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(54) **Anti-counterfeiting element for identification document, method for manufacturing such element, and secure identification document**

(57) The invention relates to an anti-counterfeiting element for an identification document, said anti-counterfeiting element being able to reveal different sets of data or images superimposed onto a background when tilting the document. The anti-counterfeiting element comprises two separate fragments (F1, F2), each of which comprising part of data/images to be revealed and part of the background, each fragment being provided on each side (S1, S2) of said identification document and overlapping each other through the thickness of said identification document.

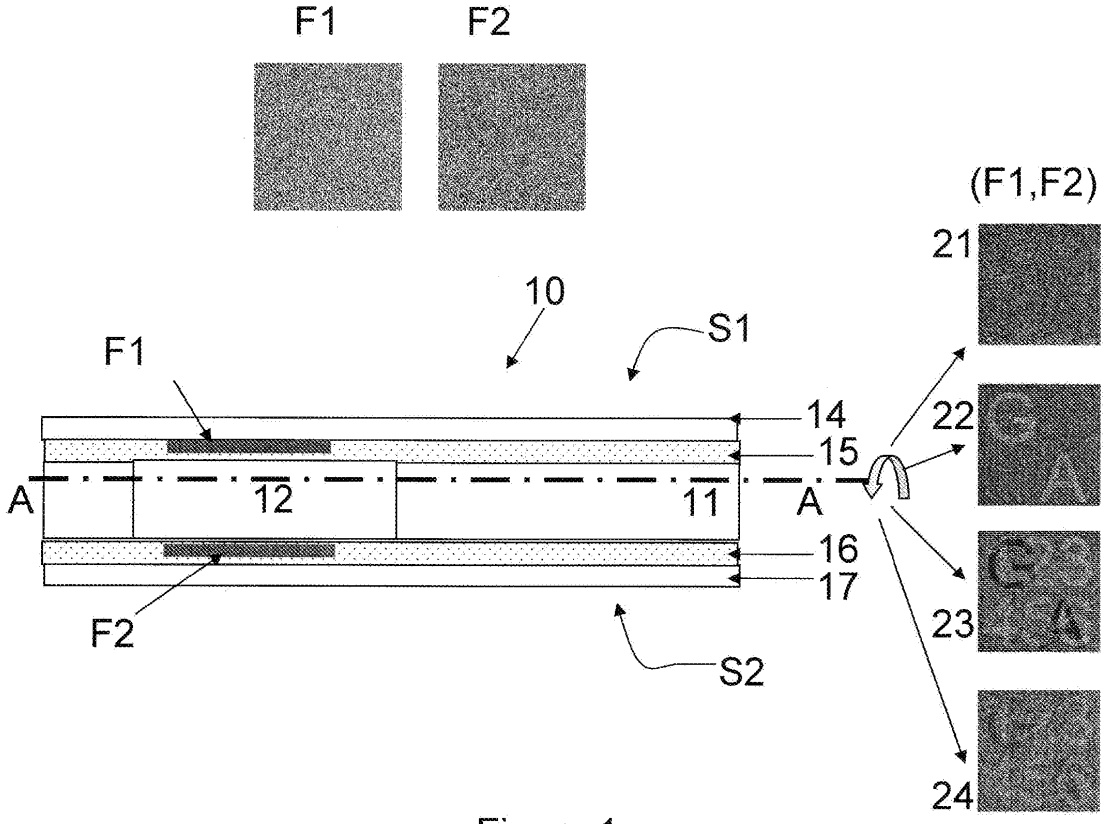

Figure 1

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Description

BACKGROUND

[0001] This invention relates generally to identification documents and a method for making such identification documents. More particularly, this invention relates to an anti-counterfeiting element for such identification document and to a secure identification document that allows detecting a fraudulent modification of the existing personalization or a completely falsified document. The invention also relates to a method for making such anti-counterfeiting element.

[0002] Identification documents are associated with secure applications, such as for example driving licenses, identity cards, membership cards, badges or passes, passports, discount cards, banking cards, money cards, multi-application cards, and other papers of value; and security documents such as bank notes. Such documents are widely used, they may comprise an electronic module or not. If they comprise an electronic module, they can function either with contact and/or without contacts depending on the application to which they are intended. They may take the shape of card or a booklet or something else. Such identification documents are graphically personalized. Personalized information is personal data of the card's owner, i.e for example his photo, his name, his birth date, his social security number, his biometric information such as his fingerprint for example, a validity date, an identification number allocated to him etc... This personalized information is printed onto the surface of the document, or into one or more constitution layers of the document. Because of the value and importance associated with each of these data carriers, they are often the subject of unauthorized copying and alterations, and forgeries.

[0003] To prevent such activities from being carried out on these data carriers, different types of visual and touchable security features have been added to data carriers. One of these security features consists in providing, into the document, an optically variable security element, which comprises at least two security markings. Said markings are decomposed and interleaved, to create a complex image that is printed into the document. Then, a filter is placed over this complex image, said filter being arranged so that it enables to visualize each marking at a respective particular angle by tilting the document. Such filter can be made either with micro-lens or with printed parallel lines.

[0004] However, even if these optically variable security elements are difficult to copy because impossible to scan, they may still be falsified. Indeed, an infringer can arrive to change the variable data viewed through the filter, or to remove the part of the document comprising the optically variable security feature and to replace it by another part comprising another falsified optically variable element.

[0005] Considering the above, a problem intended to be solved by the invention, is to propose an anti-counterfeiting element for an identification document, said anti-counterfeiting element being able to reveal different sets of data or images superimposed onto a background when tilting the document, said anti-counterfeiting element being made with a more complex security, while keeping a simple manufacturing process, and being able to reveal the different sets of data or images with different darkness in comparison with the background.

SUMMARY

[0006] The solution of the invention to this problem relates to the fact that said anti-counterfeiting element comprises two separate fragments, each of which comprising part of data/images to be revealed and part of the background, each fragment being provided on each side of said identification document and overlapping each other through the thickness of said identification document.

[0007] Thus, data or images to be revealed and background are mixed together and then divided in two fragments, each fragment facing each other through the thickness of the document. With such a structure of the anti-counterfeiting element, it appears much more complex for an infringer to modify a data onto one side, because such modification affects immediately the other side and generates wrong information inside the different items showed when tilting the document.

[0008] Then, it becomes impossible to modify such anti-counterfeiting element. Moreover, because the sets of data or images, which are revealed when tilting the document, can be linked to the identity of the owner of the document, it becomes also impossible to remove the anti-counterfeiting element and to replace it by another falsified element.

[0009] According to another aspect, the invention relates also to a secure identification document comprising such an anti-counterfeiting element.

[0010] According to another aspect, the invention relates also to a method for manufacturing such an anti-counterfeiting element for an identification document. The method comprises the following steps :

- subdividing each original pixel of information to be displayed into a matrix of X x Y dots,
- creating lines of matrices of dots, each line being intended to be used for the creation of data or images to be revealed,
- creating two fragments, each comprising a succession of the created lines, each fragment being linked to each other,
- printing each fragment respectively on each side of the identification document in such a manner that they overlap each other, through the thickness of the document, so that they enable to reveal different sets of data or images superimposed onto a background, with different darkness in comparison with the background, when tilting the identification document.

BRIEF DESCRIPTION OF DRAWINGS

[0011] Other particularities and advantages of the invention will be better understood with the help of the description below, which has been provided as an illustrative and non limitative example by reference to the enclosed figures that represent:

Figure 1, a cross-sectional view of an identification document with an anti-counterfeiting element according to the invention, said element displaying different sets of data or images depending on the tilt angle of the document,

Figure 2, some examples of variable data that appear superimposed onto a photography used as background, when tilting a document,

Figure 3, an example of some successive lines of matrices of dots used for building the first fragment of the anti-counterfeiting element according to the invention,

Figure 4, an example of a manner to built the second fragment of the anti-counterfeiting element according to the invention, said second fragment being linked to the first fragment,

Figure 5, an example of the kind of information that can be revealed by viewing the two fragments of figures 3 and 4, when tilting the identification document,

Figure 6, an example of a fragment comprising two areas of different resolution.

DETAILED DESCRIPTION

[0012] Hereafter, an embodiment of the present invention will be described in the context of identity (ID) card and a method for producing it. However, it is to be understood that the invention is usable with any data carrier that includes, but is not limited to, a driving license, a badge or pass, a passport, a discount card, a membership card, a banking card, a credit card, a money card, a multi-application card, and other security documents and papers of value that are to be provided with information or data in such a way that they cannot be easily imitated by common means. Such identification documents may take indifferently the shape of card, or booklet, or something else.

[0013] Figure 1 shows a cross-sectional view of an identification document 10 comprising an anti-counterfeiting element F1, F2. This document may be made either by molding in one-piece, or by lamination or other conventional process for attaching together several layers. In the illustrated example, the document comprises several layers 11, 12, 14, 15, 16, 17 attached together. In a preferred embodiment, the layers can be made with polycarbonate. This material is very interesting because, when they are laminated, the layers are fused and form only one piece instead of collated layers that could be delaminated. However, invention is not limited to this preferred embodiment, and layers made in other plastic material, such as PVC, ABS, PET etc;.. can also be used. The layers can also be attached by other means such as glue for example.

[0014] In the illustrated example, upper layers 14 and 17, also called external layers or overlay layers, are preferably transparent, in order to let information printed onto the body or lower layers to be seen from the outside. Layers 15 and 16, can be at least translucent, and laser-sensitive or not. Layer 11, which is the core of the body in the illustrated example, can be either opaque, or semi opaque or at least translucent. If the core 11 is completely opaque, it is then necessary to provide a part 12 in said core, which has to be either semi-opaque or at least translucent. This part 12 is intended to be used for the anti-counterfeiting element. In fact, the anti-counterfeiting element is divided into two fragments F1, F2, each of which being provided on one side , respectively S1, S2, of the document, and more particularly on both sides S1, S2 of the part 12. The two fragments overlap each other. Thus, when viewing the document, one can see the two fragments overlapping each other and displaying different sets of data or images depending on the tilt angle of the document. For example, as can be seen in figure 1, when the document is tilted along the axis A-A represented in dashed lines, different data are displayed by the two fragments, as illustrated by the references 21 to 24. In a first angle for example, the first displayed image 21 corresponds only to the background, which is black in the example of figure 1. In a second angle, a first set of data 22 revealed consists in letters G and A which appear brighter than the background. By tilting 23 another time the document, the set of data consisting in the two letters G and A appears darker, while another set of data consisting in numbers 1 to 6 appears to be brighter. In a further tilt angle 24, the first two letters G and A have almost disappeared, while the numbers 1 to 6 appear darker.

[0015] On figure 1, one can see that if each fragment F1, F2 is viewed independently from each other, it can only display an image at least corresponding to a background and at the most corresponding to a grey image. The revelation of different sets of data or images, when tilting the document, can only be viewed through the two fragments F1, F2 overlapping each other, through the thickness of the identification document 10 or at least the thickness of part 12.

[0016] In a variant, the part 12, on which are provided the two fragments F1, F2 of the anti-counterfeiting element, can be semi-opaque. In this case, the two fragments F1, F2 can be viewed with the help of a backlight.

[0017] The thickness of the part 12, and also the thickness of the body 11, has to be adapted to the resolution of the lines of the fragments F1, F2, in order to have good result. That is why the thickness is preferred at least four times the width w of a line of a fragment. The lines of the fragment and the width of line are illustrated in figure 3, which is described in detail bellow.

[0018] This lower limit of the thickness is much more

important when the part 12 is semi-opaque, because the two fragments have to be seen together, overlapping each other, in order to reveal the different sets of data or images without using huge angle of viewing. Typically, the preferred maximum angle for viewing last information is less than 30°.

[0019] The two fragments F1, F2 are applied on both sides S1, S2 either by means of a conventional color or monochrome printing process, or by laser engraving if layers used are laser sensitive. They can be applied either on/into layers 15, 16 or onto each surface of part 12.

[0020] Figure 2 shows a succession of different images displayed when tilting such a document. In this example, the background corresponds to the photograph of the owner of the document. This photograph appears whatever the tilt angle is, and different sets of data or images are revealed superimposed onto the photograph, with more or less darkness compare to the background, depending on the different tilt angles. Thus, in the illustrated example, image 25 displayed comprises the photograph onto which are superimposed letters G and A that appear brighter than the photograph, then at a second angle the displayed image 26 comprises only the photograph without any other data superimposed. In a further tilt angle, the image 27 displayed comprises the photograph of the owner on which are superimposed numbers 1 to 6 that appear darker than the photograph. In another further angle, image 28 displayed comprises the photograph of the owner on which are superimposed first the letters G and A that appear darker than the photograph, and second the numbers 1 to 6 that appear brighter than the photograph.

[0021] Figure 3 shows an example of the successive lines used to build the first fragment F1 of the anti-counterfeiting element. For building the two fragments F1, F2 required to display the background and the different variable sets of data/images, a first step of the process consists in subdividing each original pixel of information to be displayed into a matrix M of X x Y dots. In case background is a picture for example, each matrix has a sufficient color density for rendering the same details of a picture. Consequently, matrix must enable to obtain a contrast and brightness compared to original picture. In the example of figure 3, each pixel of information is subdivided into a matrix of 2x2 dots, said matrix comprising for example two dark dots and two bright dots. Thus, with such subdivision, there are six different possibilities M1 to M6 to decline the basic matrix of dots for each original pixel.

[0022] In a further step, each pixel of the first line of the background for example, is subdivided into a matrix of dots. Then, it is possible to create a first line L1 of matrices of dots, which corresponds to the first line of pixels of the background, each matrix of dots being chosen randomly amongst the different possibilities, i.e. the six different possibilities M1 to M6 in the illustrated example of figure 3.

[0023] However, in a variant of realization, each matrix of dots can also be chosen in a coded manner, in such a manner that its choice is linked to the personalization information of the owner of the document for example. In this case, matrices of dots are organized in lines by means of an algorithm using the personalized variable such as name or surname for example. The place of coded matrix element inside a fragment can either be fixed for all personalized documents or depend itself from the personalized variable. Then, during the authentication step, a similar algorithm can be used to read the coded matrices.

[0024] Then, a second line L2 of the first fragment F1 is created by reversing the just preceding first line L1. In this case, the first line L1 is called a "positive line" compare to the second line L2, which is called "negative" line. And so on, the third line L3, positive, of the fragment F1 comprises matrices of dots corresponding to the following line of pixels of the background, i.e. the second line of the background, and the fourth line L4, negative, corresponds to the reversed line of the just preceding line L3. Thus, each odd line, positive, corresponds to successive lines of pixels of the background, and each even line, negative, is the corresponding reversed line of the just preceding odd line. Each line has a width w corresponding to the size of the matrices.

[0025] The second fragment F2, intended to be applied on the other side S2 of the part 12 and opposite to the first one, is linked to the first fragment F1. Its building is illustrated by the example of figure 4. Data to be revealed onto the background are coded into lines of matrices of dots, by using each positive or negative line of the first fragment. For that, the code consists in dividing the line of matrices of dots into portions of predetermined variable size, each portion corresponding either to a portion of a corresponding odd line of the first fragment F1 or to a portion of a corresponding even line of the first fragment F1.

[0026] For better understanding, figure 4 illustrates one example. In this example, a first data to be revealed is coded in such a manner that the first line L1 of the second fragment F2 is divided into four portions P1 to P4 of different size. Each portion P1 to P4 corresponds, either to the positive first line L1 of first fragment F1 or to the negative second line L2 of the first fragment F1. In the illustrated example, the portions P1 and P3 correspond to first positive line L1 of first fragment F1, while portions P2 and P4 correspond to second negative line L2 of first fragment F1. Then, knowing this code, it is possible to build the first line L1 of the second fragment F2, by applying the corresponding positive or negative matrices of dots for each portion of line.

[0027] In a further step, the second line L2 of second fragment F2 enables to create other coded data to be revealed. The preceding steps used for the building of the first line are repeated for this second line L2, with another coded information. In the illustrated example, the second coded information consists also in dividing the second line L2 of the second fragment F2 into four por-

tions P1' to P4' of different size. Portions P1' and P3' correspond to positive first line of first fragment, while portions P2' and P4' correspond to negative second line of first fragment. Then, knowing this second code, it is possible to build the second line L2 of the second fragment F2, by applying the corresponding positive or negative matrices of dots for each portion of line.

[0028] The preceding steps are then repeated for each successive line, each odd line enabling to code the first data to be revealed, and each even line enabling to code the second data to be revealed.

[0029] This example is a simple example for illustration purpose, but it is possible to code more than two sets of data/image to be revealed, and each original pixel can be subdivided into matrix of more than 2x2 dots.

[0030] The computation of the two fragments is advantageously made by means of a computer software and then the two fragments are printed or applied or laser engraved simultaneously on both sides of the portion 12, through which the fragments are intended to be viewed and to overlap each other.

[0031] Figure 5 shows an example of the kind of information that can be revealed by the two fragments F1, F2 of figures 3 and 4, when viewing these two fragments through the thickness of the document while the identification document is tilted. For simplification, only the two first lines of matrices of dots of each fragment F1, F2 are drawn. In a first case referenced (A), the document is tilted in such a manner that when a viewer look at the two overlapping fragments F1, F2, the first line L1 of second fragment F2 is over the second line L2 of first fragment F1. In this case, the coded first set of data, which is surrounded by continuous thick lines 51, appears brighter than the background, while the second line L2 of second fragment F2 does not let appearing the second coded set of data, which is hidden into the background.

[0032] In another case referenced (B), the document is tilted in such a manner that when a viewer look at the two overlapping fragments F1, F2, fragment F2 completely covers fragment F1, i.e. first line L1 of F2 overlaps first line F1 of F1 and second line L2 of F2 overlaps second line L2 of F1. In this case, the coded first set of data, which is surrounded by continuous thick lines 51', appears to be darker than the background, while the coded second set of data, which is surrounded by dashed thick lines 52, appears to be brighter than the background.

[0033] In a third case referenced (C), the document is tilted in such a manner that when a viewer look at the two overlapping fragments F1, F2, the second line L2 of second fragment F2 overlaps the first line F1 of first fragment F1. In this case, the coded first set of data is completely hidden into the background so that it is not visible to human eye, and the coded second set of data, which is surrounded by dashed thick lines 52', appears to be darker than the background.

[0034] By tilting once again the document, the two fragments F1, F2 can overlap each other in such a manner that the two sets of data are hidden into the background and none of them can be viewed by the viewer.

[0035] The embodiments that have just been illustrated and described relate to monochromatic examples with different grey levels. However, the invention is not limited to such monochromatic embodiments and it can also be applied to all multicolor embodiments. For that, two different colors can be chosen for each fragment. Moreover, two colors of each fragment can be for example opposed in the spectrum of colors, so that they display a black color when they overlap each other, by subtractive synthesis. In an example, the first fragment F1 can be made with matrices of dots in which dark dots are in magenta color and bright dots are in yellow color, while the second fragment F2 is made with matrices of dots in which dark dots are in cyan color and bright dots are in yellow color. In this case, when the two fragments overlap each other, depending on the tilt angles, they display variable information darker or brighter than the background and also display additional information with another color different from the colors used for the fragments.

[0036] In another example, it is possible to chose adjacent colors in the spectrum of colors, for each fragment. For example, first fragment F1 can be made with matrices of dots having red dots, while second fragment F2 can be made with matrices of dots having green dots. In this case, the two overlapping fragments enable to display a third color, yellow in the example, by additive synthesis.

[0037] In another embodiment, useful for complicating much more a potential falsification, it is also possible to insert in at least one fragment, different areas having different resolutions. For those areas where resolution is upper than the other areas, then the change between a first visual information and another is quicker. It is also possible to define the tilt angles for which visual information will appear for each area having a given resolution, by shifting the lines of first fragment compared to the lines of second fragment. Thus, by mixing the different resolutions in one fragment, infringement becomes much more impossible. Figure 6 illustrates an example of a fragment F1' having two different areas 61, 62 of different resolution.

[0038] Thanks to such anti-counterfeiting element, if an infringer wants to modify either the background, or one of the sets of data that appear with different brightness compare with the background, by modifying pixels on one side, then the modification affects automatically the other fragment on the other side and generates wrong information inside the different data/image to be displayed when tilting the document. Thus, it becomes impossible to modify such element or to replace it by another falsified element.

Claims

1. An anti-counterfeiting element for an identification document, said anti-counterfeiting element being able to reveal different sets of data/images, super-

imposed onto a background, when tilting said identification document, **characterized in that** said anti-counterfeiting element comprises two separate fragments (F1, F2), each of which comprising part of data/images to be revealed and part of the background, each fragment (F1, F2) being provided on each side (S1, S2) of said identification document and overlapping each other through the thickness of said identification document.

2. An anti-counterfeiting element according to claim 1 wherein the two fragments (F1, F2) are separated from each other by an at least translucent portion (12).

3. An anti-counterfeiting element according to claim 1, wherein the two fragments (F1, F2) are separated from each other by a semi-opaque portion (12), and viewed using a backlight.

4. An anti-counterfeiting element according to anyone of preceding claims, wherein each fragment (F1, F2) comprises a succession of lines of matrices of dots, each matrix of dots being equivalent to an original pixel of information to be displayed and wherein each fragment is linked to the other.

5. An anti-counterfeiting element according to anyone of preceding claims, wherein data/images to be revealed are linked to the identity of the owner of the document.

6. A secure identification document comprising an anti-counterfeiting element according to anyone of preceding claims 1 to 5.

7. Method for manufacturing an anti-counterfeiting element for an identification document, said anti-counterfeiting element being able to reveal different sets of data/images, superimposed onto a background, when tilting said identification document, **characterized in that** said method comprises the following steps :

- subdividing each original pixel of information to be displayed into a matrix of X x Y dots,
- creating lines of matrices of dots, each line being intended to be used for the creation of data or images to be revealed,
- creating two fragments (F1, F2), each comprising a succession of the created lines, each fragment being linked to each other,
- printing each fragment (F1, F2) respectively on each side (S1, S2) of the identification document in such a manner that they overlap each other, through the thickness of the document, so that they enable to reveal different sets of data or images superimposed onto a background, with different darkness in comparison with the background, when tilting the identification document.

8. Method according to claim 7, wherein each basic matrix, equivalent to an original pixel, used for creating the lines of matrices, is chosen randomly amongst different possibilities of equivalent basic matrices.

9. Method according to claim 7, wherein each basic matrix, equivalent to an original pixel, used for creating the lines of matrices, is chosen according to a code linked to the identity of the owner of the document.

10. Method according to anyone of preceding claims 7 to 9, wherein the two separate fragments (F1; F2) are built according to the following steps:

- first fragment (F1) comprises a succession of lines (F1 L1, F1 L2, F1 L3, F1 L4) of matrices of dots, each odd line (F1L1, F1 L3) corresponding to successive lines of pixels of the background, and each even line (F1 L2, F1L4) being the corresponding reversed line of the just preceding odd line (F1 L1, F1 L3),
- second fragment (F2) comprises a succession of lines (F2L1, F2L2) of matrices of dots, each line comprising a code for data/image to be revealed, said code consisting in dividing the line into portions (P1, P2, P3, P4; P1', P2', P3', P4') of predetermined variable size, each portion corresponding either to a portion of a corresponding odd line of first fragment (F1,L1) or to a portion of a corresponding even line of the first fragment (F1,L2).

11. Method according to claim 7, wherein each fragment (F1, F2) is printed by means of a laser beam.

12. Method according to claim 7, wherein each fragment (F1, F2) is printed in color by means of a conventional printing process.

13. Method according to claim 12, wherein each fragment (F1, F2) is printed respectively in at least one predetermined color, in such a manner that when the two fragments overlap each other, they display additional information with a third color according to subtractive or additive synthesis.

14. Method according to claim 7, wherein at least one fragment (F1') comprises different areas of different resolution.

15. Method according to anyone of preceding claims 7 to 14, wherein the sets of data/images intended to be revealed when tilting the document, are linked to

the identity of the owner of the document.

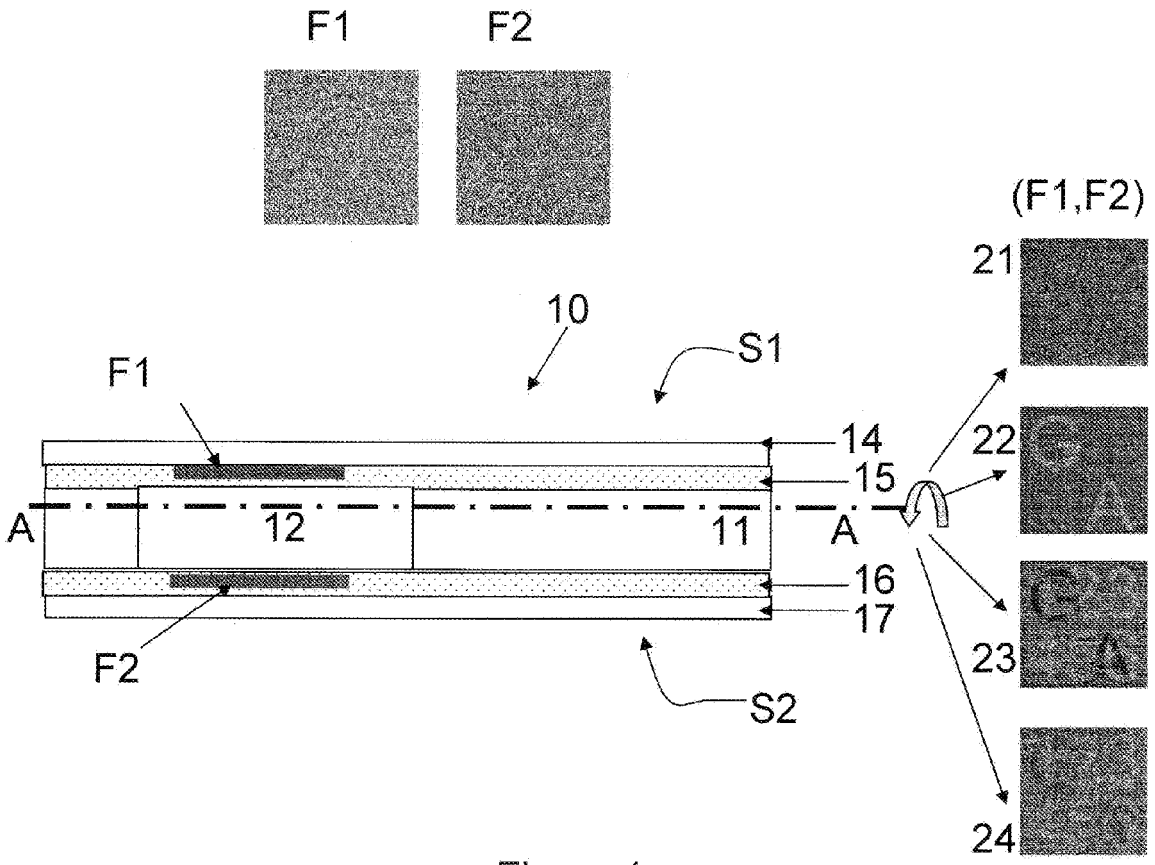

Figure 1

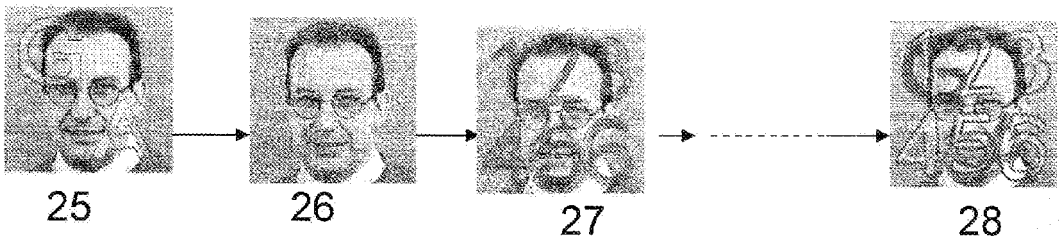

Figure 2

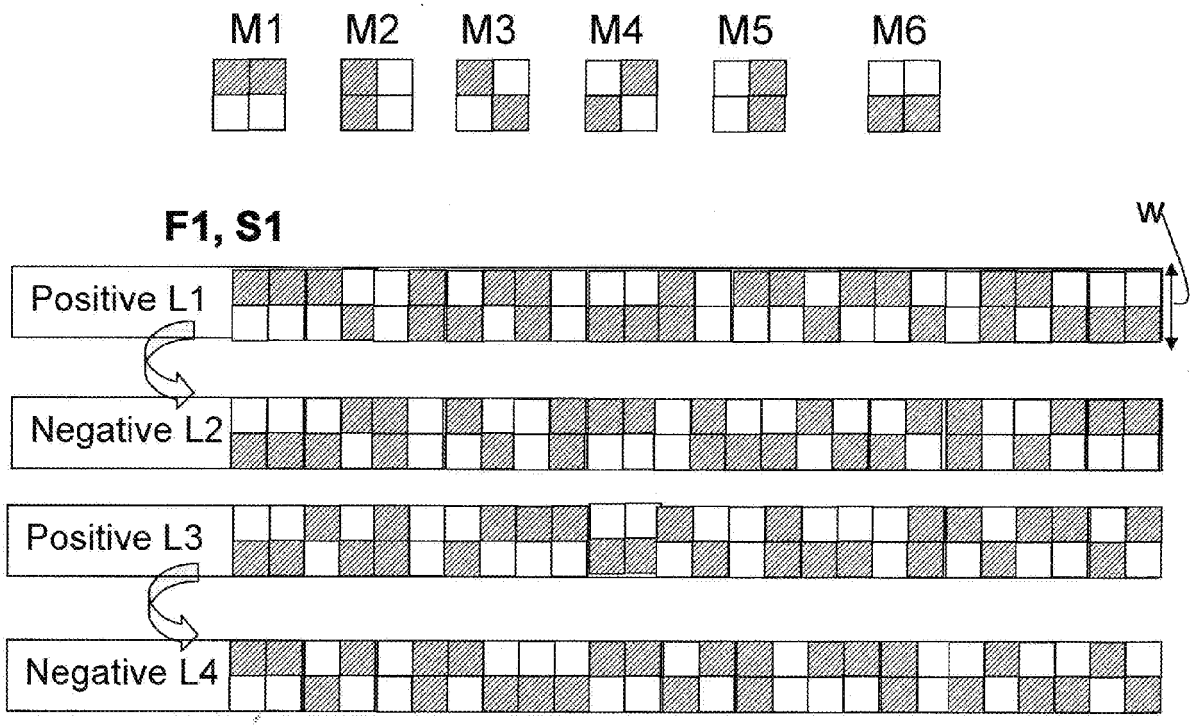

Figure 3

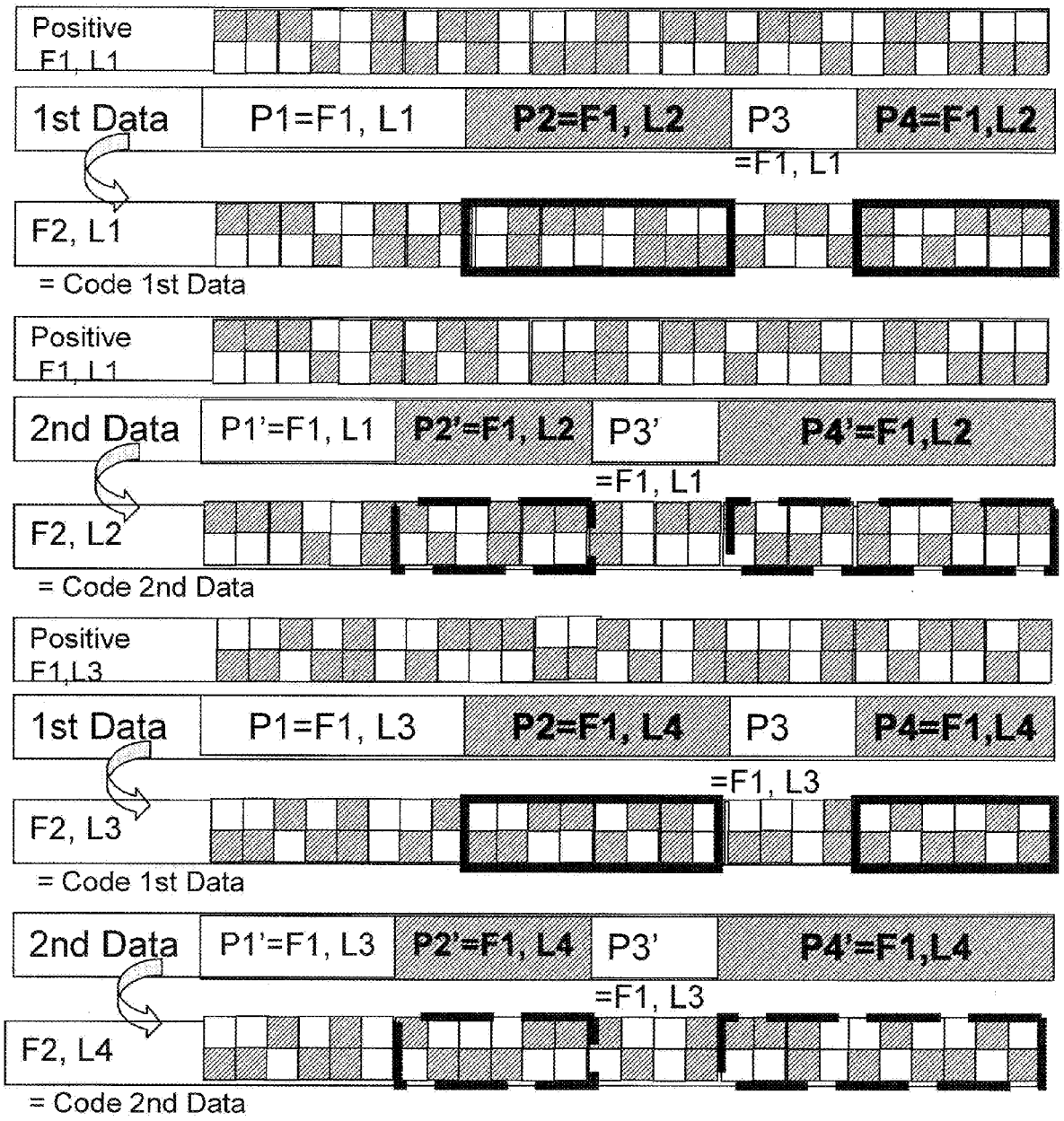
Positive
F1, L1
1st Data
P1=F1, L1
P2=F1, L2
P3
=F1, L1
P4=F1,L2
F2, L1
= Code 1st Data
Positive
F1, L1
2nd Data
P1'=F1, L1
P2'=F1, L2
P3'
=F1, L1
P4'=F1,L2
F2, L2
= Code 2nd Data
Positive
F1,L3
1st Data
P1=F1, L3
P2=F1, L4
P3
=F1, L3
P4=F1,L4
F2, L3
= Code 1st Data
2nd Data
P1'=F1, L3
P2'=F1, L4
P3'
=F1, L3
P4'=F1,L4
F2, L4
= Code 2nd Data

Figure 4

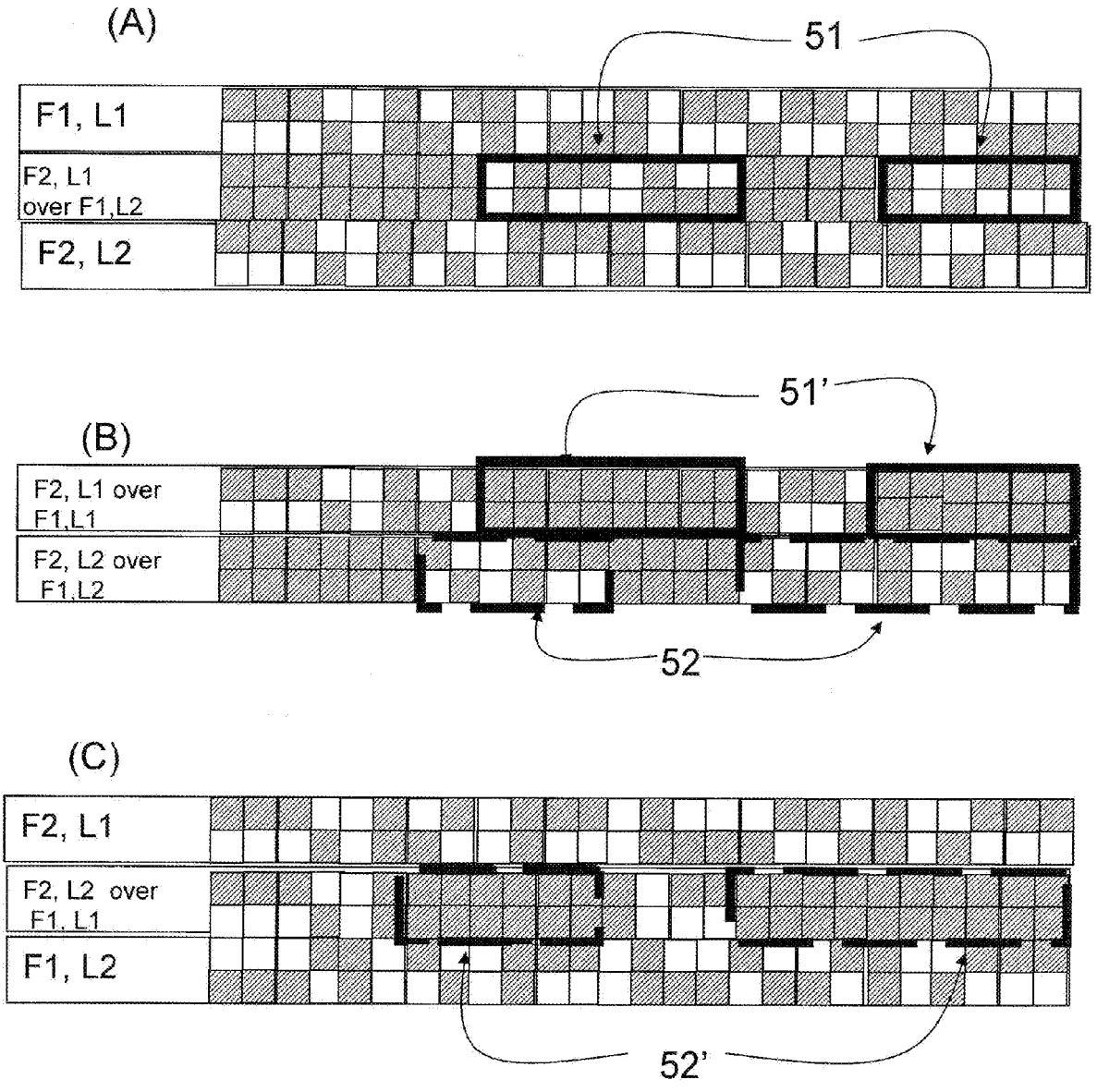
(A)
51
F1, L1
F2, L1
over F1,L2
F2, L2
(B)
51'
F2, L1 over
F1,L1
F2, L2 over
F1,L2
52
(C)
F2, L1
F2, L2 over
F1, L1
F1, L2
52'

Figure 5

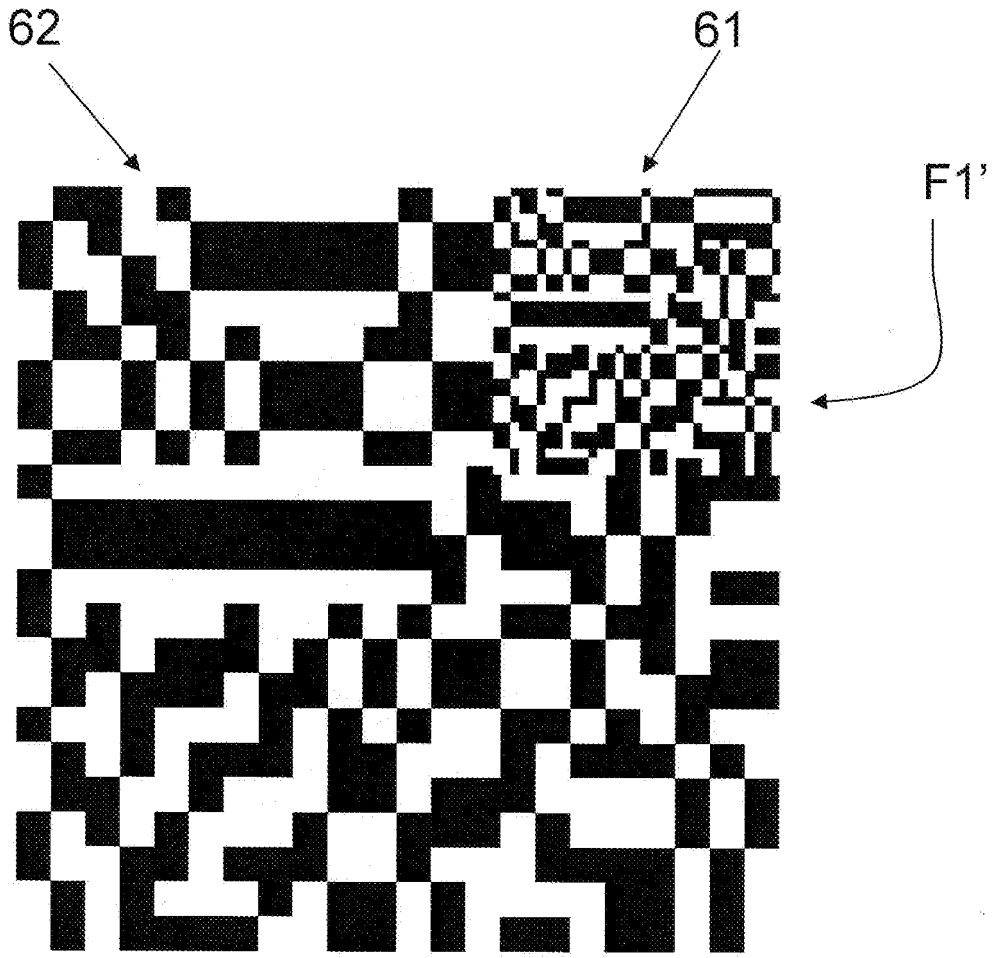

Figure 6

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 08 30 5976

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GB 2 282 563 A (CENTRAL RESEARCH LAB LTD [GB]) 12 April 1995 (1995-04-12) * pages 2-4; figures 2-5 * -----	1-15	INV. B42D15/00
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X	EP 1 886 827 A (NAT BANK OF BELGIUM [BE]) 13 February 2008 (2008-02-13) * the whole document * -----	1,7	
X	WO 03/019483 A (SHOVGENYUK MIKHAIL VASILIEVICH [UA]; BILORUS VITALII EUGENIEVICH [UA];) 6 March 2003 (2003-03-06) * abstract; figures 1-14 * -----	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

B42D
G06T
B41M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	29 June 2009	Curt, Denis

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