou translucide, si bien que la caractéristique de sécurité discernable visuellement est une caractéristique de sécurité discernable en lumière transmise.

44. Produit de sécurité selon l'une quelconque des revendications 24 à 43, comprenant en outre un revêtement protecteur et/ou adhésif placé sur le métal magnétique.
- 5 45. Produit de sécurité selon l'une quelconque des revendications 24 à 44, dans lequel le dessin spécifique contient intrinsèquement des informations.
46. Produit de sécurité selon la revendication 45, dans lequel le dessin spécifique est un code à barres qui est lisible par une machine.
- 10 47. Papier de sécurité comprenant un produit de sécurité selon l'une quelconque des revendications 24 à 45, dans lequel le produit de sécurité est un fil de sécurité incorporé au papier de sécurité sous forme enrobée ou dans une fenêtre.
- 15 48. Billet de banque contenant le papier de sécurité selon la revendication 47.
49. Film qui peut être découpé en produits de sécurité tels que les fils de sécurité destinés à un papier de sécurité, y compris des billets de banque, le film comprenant :
- 20 un substrat polymère,
un matériau catalytique recouvrant une partie au moins d'une première surface du substrat polymère, et
une couche d'un métal magnétique déposé chimiquement, recouvrant une partie au moins du matériau catalytique dans une couche de métal magnétique ayant une épaisseur comprise entre 0,01 et 3,0 μm , et
la couche du métal magnétique a un dessin choisi de manière que, lorsqu'un produit de sécurité est découpé
25 dans le film, la couche du métal magnétique donne à la fois une caractéristique de sécurité discernable visuellement et une caractéristique de sécurité détectable magnétiquement, et le produit de sécurité peut avoir une rémanence magnétique comprise entre 0,001 et 0,05 emu.cm^{-2} .
50. Film selon la revendication 49, comprenant en outre un revêtement protecteur et/ou adhésif placé sur le métal magnétique.
- 30 51. Film selon la revendication 49 ou 50, dans lequel le métal magnétique déposé chimiquement comprend du cobalt et éventuellement un ou plusieurs métaux choisis parmi le nickel ou le phosphore et leurs alliages.
52. Film selon l'une quelconque des revendications 49, 50 et 51, dans lequel la couche de métal magnétique peut former un fil magnétique tranché dans le film avec un champ coercitif magnétique compris entre 100 et 2 000 Oe.
- 35 53. Film selon l'une quelconque des revendications 49 à 52, dans lequel la couche de métal magnétique peut donner un fil de sécurité tranché dans le film avec une rémanence magnétique comprise entre 0,005 et 0,025 emu.cm^{-2} .
- 40 54. Film selon l'une quelconque des revendications 49 à 53, dans lequel le matériau catalytique est le palladium.
55. Film selon la revendication 54, dans lequel le matériau catalytique est pratiquement dépourvu d'étain.
- 45 56. Film selon l'une quelconque des revendications 49 à 53, dans lequel le dessin choisi représente intrinsèquement des informations.

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FIG. 1.



FIG. 2.

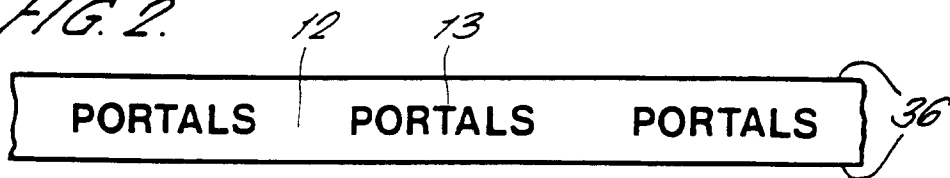


FIG. 3.

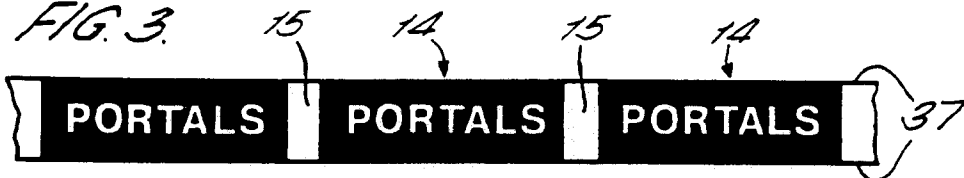


FIG. 4.

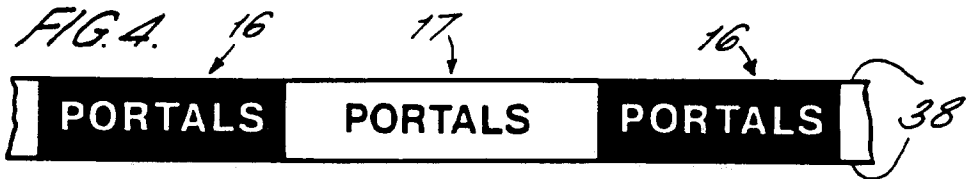


FIG. 6.

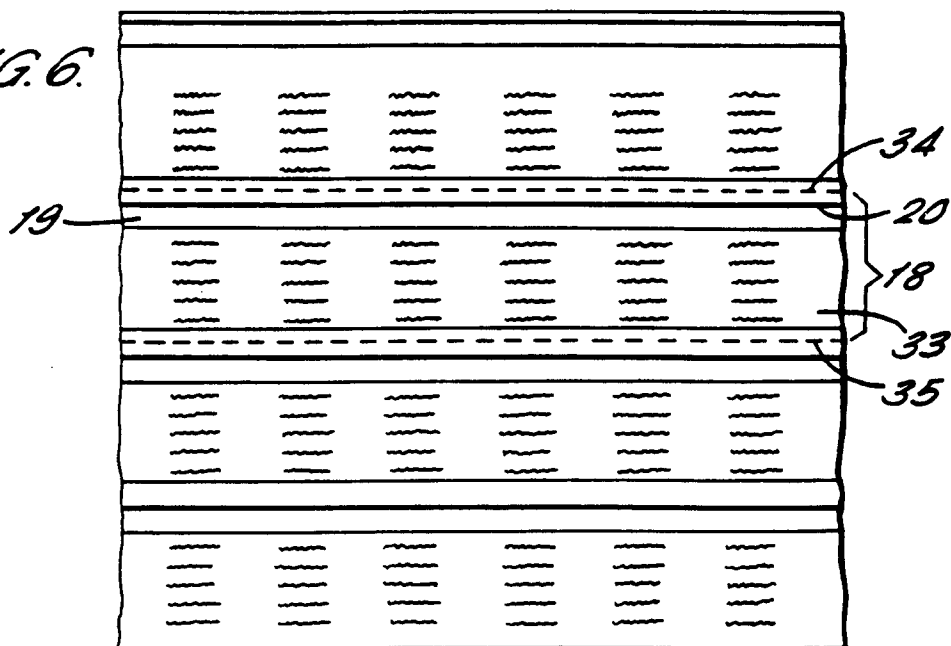


FIG. 5a.

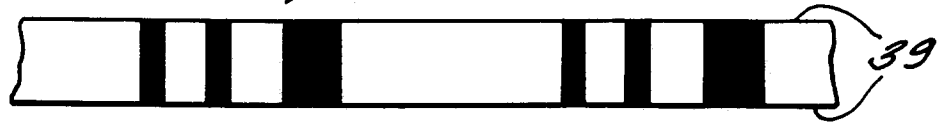


FIG. 5b.

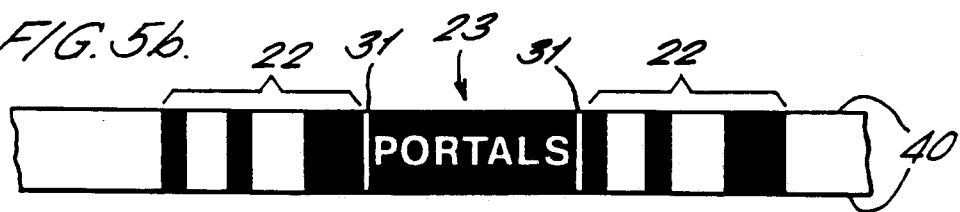


FIG. 5c.

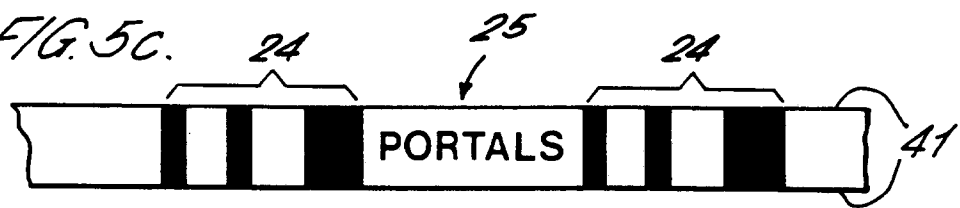


FIG. 7.

