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(72) Inventor; and

(71) Applicant: **PATEL, Shilpan** [IN/IN]; 303 Suman Apartment, Lokhandwala Complex, Andheri West, Maharashtra, Mumbai 400053 (IN).

(74) Agent: **BHATTACHARYA, Ranjit**; Jai Shastri Nagar, No. 7 Building, Flat No.127,First Floor, Mulund Colony, Mulund (West), Maharashtra, Mumbai 400082 (IN).

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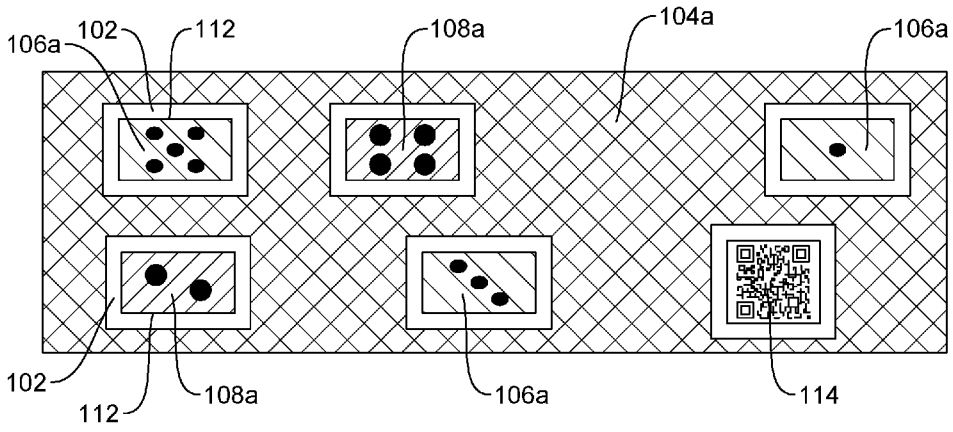

FIG. 6

(57) Abstract: The present invention relates to a magnetic security feature comprising a dimensionally stable non-magnetic substrate forming a base of the magnetic security feature. A first magnetic element (104a, 106) of a first coercivity value deposited over a surface of the dimensionally stable non-magnetic substrate while leaving uncoated spaces at discreet locations, a second magnetic element (106, 108, 106a, 108a) of a different coercivity value than the first coercivity value, deposited over the uncoated spaces (102).

[Continued on next page]

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NOVEL ALPHA NUMERIC SECURITY FEATURES WITH MAGNETIC ELEMENT AND METHOD OF MANUFACTURING THE SAME THEREOF

FIELD OF INVENTION

[001] The present invention relates to the field of security features for valuable documents. More particularly, the present invention relates to magnetic security features coated with magnetic feature such as an alpha numeric coded structured magnetic particles combined with additional high coercivity and low coercivity magnetic features for providing a secure and efficient security feature and method of manufacturing the same. Further, the present invention provides a security feature that can be used as digitally marked security thread having smaller thickness encompassing the entire security feature at the same time.

BACKGROUND OF THE INVENTION

[002] Machine readable security features can be located in one or more regions of a banknote, either in the substrate, in the printing or as an applied feature. Some examples of such features include holograms, security threads, magnetic inks, fluorescent pigments, phosphorescent materials, thermo chromic features and conductive metallic features.

[003] Unfortunately, to overcome these security features, some counterfeiters have started to produce so-called composite banknotes. In such composite banknotes, part of a genuine banknote is cut out and replaced by a paper strip and the like, enabling the cut out part to be used to produce a further, counterfeit banknote or bill.

[004] Generally, coded magnetic threads are currently produced by depositing magnetic areas on a metalized/ demetalized/ polyester/filmic substrate. These areas are composed of a single type of magnetic ink and are separated by spaces in which regions without metallic material, meant for generating texts, are generated. It is evident that once the presence of magnetic areas has been discovered, their coercivity and residual magnetism can be identified easily

and consequently so can the magnetic material to be used to create a counterfeit or forgery. Security threads with magnetic regions provided with a single type of magnetic ink also have undergone counterfeiting, again with the transfer technique.

[005] Further, some state of the art technologies involve a digital mark security thread that includes a dimensionally stable non-magnetic substrate forming the base of the security thread, wherein the said dimensionally stable non-magnetic substrate/PET roll is multi coated/printed with plurality of magnetic features. The first section of the substrate is coated vertically along the length of the substrate or in machine direction with magnetic oxide slurry to form a magnetic strip having a specific thickness, while the second and third section of the substrate is coated/printed vertically or in cross direction in two parts. In particular, the second section of the substrate is coated vertically up to a particular distance with higher coercivity magnetic material such as magnetic ink having a specific thickness and the third section of the substrate is coated vertically up to a particular distance with low coercivity magnetic materials such as magnetic ink having a specific thickness.

[006] The disadvantage of the above mentioned prior art is that the security feature formed on the substrate when seen collectively together is of greater thickness, thereby limiting its usage as a security thread. Such security features formed on the substrate will only be useful when a security thread is to be designed of more than 2.0 to 1.6 mm thickness, which leads to restriction in the usage of such type of digital mark security threads.

[007] Therefore, there is a need to design a digitally marked security thread comprising a security feature that can be used as security thread having smaller thickness encompassing the entire security feature at the same time. Further there is a need to provide improved security features of such documentation to add additional security features or to enhance the perceptions and resistance of simulation to existing features.

SUMMARY OF THE INVENTION

[008] The primary object of the present invention is to provide a novel alpha numeric security features with magnetic element.

[009] Another object of the present invention is to provide a novel magnetic security features coated with alpha numeric coded structured magnetic particles combined with additional high coercivity and low coercivity magnetic features, thereby creating a more complex magnetic combination.

[0010] Yet another object of the present invention is to provide various combination of novel magnetic security features coated with alpha numeric coded structured magnetic particles combined with additional high coercivity and low coercivity magnetic features, thereby creating a more complex magnetic combination.

[0011] Yet another object of the present invention is to design a digitally marked security thread comprising security feature that can be used as security thread having smaller thickness encompassing the entire security feature at the same time.

[0012] Yet another object of the present invention is to link different signals created by discreet formulations and lay downs of different microns and at discreet locations, and linking the signals to read simultaneously or sequentially in a pre-determined algorithm.

[0013] Yet another object of the present invention is to provide an efficient security feature with structured codes, based on magnetic particles and magnetic orientation.

[0014] Yet another object of the present invention is to print-coat magnetic patters, including graphic, indicia, wrap-around designs and specific blocks at discreet locations to converge and to detect bits, reminiscence and coercivity.

[0015] Yet another object of the present invention is to create a variable information based Q.R readable code that is magnetic particles based, printable by specialized printing equipment, including digital printers, like but not limited to inkjet printers.

[0016] Yet another object of the present invention is to provide a method of manufacturing the novel alpha numeric security features with magnetic element.

[0017] Yet another object of the present invention is to provide a complex security feature which is highly reliable, relatively simple to provide and at competitive costs.

[0018] To accomplish the above stated objectives of the present invention, in a first aspect of the present invention, according to an embodiment, a magnetic security feature comprises a dimensionally stable non-magnetic substrate that forms a base for the magnetic security feature. A first magnetic element of a first coercivity value is deposited over a surface of the dimensionally stable non-magnetic substrate while leaving uncoated spaces at discreet locations and a second magnetic element of a different coercivity value than the first coercivity value is deposited over the uncoated spaces.

[0019] In an embodiment, the coercivity value of the second magnetic element is higher than the first coercivity value.

[0020] In an embodiment, the second magnetic element has a thickness greater than the first magnetic element.

[0021] In an embodiment, an alpha numeric code is permanently embedded on the dimensionally stable non-magnetic substrate.

[0022] In an embodiment, the first and second magnetic elements comprise magnetic particles at least one of flood coated and printed on the substrate.

[0023] In an embodiment, the magnetic particles include magnetic oxide slurry.

[0024] In an embodiment, the magnetic particles are alpha-numeric coded structured magnetic particles.

[0025] In an embodiment, the magnetic particles are aligned parallel to each other.

[0026] In an embodiment, the higher coercivity value is about 2000 to 3000 oersted.

[0027] In an embodiment, the lower coercivity value is about 200 oerstedto 400 oersted.

[0028] In an embodiment, each of the magnetic elements comprises a magnetic ink.

[0029] In an embodiment, the uncoated spaces are of predefined shapes and sizes.

[0030] In an embodiment, the uncoated space is box shaped.

[0031] In an embodiment, at least one of the magnetic element is at least one of coated and printed at the centre of the uncoated space leaving a square shape margin of uncoated space.

[0032] In an embodiment, at least one of the higher coercivity and the lower coercivity magnetic element is completely coated over the uncoated space at discreet locations.

[0033] In an embodiment, the at least one of the first and second magnetic elements comprises a QR readable code printed on the substrate.

[0034] In an embodiment, the substrate comprises polyethylene tetraphthalate (PET) material.

[0035] In another aspect of the invention, a method of manufacturing a magnetic security feature is described having the steps of pre-treating a dimensionally stable non-magnetic substrate for deposition of at least one magnetic material;

depositing a first magnetic element coating of a first coercivity value over the substrate to form a first magnetic element layer while leaving uncoated spaces at discreet locations on the substrate;

depositing a second magnetic element coating of a different coercivity value than the first magnetic element coating on the uncoated spaces; and

aligning magnetic particles of the first and second magnetic element coatings.

[0036] In an embodiment, the depositing comprises coating of said at least one magnetic material along a length of the substrate.

[0037] In an embodiment, the depositing comprises printing of said at least one magnetic material along a machine direction.

[0038] Also described is a magnetic thread made by the process as recited above.

[0039] The magnetic security feature made by the above disclosed method can be used a digitally marked security thread having smaller thickness encompassing the entire security feature at the same time.

[0040] Further, the digitally marked security thread according to the present invention, having a complex magnetic security feature, which are highly reliable, relatively simple to provide and at competitive costs, and at the same time are extremely difficult to replicate or to detect the exact discrete location of the second magnetic element, can effectively be incorporated in at least banknote, security cards and the like. Furthermore, this gives each valuable document a secure identity number, which is protected against copying, alteration or erasure.

[0041] Various objects, features, aspects and advantages of the inventive subject matter will become more apparent from the following detailed description of preferred embodiments, along with the accompanying drawing figures in which like numerals represent like components.

BRIEF DESCRIPTION OF DRAWINGS

[0042] In the figures, similar components and/or features may have the same reference label. Further, various components of the same type may be distinguished by following the reference label with a second label that distinguishes among the similar components. If only the first reference label is used in the specification, the description is applicable to any one of the similar components having the same first reference label irrespective of the second reference label.

[0043] Fig. 1 illustrates an aspect of magnetic security feature showing first magnetic element deposited on a substrate, leaving uncoated spaces at discreet locations.

[0044] Fig. 2 illustrates another aspect of magnetic security feature of Fig. 1 comprising a second magnetic element deposited over the uncoated spaces at discreet locations.

[0045] Fig. 3 illustrates perspective view of magnetic security feature comprising a first magnetic element and a second magnetic element deposited over a substrate.

[0046] Fig. 4 illustrates another aspect of the invention having combination of magnetic security feature, including alpha numeric coded structured magnetic particles.

[0047] Fig. 5 illustrates yet another aspect of the magnetic security feature of the present invention showing another presentation of first magnetic element and second magnetic element.

[0048] Fig. 6 illustrates another aspect of the magnetic security feature as shown in Fig. 5, in addition comprising a second magnetic element as a QR code.

[0049] Fig. 7 illustrates a combination of multiple security features in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0050] As required, detailed embodiments of the present invention are disclosed herein, however, it is to be understood that the disclosed embodiments are merely exemplary of the invention which may be embodied in various forms. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a basis for the claims and as a representative basis for teaching one skilled in the art to variously employ the present invention in virtually any appropriately detailed structure.

[0051] While certain aspects of conventional technologies have been discussed to facilitate disclosure of the invention, Applicants in no way disclaim these technical aspects, and it is contemplated that the claimed invention may encompass one or more of the conventional technical aspects discussed herein.

[0052] The present invention may address one or more of the problems and deficiencies of the prior art discussed above. However, it is contemplated that the invention may prove useful in addressing other problems and deficiencies in a number of technical areas. Therefore, the claimed invention should not

necessarily be construed as limited to addressing any of the particular problems or deficiencies discussed herein.

[0053] As used in this specification and the appended claims, the singular forms "a," "an," and "the" include plural referents unless the content clearly dictates otherwise. As used in this specification and the appended claims, the term "or" is generally employed in its sense including "and/or" unless the context clearly dictates otherwise.

[0054] Coercivity refers to the magnetic material's resistance to becoming demagnetized – therefore, HiCo and LoCo represent different standards of card durability and security. HiCo: stands for high-coercivity. High-coercivity (HiCo) stripes are magnetically harder .HiCo magnetic stripe cards are typically black in color and they are encoded with a stronger magnetic field (2750 Oersted). The magnetic coercivity ranges from 1250 to 4000 oe for high coercivity. The stronger magnetic field makes HiCo cards more durable because the data encoded on the stripes are less likely to unintentionally be erased when exposed to an outside magnetic field. LoCo**:** stands for low-coercivity. Low-coercivity (LoCo) stripes are magnetically softer. LoCo magnetic stripe cards are generally brown in color and they are encoded at a low-intensity magnetic field (300 Oersted).The magnetic coercivity ranges from 100 to 650oe for low coercivity LoCo is best suited for cards used infrequently and/or where data is routinely changed, such as with hotel key cards.

[0055] Substrate: A dimensionally stable substrate forms the base of the security thread, may be selected may be selected from PET or PET like material. The substrates may include carrier films or substrate, preferably transparent, flexible plastic films, such as those made of PI, PP, MOPP, PE, PPS, PEEK, PEK, PEI, PSU, PAEK, LCP, PEN, PBT, PET, PA, PC, COC, POM, ABS, PVC, PTFE, ETFE (ethylene tetrafluoroethylene), PFA (tetrafluoroethylene-perfluoropropylvinylether-fluorine copolymer), MFA (tetrafluoromethylene-perfluoropropylvinylether-fluorine copolymer); PTFE (polytetrafluoroethylene), PVF (polyvinyl fluoride), PVDF (polyvinylidene

fluoride), and EFEP (ethylene-tetrafluoroethylene-hexafluoropropylene-fluorine terpolymer), wherein the substrate/PET film has a thickness in the range of 3 microns to 36 microns, preferably in the range of 6 microns to 24 microns, more preferably in the range of 9 microns to 12 microns.

[0056] The present invention relates to security features for valuable documents. More particularly the present invention relates to novel magnetic security features coated with alpha numeric coded structured magnetic particles combined with additional magnetic features and method of manufacturing the same. The additional magnetic features include high coercivity and low coercivity magnetic features to provide a more secure and competent security features.

[0057] Further, the present invention provides a digitally marked substrate comprising security feature that can be used as security thread having smaller thickness encompassing the entire security feature at the same time.

[0058] Fig.1 illustrates an embodiment of the present invention showing a novel security thread (100) comprising novel magnetic security features. A dimensionally stable non-magnetic substrate forms a base of the security thread. The substrate may be selected from PET or PET like material of specific thickness. A first magnetic element (104a), such as magnetic oxide slurry (104a),is at least one of flood coated and printed over the base of the substrate, leaving uncoated spaces (102) located at discreet locations on the substrate. The first magnetic element comprises of a first coercivity value. The substrate may also include alpha numeric code permanently embedded therein (not shown in the figure).The substrate (110) is flood coated/printed along the length of the substrate (110) or in machine direction with magnetic oxide slurry (104a) to form a magnetic strip having a specific thickness or can have an alphanumeric code permanently embedded. Optionally, the substrate (110) is coated/printed with magnetic oxide slurry in desired shape and thickness.

[0059] As shown in Fig. 2, the uncoated spaces (102) located at discreet locations are completely coated or printed with a second magnetic element (106 and 108), of a different coercivity value than the first magnetic element (104a).

The second magnetic element (106 and 108), which is magnetic ink, is completely printed or coated over the uncoated spaces (102), located at discreet locations, such that bits, reminiscence and coercivity can be detected. The second magnetic element (106 and 108) can be at least one of a high coercivity magnetic ink (106) and a low coercivity magnetic ink (108). Therefore, according to the present invention, not only a more complex combination of magnetic security features can be achieved, but also different coercivity values provided over the substrate at discrete locations aids in achieving security thread having smaller thickness encompassing the entire security feature therein.

[0060] Fig. 3 illustrates a perspective view of the security thread (100) showing magnetic security feature comprising a first magnetic element (106) and a second magnetic element (108) deposited over a substrate (110). The dimensionally stable non-magnetic substrate (110) forms a base of the security thread (100), having a specific thickness. The coating of the first magnetic element (104a), i.e., the magnetic oxide slurry (104a) having a specific coercivity value is shown with a specific thickness. The second magnetic elements (106) including the high coercivity magnetic ink (106) has a greater thickness and the second magnetic elements (108) including lower coercivity magnetic ink (108) has a lesser thickness. As different coercivity magnetic inks are directly added over the substrate (110) and not overlapped over one another, the overall thickness of the security thread is reduced. Further, second magnetic element of different coercivity value, having at least one of high coercivity value and low coercivity value being deposited at discrete locations make it difficult to imitate.

[0061] Fig. 4 illustrates another aspect of the present invention, having a combination of multiple magnetic security features. The dimensionally stable non-magnetic substrate (110) is at least one of coated and printed with magnetic oxide slurry (104a), and may include alpha numeric coded structured magnetic particle (104b) in any orientation, leaving uncoated spaces (102) located at discreet locations. The second magnetic elements (106 and 108) are

completely coated or printed over the uncoated spaces (102), where the second magnetic element can be at least one of the high coercivity magnetic ink (106) and the low coercivity magnetic ink (108).

[0062] Fig.5 illustrates yet another aspect of the present invention showing first magnetic element (104a) and second magnetic elements (106a, 108a). The dimensionally stable non-magnetic substrate (110) may be at least one of coated and printed with the magnetic oxide slurry (104a), leaving uncoated spaces (102) located at discreet locations. The second magnetic element (106a, 108a), being magnetic ink, printed or coated in the centre of the uncoated spaces (102) located at discreet locations, leaving a square shape margin (112) of uncoated area or uncoated space (102), such that bits, reminiscence and coercivity can be detected. The second magnetic element including at least one of the high coercivity magnetic ink (106a) and the low coercivity magnetic ink (108a) may be of any shape or size. Here, as an exemplary embodiment, in the Fig.5, high coercivity magnetic ink (106a) coatings are shown with dice shape having 5 face, 3 face and 1 face respectively, and low coercivity magnetic ink (108a) coatings are shown with dice shape having 2 face, 4 face and 6 face respectively.

[0063] Fig. 6 illustrates another aspect of the invention having the magnetic security feature as shown in Fig. 5, in addition comprising a second magnetic element (106a, 108a) as a QR readable code (114). The dimensionally stable non-magnetic substrate (110) may be coated/printed with the magnetic oxide slurry (104a), leaving uncoated spaces (102) located at discreet locations. The second magnetic element (106a, 108a) including magnetic ink printed or coated in the centre of the uncoated spaces (102) located at discreet locations, leaving a square shape margin (112) of uncoated space (102), such that bits, reminiscence and coercivity can be detected. In addition, the second magnetic element may also include the QR readable code (114) printed using magnetic ink in the centre of the uncoated spaces (102) located at discreet locations, leaving a square shape margin (112) of uncoated space (102).

[0064] Fig. 7 illustrates a yet more complex combination of magnetic security features in an aspect of the present invention. The dimensionally stable non-magnetic substrate (110) may be coated/printed with the magnetic oxide slurry (104a), and may also be coated/printed with an alpha numeric coded structured magnetic particle (104b) in any orientation, leaving uncoated spaces (102) located at discreet locations. The uncoated spaces (102) may be coated with the second magnetic element including coating/printing high coercivity magnetic ink (106) and/or the low coercivity magnetic ink (108) over the uncoated spaces (102) located at discreet locations. Further, certain uncoated spaces (102) may be coated/printed at the centre with the high coercivity magnetic ink (106a) and/or the low coercivity magnetic ink (108a), leaving a square shape margin (112) of uncoated space (102).Furthermore, certain uncoated spaces (102) can be printed at the centre with the QR readable code (114) using magnetic ink leaving a square shape margin (112) of uncoated space (102).

[0065] Therefore, the security features provided in the present invention can particularly be implemented in banknotes, security cards and the like, having magnetic elements, where the magnetic difference of the regions, strategically positioned at discrete locations, which cannot be easily read by a normal magnetic reader, nor the location of said discretely positioned magnetic element having different coercivity be detected or replicated.

[0066] Optionally, the present invention discloses novel magnetic security features, wherein the non-magnetic substrate (110)is flood coated with alpha numeric coded structured magnetic particles (104b).

[0067] In another embodiment of the present invention discloses a novel magnetic security features, wherein the non-magnetic substrate (110)is coated with alpha numeric coded structured magnetic particles (104b), with uncoated spaces (102)located at discreet location, wherein additionally high coercivity magnetic features (106a) and low coercivity magnetic features(108a)are coated at discreet locations to converge and to detect bits, reminiscence and coercivity. The uncoated space located at discreet location can be of any

desired shape, for example box type uncoated space located at discreet location. Further, the uncoated spaces located at discreet location are coated or printed with high coercivity magnetic ink (106a)and low coercivity magnetic ink (108a), at the centre of the uncoated spaces, such that the novel magnetic security features comprises of a non-magnetic substrate (110)that is coated with alpha numeric coded structured magnetic particles (104b)with uncoated space (102) in between them, such that the uncoated space are coated or printed with high coercivity magnetic ink (106a) and low coercivity magnetic ink (108a), at the centre, leaving a square shape margin (112) of uncoated area (102), such that bits, reminiscence and coercivity can be detected.

[0068] This combination of magnetic features combined together increases the complexity of the security thread.

[0069] According to the second embodiment, the substrate may be selected from PET or PET like material of specific thickness. The substrate (110) that forms the base of the security thread (100) is coated with magnetic oxide slurry (104a) to form a magnetic strip having a specific thickness or can have an alphanumeric code permanently embedded; wherein the substrate (110)is coated/printed along the length of the substrate (110) or in machine direction with magnetic oxide slurry (104a)to form a magnetic strip having a specific thickness or can have an alphanumeric code permanently embedded. Optionally, the substrate is coated/printed with magnetic oxide slurry (104a)in desired shape and thickness. Wherein according to the second embodiment the non-magnetic substrate (110)is coated with alpha numeric coded structured magnetic particles (104b), with uncoated spaces (102)located at discreet location, wherein additionally high coercivity magnetic features (106a) and low coercivity magnetic features (108a)are coated at discreet locations to converge and to detect bits, reminiscence and coercivity. Further, the uncoated spaces (102)located at discreet location are coated or printed with high coercivity magnetic ink (106a)and low coercivity magnetic ink(108a), at the centre of the uncoated spaces (102), such that the novel magnetic security features comprises of a non-magnetic substrate (110) that is coated with alpha

numeric coded structured magnetic particles (104b)with uncoated space (102)in between them, such that the uncoated space (102)are coated or printed with high coercivity magnetic ink(106a) and low coercivity magnetic ink(108a), at the centre, leaving a square shape margin (112)of uncoated area (102), such that bits, reminiscence and coercivity can be detected.

[0070] Third embodiment of the present invention discloses a novel magnetic security features, wherein the non-magnetic substrate (110) is first coated with alpha numeric coded structured magnetic particles (104b) in horizontal pattern, with uncoated horizontal spaces (102)located adjacent to the coats of alpha numeric coded structured magnetic particles (104b)at discreet location. Further, the uncoated horizontal spaces (102)located between the coats of alpha numeric coded structured magnetic particles (104b)at discreet location are coated or printed with high coercivity magnetic ink (106) and low coercivity magnetic ink (108), completely over the uncoated horizontal spaces (102), such that the novel magnetic security features comprises of a non-magnetic substrate (110)that is coated with alpha numeric coded structured magnetic particles (104b)in horizontal manner, with uncoated horizontal spaces (102) located adjacent to the coats of alpha numeric coded structured magnetic particles (104b)at discreet location, wherein said uncoated horizontal spaces (102)located between the coats of alpha numeric coded structured magnetic particles (104b)are further coated or printed with high coercivity magnetic ink (106) and low coercivity magnetic ink (108), such that bits, reminiscence and coercivity can be detected.

[0071] The uncoated horizontal space (102) located at discreet location can be of any desired shape and size located at discreet location.

[0072] Fourth embodiment of the present invention discloses an arrangement of structured magnetic particles, wherein the dimensionally stable non-magnetic substrate (110)forms the base of the security thread, wherein the said dimensionally stable non-magnetic substrate (110)is coated/printed with plurality of magnetic features (104a, 104b, 106, 106a, 108, 108a). The substrate (110) may be selected from PET or PET like material of specific

thickness. The substrate (110) is first horizontally flood coated with alpha numeric coded structured magnetic particles (104a)over the substrate(110), with uncoated horizontal spaces (102)located between the coats of alpha numeric coded structured magnetic particles (104b)at discreet location. Further, the uncoated horizontal spaces (102)located between the coats of alpha numeric coded structured magnetic particles (104b)at discreet location are coated or printed with high coercivity magnetic ink (106) and low coercivity magnetic ink(108), completely over the uncoated horizontal spaces (102), such that the novel magnetic security features comprises of a non-magnetic substrate that is coated with alpha numeric coded structured magnetic particles (104b)in horizontal pattern, with uncoated horizontal spaces (102) located between the coats of alpha numeric coded structured magnetic particles (104b)at discreet location, wherein said uncoated horizontal spaces (102)located between the coats of alpha numeric coded structured magnetic particles (104b)are further coated or printed with high coercivity magnetic ink (106)and low coercivity magnetic ink(108), such that bits, reminiscence and coercivity can be detected.

[0073] The substrate (110)that forms the base of the security thread is coated along the length of the substrate (110)or in machine direction with magnetic oxide slurry (104a) to form a magnetic strip having a specific thickness or can have an alphanumeric code permanently embedded. Optionally, the substrate is coated/printed with magnetic oxide slurry (104a) in desired shape and thickness.

[0074] Further, the substrate (110) is coated/printed with higher coercivity magnetic element (106)such as magnetic ink having a specific thickness and low coercivity material element (108) such as magnetic ink having a specific thickness at discreet location over the non-magnetic substrate (110) to converge and to detect bits, reminiscence and coercivity.

[0075] The substrate (110) coated with magnetic ink comprise at least two types of magnetic areas which have different coercivity values and whose residual magnetism is identical or different. The difference in coercivity and the

identical or different residual magnetism are aimed at generating different codes. In particular, the magnetic areas are provided by means of magnetic inks whose coercivity is different such that it may be a mix of high coercivity and low coercivity.

[0076] The magnetic coercivity ranges from 1250 to 4000 oe for high coercivity and the magnetic coercivity ranges from 100 to 650oe for low coercivity. More preferably the coercivity magnetic features are coated /printed by means of magnetic inks whose coercivity ranges from 100 to 200 Oe low coercivity and 2000 to 3000 Oe for high coercivity.

[0077] The security elements (106, 106a 108, 108a)coated over the substrate(110) disclosed in the present invention provide a security thread particularly for banknotes, having magnetic elements in which the magnetic difference of the regions provides different magnetic codes provided on security threads. The present invention discloses security thread coated with structured magnetic particles, high coercivity magnetic features (106, 106a) and low coercivity magnetic features (108, 108a)to provide a more secure and more efficient security thread, with exceptional multiple codes.

Further, the second magnetic element may also comprise a QR readable code (114) printed on the substrate (110). The magnetic particles based QR readable code (114) can include variable information and can be printed using specialized printing equipment, including digital printers, like but not limited to inkjet printers. Further, QR readable codes (114) may also allow a user to scan and verify the authenticity of a security document.

[0078] Yet another aspect of the present invention is to link different signals created by discreet formulations and lay downs of different microns at discreet locations, and linking the signals to read simultaneously or sequentially in a pre-determined algorithm.

[0079] Optionally, some of the magnetic security strip (100) may be coated with high coercivity magnetic material (106) of specific length, whereas some of the magnetic strip may be coated with low coercivity magnetic material (108)of specific length. Detection of the magnetic features is done by variation

of magnetic coercivity of composite element bits with a change in the strip thickness. This variation in positioning the magnetic strip along with combination of high coercivity and low coercivity provides better complexity that may have specific blocks at discreet locations to converge and to detect bits, reminiscence and coercivity using specialized detecting machine.

[0080] The discreetly place structured magnetic particles/blocks/graphics/ linear lines in positioned in such a manner that it can be read by a pre-designed algorithm to sort the specific nation's currency as well as denominations.

[0081] Another aspect of the present invention discloses a method of manufacturing the digital mark security thread (100)that comprises of structured magnetic particles combined with additional high coercivity and low coercivity magnetic features.

[0082] Another aspect of the present invention is printing of variable information, at discreet locations for forensic analysis, specific to a currency and/or denomination.

[0083] Further, the present invention is to provide a method of manufacturing a digital mark security thread (100)with multi coats comprises the steps of coating the first section of the substrate with structured magnetic particles that encodes a unique alpha numeric code (104b)in a structured manner, after the magnetic particles are aligned in a requisite format; wherein the magnetic particle may be of high or low coercivity; Coating the second section of the substrate with high coercivity magnetic ink (106); and coating the third section of the substrate with low coercivity magnetic ink (108) to provide an efficient and more secure security thread with exceptional multiple codes.

[0084] The present invention provides a method of manufacturing a magnetic security feature comprising the steps of: pre-treating a dimensionally stable non-magnetic substrate for deposition of at least one magnetic material; depositing a first magnetic element coating of a first coercivity value over the substrate to form a first magnetic element layer while leaving uncoated spaces at discreet locations on the substrate; depositing a second magnetic element coating of a different coercivity value than the first magnetic element coating

on the uncoated spaces; and aligning magnetic particles of the first and second magnetic element coatings.

[0085] Further, the present invention is to provide a method of coating of the substrate with structured magnetic particles:

[0086] The aforementioned digital mark security thread (100) structure is structured using a special equipment, which encodes a unique code in a structured manner, after the magnetic particles are aligned in a requisite format. This also shows traceability and can be assigned to each manufacturer, or a particular period in time or a particular series etc.

[0087] S01: Taking a dimensionally stable non-magnetic substrate/PET roll (110)of specific thickness;

[0088] S02: Coating magnetic oxide slurry (104a) of controlled thickness onto a suitable non-magnetic substrate (110);

[0089] S03: Passing the wet slurry of magnetic oxide coated on the non-magnetic substrate (110) over a permanent magnet to align all the oxide particles, so that all the particles lie parallel to each other; till the oxide particles are aligned;

[0090] S04: Subsequently passing the wet slurry over an electromagnetic encoding head, that is at 90°L to the permanent magnet; switching on the electromagnetic encoding head results in rotating/orienting the magnetic oxide particles to 90°L, likewise when the electromagnetic encoding head is switched off, the magnetic oxide particles remains in their original orientation;

[0091] S05: aligning the oxide particles to form a permanent unique or non-unique pattern on to the magnetic strip (100); wherein the magnetic strip (100)may have high or low coercivity feature;

[0092] S06: drying the coated magnetic strip (100); and

[0093] S07: winding the dimensionally stable non-magnetic substrate/PET roll (110).

[0094] This process of aligning the oxide particles during the manufacturing process results in formation of a permanent unique or non-unique pattern on to

the magnetic strip (100). This gives each document a secure identity number, which is protected against copying, alteration or erasure.

[0095] The security thread thus provided, detected by the sensors as described and therefore encodes a unique code in a structured manner, after the magnetic particles are aligned in a requisite format along with high and low coercivity magnetic features that exist in a single banknote, can be used for example by different devices intended for different operators, such as a commercial banks.

[0096] Further additionally, the security thread thus provided, detected by the sensors as described and therefore encodes a unique code in a structured manner wherein the magnetic strip is identified first, followed by identification of high coercively and low coercively magnetic ink, followed by uncoated spaces or bits, followed by distance between the security features and bits or can have any various combination of reading pattern.

[0097] The present invention relates to novel magnetic security features coated with alpha numeric coded structured magnetic particles combined with additional high coercivity and low coercivity magnetic features to provide a more secure and more efficient security feature and method of manufacturing the same. The present invention discloses a digitally marked security thread comprising security feature that can be used as security thread having smaller thickness encompassing the entire security feature at the same time, so that limitation related to higher thickness of the security thread to be incorporated in bank notes can be eliminated.

[0098] The above description is intended to describe the preferred embodiments of the invention in sufficient detail to enable those skilled in the art to practice the invention. The above description is intended to be illustrative and should not be interpreted as limiting the scope of the invention. The advantages set forth above, and those made apparent from the foregoing description, are efficiently attained. Since certain changes may be made in the above construction without departing from the scope of the invention, it is intended that all matters contained in the foregoing description or shown in the

accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

[0099] It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention that, as a matter of language, might be said to fall there between.

I Claim:

1. A magnetic security feature comprising:

   a dimensionally stable non-magnetic substrate that forms a base for the magnetic security feature;

   a first magnetic element of a first coercivity value deposited over a surface of the dimensionally stable non-magnetic substrate while leaving uncoated spaces at discreet locations; and

   a second magnetic element of a different coercivity value than the first coercivity value is deposited over the uncoated spaces.

2. The magnetic security feature of claim 1, wherein the coercivity value of the second magnetic element is higher than the first coercivity value.
3. The magnetic security feature of claim 1, wherein the second magnetic element has a thickness greater than the first magnetic element.
4. The magnetic security feature of claim 1, wherein an alpha numeric code is permanently embedded on the dimensionally stable non-magnetic substrate.
5. The magnetic security feature of claim 1, wherein the first and second magnetic elements comprise at least one of a magnetic ink and a magnetic oxide slurry at least one of flood coated and printed on the substrate.
6. The magnetic security feature of claim 5, wherein the magnetic particles are an alpha numeric coded structured magnetic particles.
7. The magnetic security feature of claim 5, wherein the magnetic particles are aligned parallel to each other.
8. The magnetic security feature of claim 1, wherein the higher coercivity value is about 1250 to 4000 oersted, while the lower coercivity value is about 100 oersted to 650 oersted.
9. The magnetic security feature of claim 1, wherein the uncoated spaces are of predefined shapes and sizes.
10. The magnetic security feature of claim 9, wherein the uncoated space is box shaped.

11. The magnetic security feature of claim 1, wherein at least one of the magnetic elements is at least one of coated and printed at the centreof the uncoated space leaving a square shape margin of uncoated space.
12. The magnetic security feature of claim 1, wherein at least one of the higher coercivity and the lower coercivity magnetic element is completely coated over the uncoated space at discreet locations.
13. The magnetic security feature of claim 1, wherein the at least one of the first and second magnetic elements comprises a QR readable code printed on the substrate.
14. The magnetic security feature of claim 1, wherein the substrate comprises polyethylene tetraphthalate (PET) material.
15. A method of manufacturing a magnetic security feature comprising the steps of:

pre-treating a dimensionally stable non-magnetic substrate for deposition of at least one magnetic material;

depositing a first magnetic element coating of a first coercivity value over the substrate to form a first magnetic element layer while leaving uncoated spaces at discreet locations on the substrate;

depositing a second magnetic element coating of a different coercivity value than the first magnetic element coating on the uncoated spaces; and

aligning magnetic particles of the first and second magnetic element coatings.
16. The method as claimed in claim 15, wherein the depositing comprises coating of said at least one magnetic material along a length of the substrate.
17. The method as claimed in claim 15, wherein the depositing comprises printing of said at least one magnetic material along a machine direction.
18. A magnetic thread made by the process as recited in claim 15.

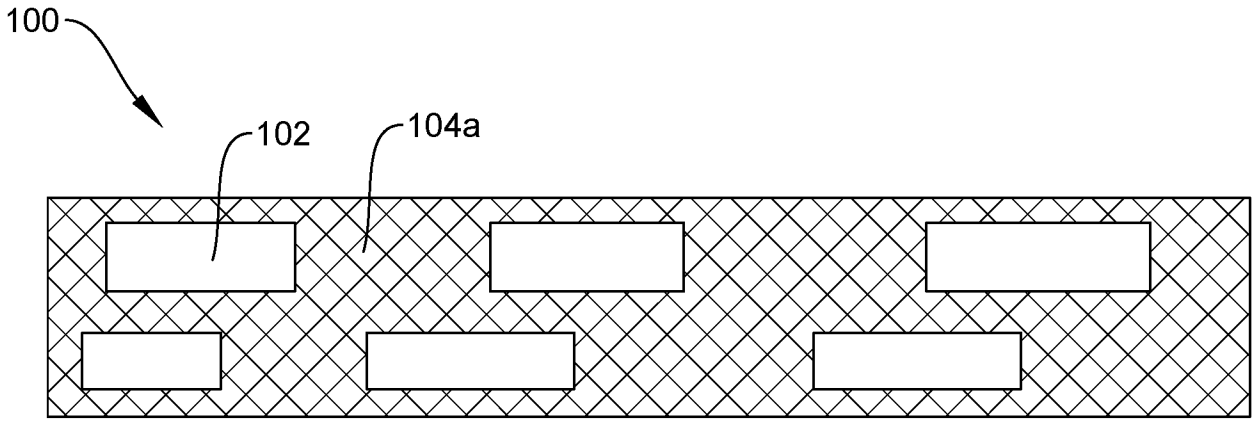


FIG. 1

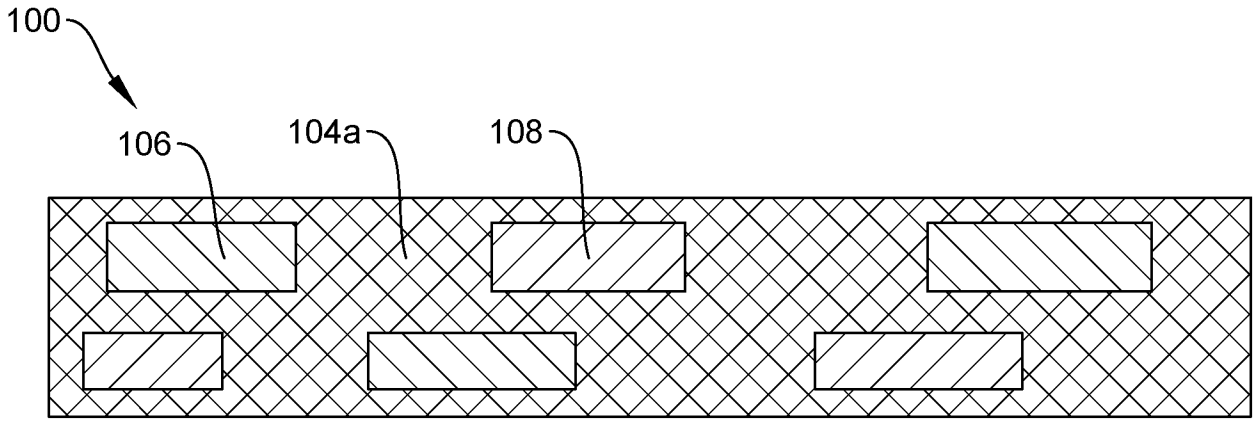


FIG. 2

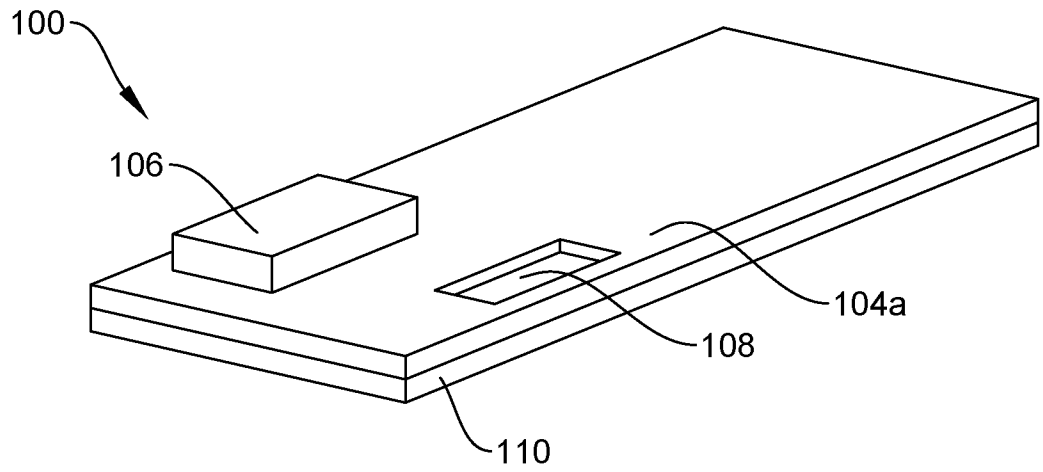


FIG. 3

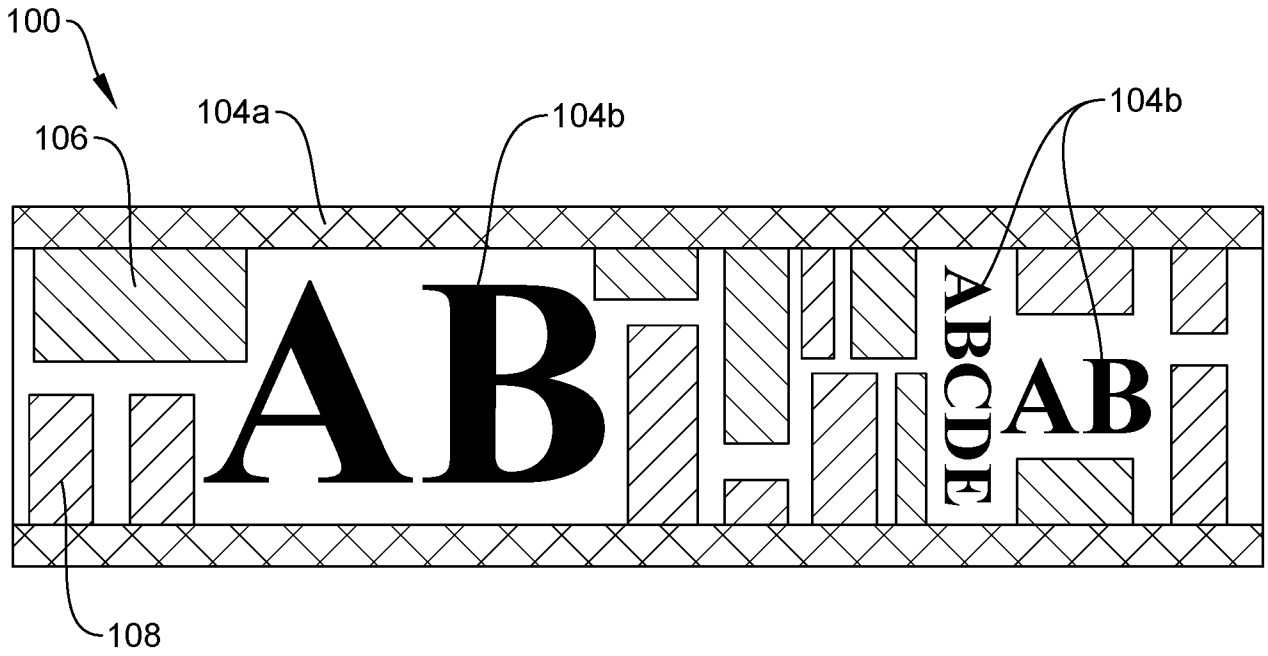


FIG. 4

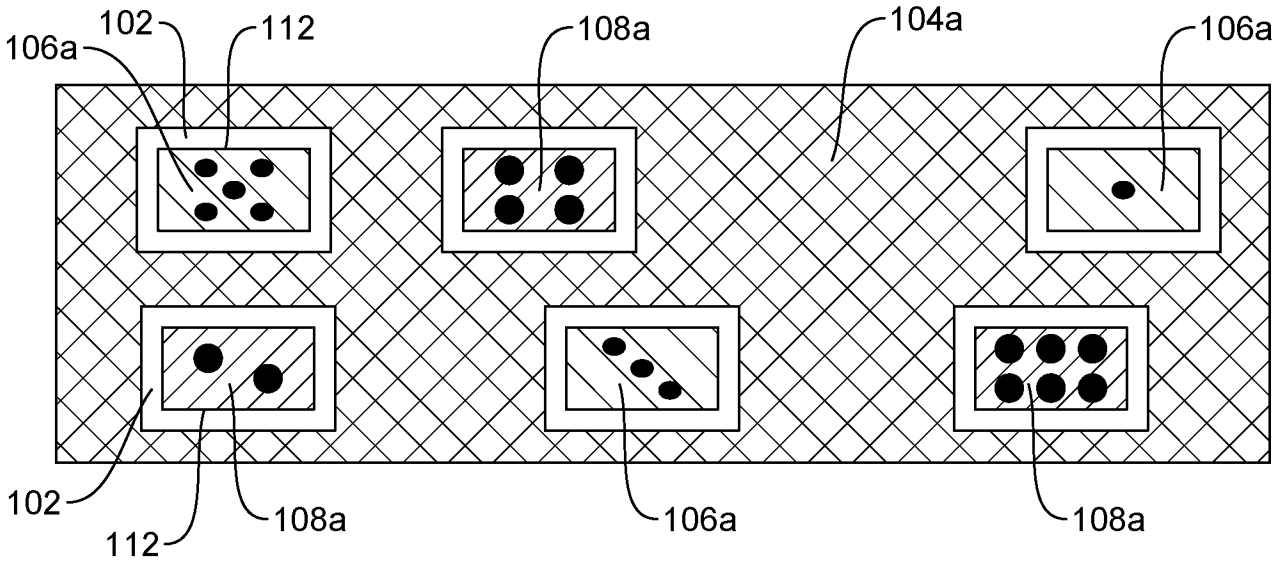


FIG. 5

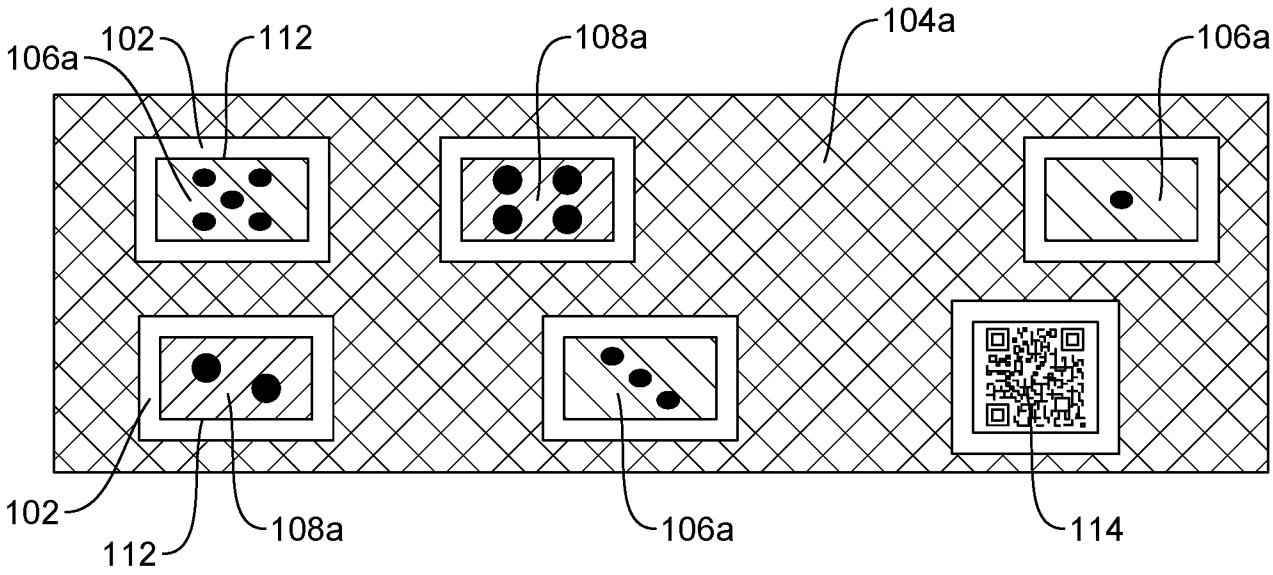
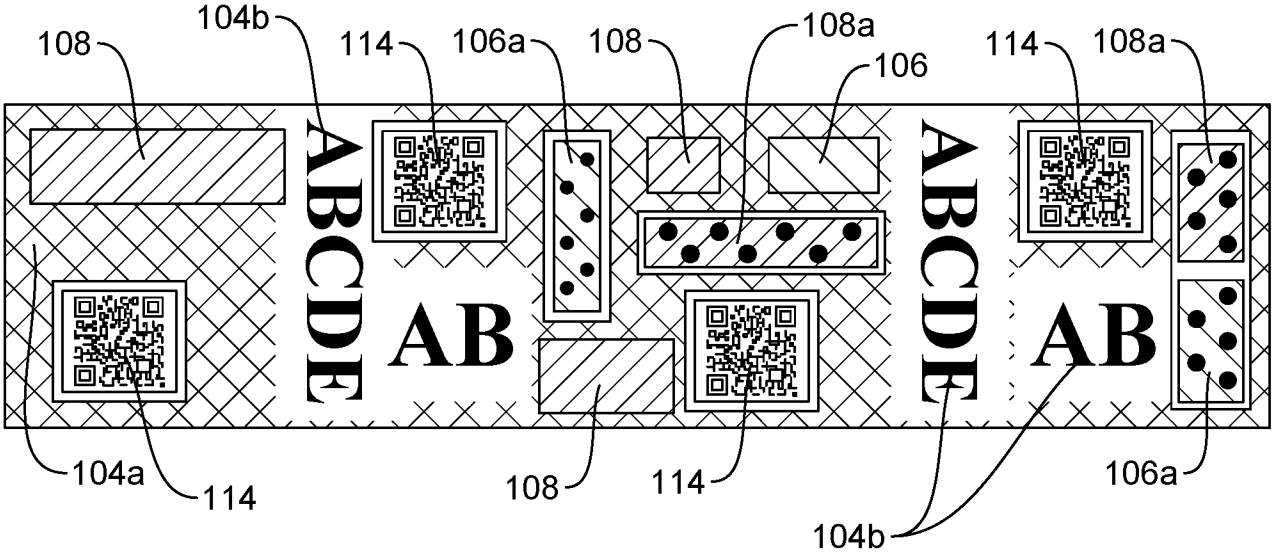


FIG. 6


108
104b
114
106a
108
108a
106
114
108a
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AB
ABCDE
AB
104a
114
108
114
104b
106a

FIG. 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/IN2023/050547

A. CLASSIFICATION OF SUBJECT MATTER
INV. B42D25/355 B42D25/369
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B42D

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 10 2020 006240 A1 (GIESECKE DEVRIENT CURRENCY TECH GMBH [DE]) 14 April 2022 (2022-04-14) paragraphs [0031], [0036] - [0038]; figures 2, 3, 4a	1,2,4-18
X	EP 4 000 942 A1 (HUECK FOLIEN GMBH [AT]) 25 May 2022 (2022-05-25) paragraph [0012] paragraphs [0078] - [0097]; figures 1-6	1-18
X	WO 2022/096241 A1 (MANTEGAZZA PATRIZIA GIUSEPPINA [IT]; LAZZERINI MAURIZIO [IT] ET AL.) 12 May 2022 (2022-05-12) page 5, line 25 - page 8, line 17; figure 2	1-18

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed

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"X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 October 2023	18/10/2023

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Achermann, Didier

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IN2023/050547

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2012/000568 A1 (FABRIANO SECURITIES SRL [IT]; LAZZERINI MAURIZIO [IT] ET AL.) 5 January 2012 (2012-01-05) page 4, line 8 - line 31 page 5, line 26 - page 6, line 15 page 7, line 7 - line 35 page 8, line 15 - line 27	1-18

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IN2023/050547

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