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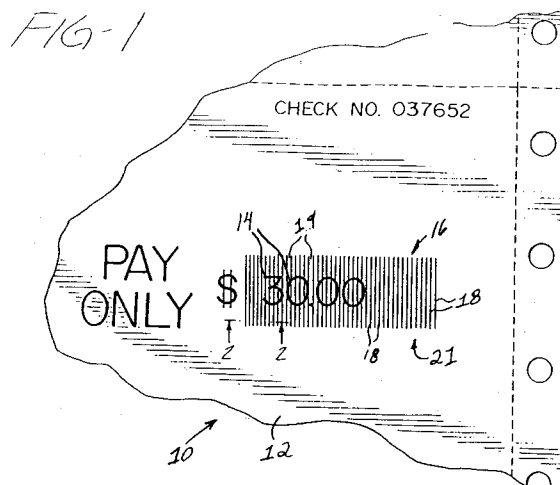
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London EC1N 6SN (GB)(54) **Security document.**

(57) A security document (10) is provided having a designated area of weakness (16) which is capable of subsequently receiving an image thereon of a predetermined amount to be paid. The area of weakness preferably comprises an area having a plurality of lines of weakening (18) formed therein. Any attempt to remove or alter the image will further weaken the area of weakness causing premature failure, thereby providing an indication of attempted alteration to the document.

**EP 0 543 528 A1**

The present invention relates to tamper resistant documents and, more particularly, to security documents having designated weakened areas for receiving an image thereon.

Documents which represent money or other value and have an added feature designed to prevent fraudulent use are known in the art as "security documents." Such documents are sometimes also referred to as "tamper resistant documents." Security documents include checks, money orders, auto titles, boat titles, birth certificates, death certificates, and like documents of value.

In the past, numerous methods have been used to protect documents which represent money or other value from alteration. In one such method, a device was used to simultaneously produce a distinctively inked and embossed image of a predetermined amount to be paid on a preselected area of a security document. The device included type having parallel serrations thereon which mated with a sawtooth platen. When the type and platen engaged with one another they acted to severely emboss the paper therebetween and further served to extract ink from an intervening ribbon to produce the inked and embossed image. This method was time consuming and, hence, was not adaptable to the speed of computer driven office machinery.

Accordingly, a need exists for a new method for producing an image on a document to protect it from alteration and which permits use of standard high speed computer driven office machinery.

This need is met by the present invention whereby a security document is produced having a designated weakened area which is capable of subsequently receiving an image in an automated printing device such as a dot matrix, a daisy wheel or a chain impact printer, or a laser, an inkjet or a thermal transfer non-impact printer. Thereafter, any attempt to remove or alter the image applied to the weakened area of the document will further weaken the area causing premature failure, thereby providing a visible indication of attempted alteration of the document.

In accordance with a first aspect of the present invention, a security document is provided and comprises a substrate of material having a given thickness and including a weakened area for subsequently receiving an image thereon. The weakened area is susceptible to failure upon attempted removal of the image subsequently received thereon.

The weakened area on the substrate may comprise a plurality of lines of weakening. The lines of weakening may be formed in a parallel pattern, a diamond-shaped pattern, or any other similar type pattern. A portion of the lines of weakening may comprise cut lines which extend

substantially through the entire thickness of the substrate. The lines of weakening may also comprise score lines which extend only partially through the thickness of the substrate. The lines of weakening may additionally comprise a combination of both cut lines and score lines. It is further contemplated that the lines of weakening may comprise a plurality of embossed lines of weakening.

The weakened area may alternatively comprise an area of reduced thickness on the substrate formed for example by calendering, grinding or abrading the surface fibers at that area. The area of reduced thickness may additionally include cut lines, score lines and/or embossed patterns formed therein.

To further improve the security of the document, a pressure-sensitive, color-forming layer may be placed on the weakened area. The color-forming layer may include a colorless color former capable of forming a color, and a color developer capable of developing the colored form of the color former on the application of pressure on the pressure-sensitive, color-forming layer. Any attempt to alter a subsequently received image by the application of pressure will result in a smudge on the weakened area which will be immediately visible.

It is additionally contemplated that the color-forming layer may comprise frangible microcapsules containing solvent only, dispersed throughout the layer together with minute particles of a colored dye, also dispersed within the layer. Any attempt at alteration will release solvent from the microcapsules, dissolving dye particles and causing penetration and spread of a visible colored solution within and on the document, thereby providing a visible indication of attempted alteration of the document.

The security document may comprise a check, money order, auto title, boat title, birth certificate, death certificate, or like document of value.

In accordance with a second aspect of the present invention, a method is provided for forming a security document. The method comprises the steps of providing a substrate of material having a given thickness, and forming an area of weakness on the substrate for subsequently receiving an image thereon. Prior to being weakened, the area for receiving the image thereon may be preprinted with a uniform solid ink color or have other indicia preprinted thereon. The area of weakness on the substrate is susceptible to failure upon attempted removal of the image subsequently received thereon, thereby providing an indication of attempted alteration of the document.

The step of forming an area of weakness may comprise the step of creating a plurality of lines of

weakening in an area on the substrate. The lines of weakening may be formed by cutting lines into the substrate which extend substantially through the entire thickness of the substrate. The lines of weakening may also be formed by creating score lines which extend only partially through the thickness of the substrate. The lines of weakening may further be formed by creating a combination of score lines and cut lines in the substrate. It is additionally contemplated that the lines of weakening may be formed by creating a pattern of embossments in the substrate.

The step of forming an area of weakness may alternatively comprise the step of reducing the thickness of the substrate at an area on the substrate by calendering, grinding or abrading the surface fibers at that area. The area of reduced thickness may additionally include cut lines, score lines and/or embossed patterns formed therein.

To further improve the security of the document, a pressure-sensitive, color-forming layer, such as described above with respect to the first aspect of the present invention, may be placed over the weakened area.

In accordance with a third aspect of the present invention, a method is provided for producing a plurality of security documents. The method comprises the steps of: providing a continuous strip of paper having a given thickness; perforating the continuous strip at spaced apart locations thereon to define two or more successive security documents; forming an area of weakness on each of the documents for subsequently receiving an inked image thereon; and, thereafter, applying an inked image on at least one of the documents over its area of weakness. The step of forming an area of weakness on each of the documents may comprise the step of creating a plurality of lines of weakening in an area on each of the documents.

According to preferred embodiments, it is an object of the present invention to provide a tamper resistant document which provides an indication of attempted alteration thereto. It is a further object of the present invention to provide a method for forming a security document wherein the document is formed having an area of weakness for subsequently receiving an image thereon. It is additionally an object of the present invention to provide a method for forming a plurality of security documents, each including an area of weakness for receiving an image thereon. Yet another object of the present invention is to provide a method for producing selected weakened areas on documents for subsequently receiving an image in a high speed printing device. These and other objects and advantages of the invention will be apparent from the following description, the accompanying draw-

ings, and the appended claims.

In order that the invention may be more readily understood, reference will now be made by example to the accompanying drawings in which:

Fig. 1 is a partial, top plan view of a security document of the present invention including an area of weakness having an image printed thereon;

Fig. 2a is a cross-sectional view taken generally along section line 2-2 in Fig. 1 showing cut lines extending partially through the entire thickness of the document;

Fig. 2b is a partial, cross-sectional view of a security document having cut lines of weakening which extend substantially through the entire thickness of the document;

Fig. 2c is a partial, cross-sectional view of a security document having lines of weakening comprising a combination of cut lines and score lines;

Fig. 2d is a partial, cross-sectional view of a security document having lines of weakening comprising a plurality of embossed lines or patterns;

Figs. 3a-3e are partial, top plan views each illustrating an area of weakness having a different pattern of weakening formed thereon;

Fig. 4 is a partial, cross-sectional view of a security document having a weakened area of reduced thickness and including score lines and cut lines formed therein;

Figs. 5a and 5b are partial, top plan views each illustrating an area of weakness having a different pattern of embossed regions formed therein;

Fig. 6 is a schematic perspective view of an automated printing device applying an image onto the area of weakness of each of a plurality of security documents;

Fig. 7 is an enlarged partial, plan view illustrating premature failure of a portion of the area of weakness after attempted alteration of the security document;

Fig. 8 is a partial, perspective view of a security document having an area of weakness covered by a pressure-sensitive, image forming layer; and,

Fig. 9 is an enlarged partial, plan view which illustrates attempted alteration of a security document having a pressure-sensitive, color-forming layer over the area of weakness resulting in a noticeable smudge appearing on the document.

Fig. 1 generally illustrates a portion of a security document 10 (also referred to herein as a tamper resistant document), for example a check, a money order, an auto title, a boat title, a birth certificate, a death certificate, or like document of

value, which comprises a sheet of paper 12 of a given thickness that bears the usual printed matter on its front surface or face. The security document 10 includes an area for receiving an image 14, such as an amount to be paid.

In accordance with the present invention, the area for receiving the image 14 comprises a weakened area 16, i.e., the area 16 is purposely weakened prior to receiving the image 14 of the amount to be paid, to thwart unauthorized alteration of the document 10. Prior to being weakened, the area 16 may have a uniform solid ink color or have other indicia preprinted thereon. As will be discussed in further detail below, if alteration of the image 14 produced on the area of weakness 16 is attempted, the area 16 will prematurely fail, thereby providing a clear indication that an attempt has been made to alter the document 10.

The area of weakness 16 may comprise a plurality of lines of weakening 18 positioned adjacent to one another with paper strips 19 interposed therebetween, as shown in Fig. 1. The lines of weakening 18 may comprise scorelines 20, as illustrated in Fig. 2a, which are cut or otherwise formed in the paper 12 and extend only partially through the thickness of the paper 12. The scorelines 20 may also extend from the upper surface 12a of the sheet of paper 12, as shown in Fig. 2a. While not explicitly shown in the drawings, the scorelines 20 may alternatively extend from the lower surface 12b of the sheet of paper 12, or may extend from both the upper and lower surfaces 12a and 12b of the paper 12.

The lines of weakening 18 may also comprise cut lines 22, as shown in Fig. 2b, which extend substantially through the entire thickness of the sheet of paper 12. The lines of weakening 18 may additionally comprise a combination of both scorelines 20 and cut lines 22, as shown in Fig. 2c. It is additionally contemplated that the lines of weakening 18 may comprise a plurality of embossed or crushed lines 23, shown in Fig. 2d, or perforated lines (not shown).

As shown in Figs. 3a-3e, the lines of weakening 18 may be formed in various alternative patterns in addition to the vertical pattern 21, shown in Fig. 1. Fig. 3a shows the lines of weakening 18 formed parallel to one another and at an angle so as to form a slant pattern 18a. In Fig. 3b, the lines of weakening 18 are formed parallel to one another in a horizontal pattern 18b, and in Fig. 3c, the lines of weakening 18 are formed in a curved pattern 18c. In Fig. 3d, the lines of weakening 18 are formed in a diamond-shaped pattern 18d, and in Fig. 3e, the lines 18 are formed in a checkered or square-shaped pattern 18e. It should be apparent that other patterns not explicitly shown or discussed herein may also be employed.

The lines of weakening 18 shown in Figs. 1, 2a-2d, and 3a-3e, may be formed in the sheet of paper 12 by employing, for example, conventional cutting, scoring or embossing tools, or by employing low profile dies. Well-known knurling tools may likewise be employed to form the diamond-shaped pattern 18d, shown in Fig. 3d, or the checkered pattern 18e, shown in Fig. 3e. It should be apparent that any other well-known process for forming closely spaced cut lines, score lines, and/or embossed patterns may be employed to form the lines of weakening 18.

It is further contemplated that the area of weakness 16 may be formed in the sheet of paper 12 by reducing the thickness of the paper 12 in that area 16, as shown in Fig. 4. This may be accomplished by grinding or abrading the surface fibers in that area 16. In addition to reducing the thickness of the sheet of paper 12, score lines 20 and/or cut lines 22 may also be formed in the area 16, as shown in Fig. 4.

It is additionally contemplated, that the area of weakness 16 may comprise a pattern of embossments, such as a plurality of circular embossed regions 24a, shown in Fig. 5a, or a plurality of diamond-shaped embossed regions 24b, shown in Fig. 5b. Other embossed patterns not explicitly shown or discussed herein may also be employed.

In one embodiment, a plurality of successive security documents 10, which are detachably connected in sequence, are produced on a continuous sheet of paper 25, as shown in Fig. 6. Each document 10 includes an area of weakness 16 for subsequently receiving an image created thereon. A computer controlled impact printer 40, such as shown in Fig. 6, which includes a printer head 42 and a standard printing ribbon 44, may be employed to form the desired printed numerals and characters on each of the documents 10. The printer 40 and the feed of the security documents 10 can be controlled automatically by the computer. After the documents 10 are printed, they can then be separated from one another via perforation lines 26. While Fig. 6 schematically illustrates use of an impact printer for creating an inked image on each of the areas of weakness 16 of the documents 10, it should be apparent that other conventional printers, such as non-impact laser printers could likewise be used to create a toned image on each of the areas 16. It should also be apparent that a plurality of separate security documents 10, each including an area of weakness 16 for subsequently receiving an image thereon, may be individually fed to a computer controlled printer (not shown) for forming the desired printed numerals and characters thereon.

As shown in Fig. 7, any attempt to alter the applied image on the area of weakness 16 of the

security document 10, such as by use of an eraser or an ink eradicator, will further weaken at least a portion of the paper strips 21 located between the lines of weakening 18, causing premature failure of one or more of the paper strips 21. The damaged paper strips 21 will of course be immediately visible. Consequently, unauthorized alteration of the inked image on the area of weakness 16 will be extremely difficult to accomplish without the alteration being clearly obvious.

In a further embodiment of the present invention, shown in Fig. 8, an area of weakness 16' is formed on a security document 10' for subsequently receiving an inked image thereon. Prior to being weakened, the area 16' may be preprinted with a uniform solid ink color or have other indicia preprinted thereon. The area of weakness 16' preferably comprises a plurality lines of weakening 18' which may comprise score lines, cut lines, or embossed lines, formed in the same manner as discussed above with regard to the lines of weakening 18. The area of weakness 16' may also include embossed patterns, similar to those shown in Figs. 5a and 5b, or may comprise an area of reduced thickness.

A pressure-sensitive, image or color-forming layer 30, such as disclosed in U.S. Patent No. 4,662,651, the disclosure of which is hereby incorporated by reference, may be placed over the area of weakness 16' in order to further improve the security of the document 10'. The color-forming layer 30 contains a first chemical substance, a developer, and a second chemical substance which is a color former. Either or both of the first and second chemical substances may be held immobilized in frangible capsules. When the capsules are broken by the application of pressure by a printer, the color former unites with the developer to form a colored material which provides a visible message as determined by the pattern of application of self-contained, or autogenous color-forming material.

In using the document 10', an impact printer, such as shown in Fig. 6, may be used to print the desired numerals and characters in the area 16', and the pressure of the printer on the capsules in the layer 30 causes the encapsulated chemical (assuming only one of the two chemicals is encapsulated) to be released and react with the other chemical to form the printed numerals and characters. Any subsequent attempt at alteration by the application of pressure of any kind, such as by an eraser 32, as shown in Fig. 9, will release more of the encapsulated chemical in layer 30, and this will react with the other chemical and form a smudge 34 around the original printing, and, of course, will be immediately visible.

It is further contemplated that the color forming layer 30 may comprise frangible microcapsules containing solvent only, dispersed throughout the layer together with minute particles of a colored dye, also dispersed within the layer. Any attempt at alteration will release solvent from the microcapsules, dissolving dye particles and causing penetration and spread of a visible colored solution within and on the document 10', thereby providing a visible indication of attempted alteration of the document 10'.

Having described the invention in detail and by reference to preferred embodiments thereof, it will be apparent that modifications and variations are possible without departing from the scope of the invention defined in the appended claims.

Claims

1. A security document protected against unauthorized alteration comprising:
 - a substrate of material (12) having a given thickness and including a weakened area (16) for subsequently receiving an image thereon, said weakened area being susceptible to failure upon attempted removal of the image subsequently received thereon.
2. A security document as claimed in claim 1, wherein said weakened area on said substrate comprises an area of reduced thickness.
3. A security document as claimed in claim 1, further comprising a pressure-sensitive, color-forming layer (30) on said weakened area.
4. A security document as claimed in claim 1, wherein said weakened area on said substrate comprises a plurality of lines of weakening (18) formed therein.
5. A security document as claimed in claim 4, wherein at least a portion of said lines of weakening (18) comprises cut lines (22) which extend substantially through the entire thickness of said substrate.
6. A security document as claimed in claim 4, wherein at least a portion of said lines of weakening (18) comprises score lines (20) which extend only partially through said thickness of said substrate.
7. A security document as claimed in claim 4, wherein a first portion of said lines of weakening comprises cut lines (22) which extend substantially through the entire thickness of

said substrate, and a second portion of said lines of weakening comprises score lines (20) which extend only partially through said thickness of said substrate.

8. A security document as recited in claim 4, wherein said lines of weakening are positioned substantially parallel to one another.

9. A security document as claimed in claim 4, wherein said lines of weakening comprise a plurality of embossed patterns of weakening.

10. A method for producing a security document comprising the steps of:

providing a substrate of material (12) having a given thickness; and

forming an area of weakness (16) on said substrate for subsequently receiving an image thereon, said area of weakness being susceptible to failure upon attempted removal of said image subsequently received thereon.

11. A method as claimed in claim 10 for producing a security document, wherein said step of forming an area of weakness on said substrate comprises the step of reducing the thickness of an area of said substrate.

12. A method as claimed in claim 10 for producing a security document, further comprising the step of applying over said area of weakness a pressure-sensitive, color-forming layer (30).

13. A method as claimed in claim 10 for producing a security document, wherein said step of forming an area of weakness comprises the step of creating a plurality of lines of weakening (18) in an area of said substrate.

14. A method as claimed in claim 10 for producing a security document, wherein said step of forming an area of weakness comprises the step of cutting lines (22) which extend substantially through said thickness of said substrate.

15. A method as claimed in claim 10 for producing a security document, wherein said step of forming an area of weakness comprises the step of creating score lines (20) which extend only partially through said thickness of said substrate.

16. A method as claimed in claim 13 for producing a security document, wherein a first portion of said lines of weakening are created by cutting lines (22) in said substrate which extend sub-

stantially through the entire thickness thereof, and a second portion of said lines of weakening are created by forming score lines (20) in said substrate which extend only partially through the thickness thereof.

17. A method as claimed in claim 13 for producing a security document, wherein said plurality of lines of weakening are substantially parallel to one another.

18. A method as claimed in claim 10 for producing a security document, wherein said step of forming an area of weakness comprises the step of embossing a plurality of patterns of weakening in an area of said substrate.

19. A method for producing a plurality of security documents comprising the steps of:

providing a continuous strip of paper (25) having a given thickness;

perforating said continuous strip at spaced apart locations thereon to define two or more successive security documents (10);

forming an area of weakness (16) on each of said documents

for subsequently receiving an image thereon; and, thereafter,

creating an image on at least one of said documents at said area of weakness.

20. A method as claimed in claim 19 for producing a plurality of security documents, wherein said step of forming an area of weakness on each of said documents comprises the step of creating a plurality of lines of weakening (18) in an area on each of said documents.

21. A tamper resistant document protected against unauthorized alteration comprising:

a substrate of material (12) having a given thickness and including a weakened area (16) for subsequently receiving an image thereon, said weakened area being susceptible to failure upon attempted removal of the image subsequently received thereon.

22. A tamper resistant document as claimed in claim 21, wherein said weakened area on said substrate comprises a plurality of lines of weakening (18) formed therein.

FIG-1

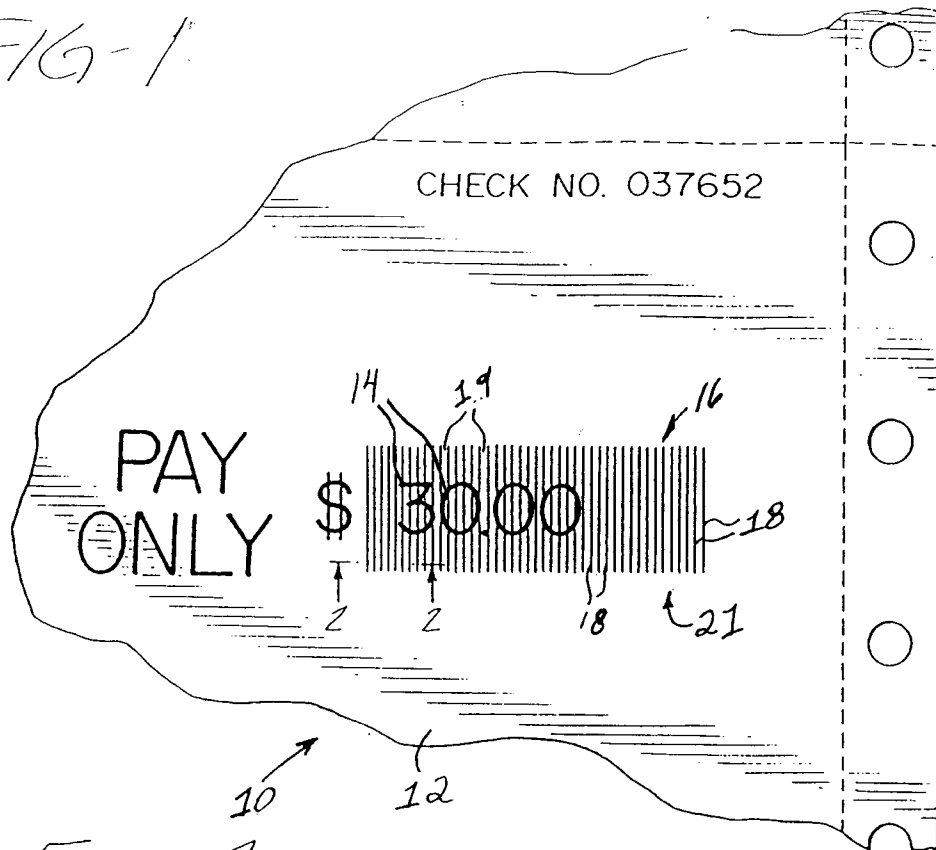


FIG-2a

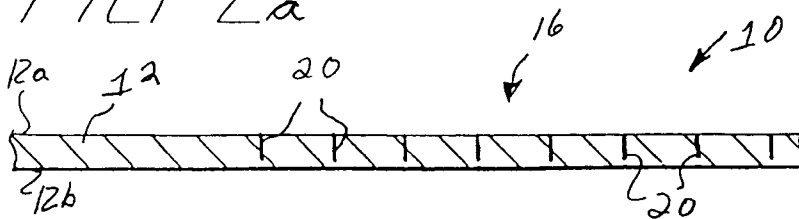


Fig. 2b

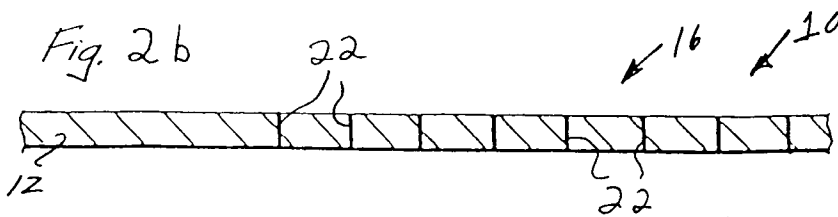


Fig. 2c

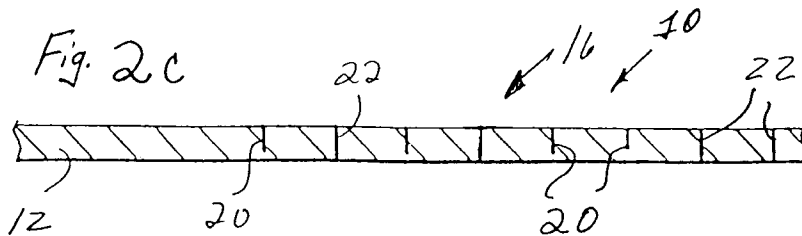


Fig 2d

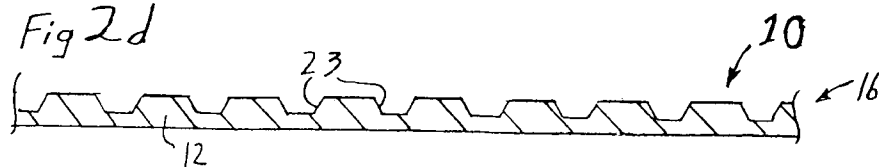


Fig. 3a

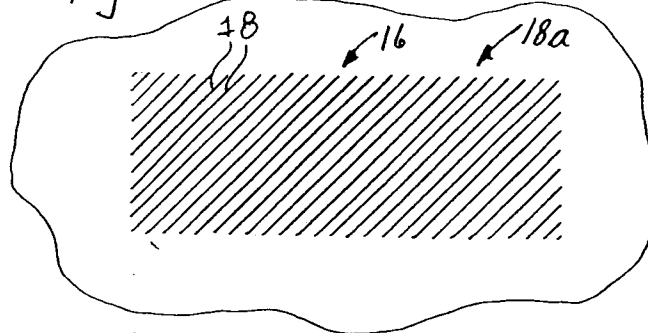


Fig. 3b

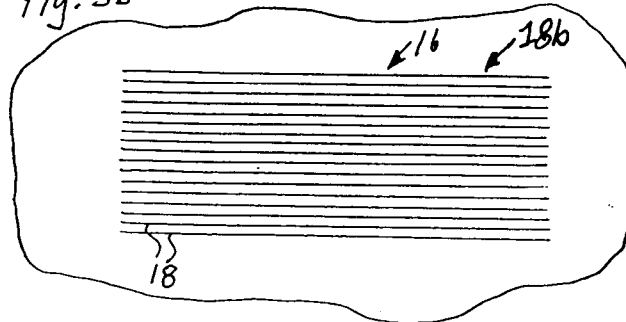


Fig. 3c

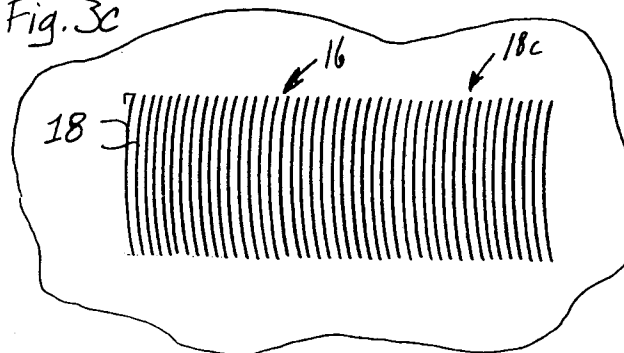


Fig. 3d

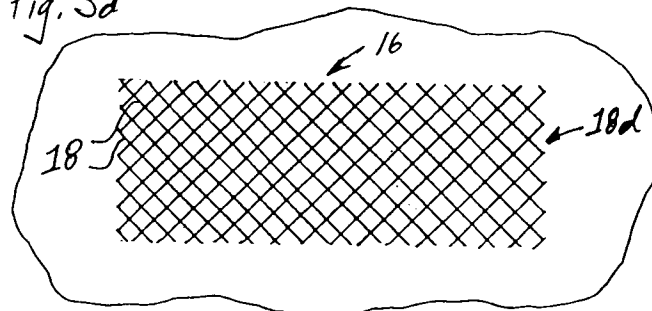
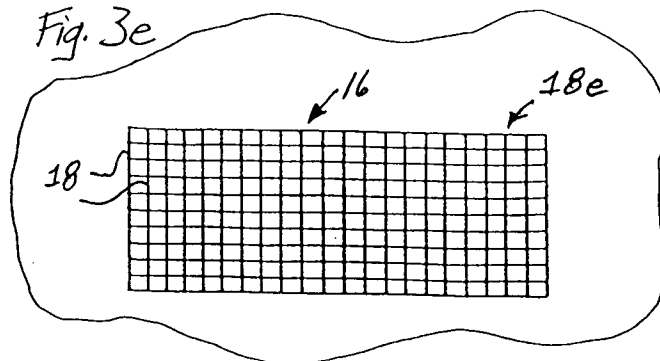


Fig. 3e



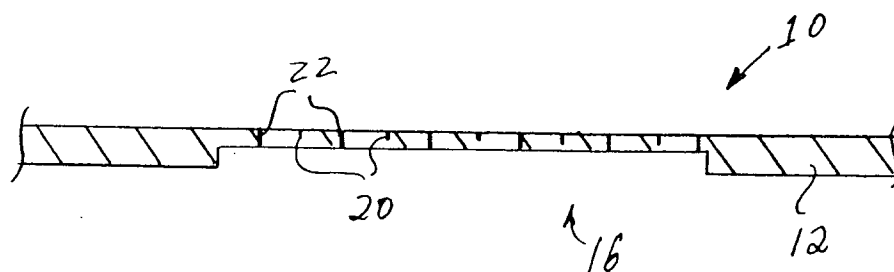


Fig. 4

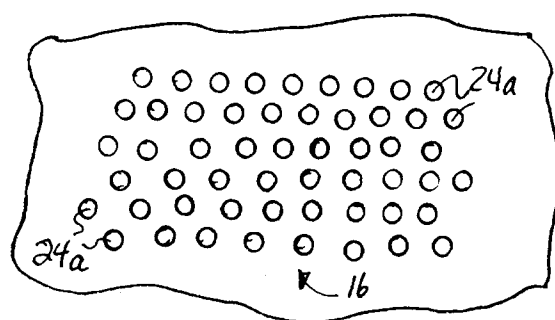


Fig. 5a

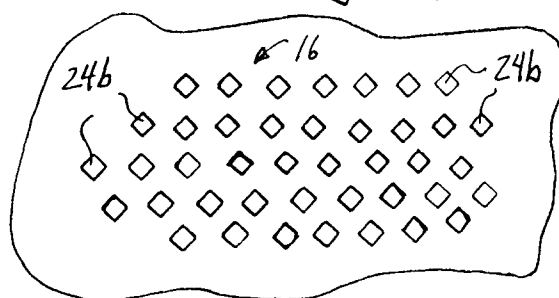


Fig. 5b

FIG-6

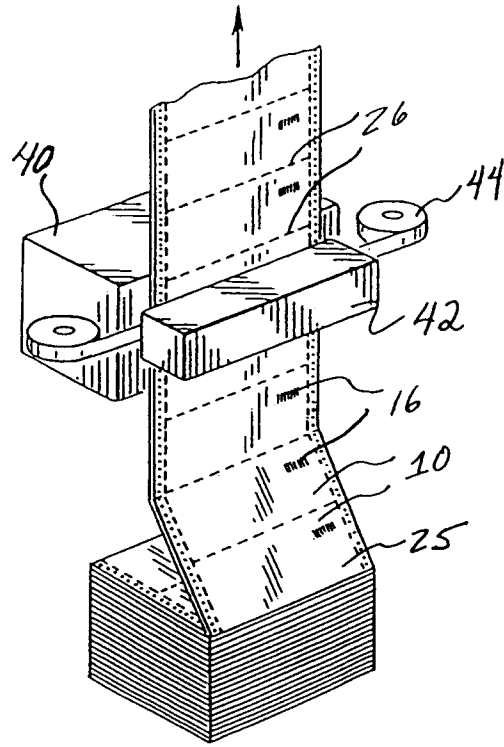
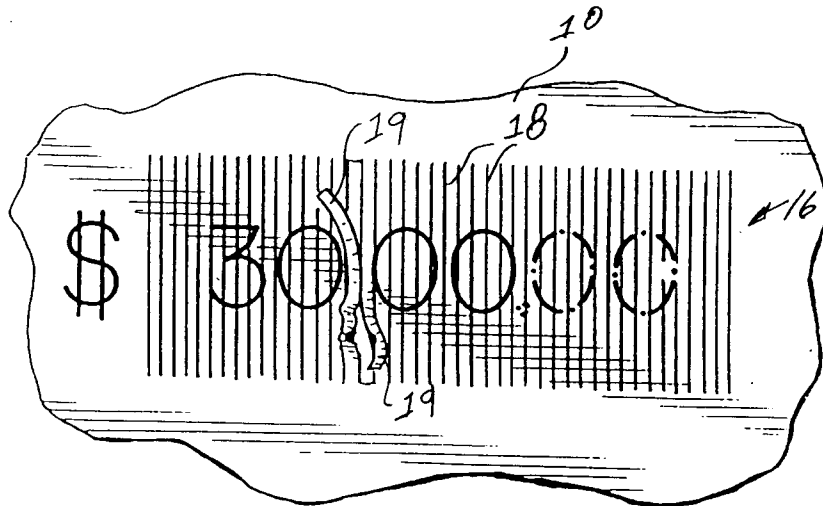
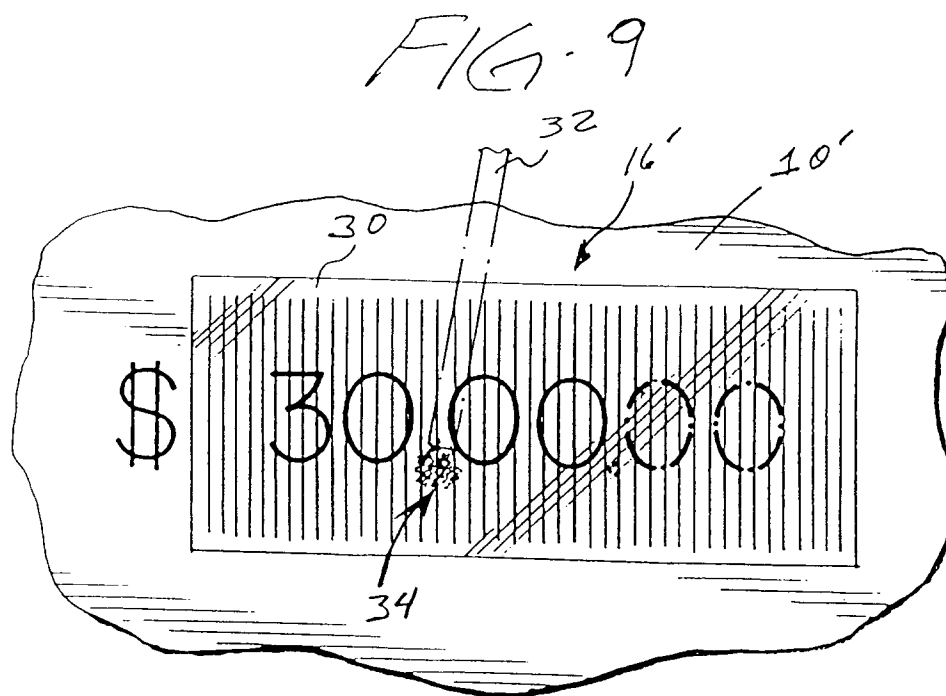
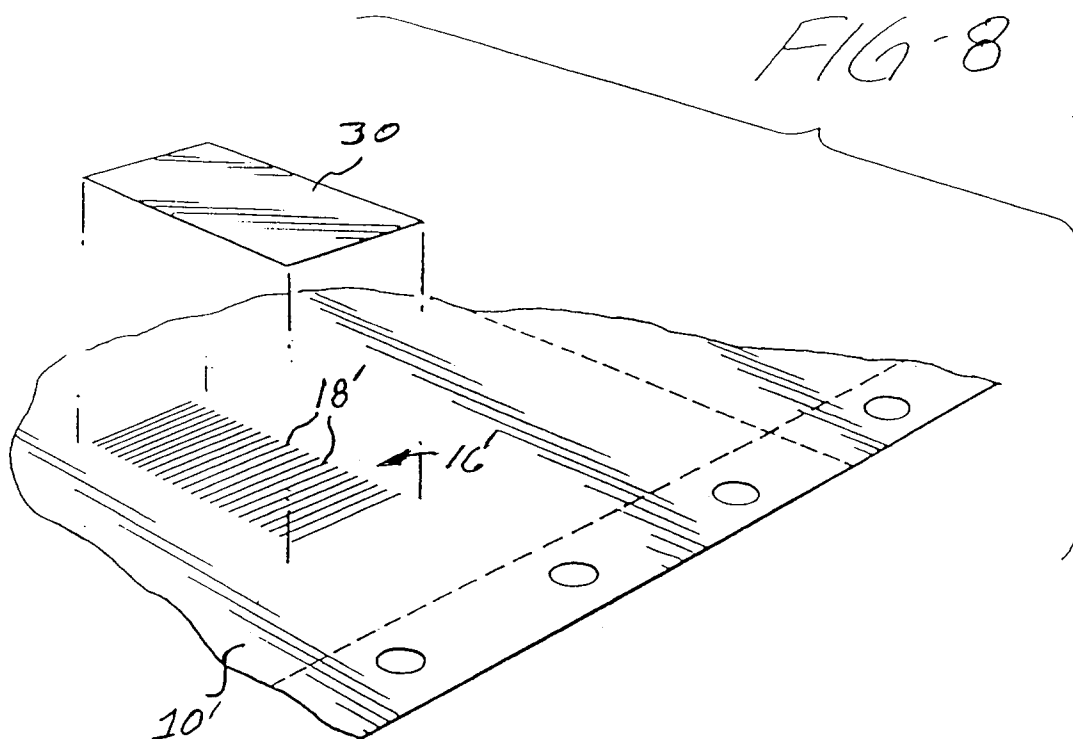


FIG-7







European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 31 0060

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-2 285 806 (CLOSE) * column 2, line 11 - column 4, line 16; figures 1,2,4 * ---	1,4,6,8, 10,13, 15,19-22	B42D15/00 B41M3/14
X	US-A-1 343 762 (CHURCHILL) * page 1, line 88 - line 99; figure 2 * -----	1,10,19, 21	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B42D B41M
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 24 FEBRUARY 1993	Examiner EVANS A.J.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			