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(54) **A method of manufacturing a security page**

(57) The present invention relates to a method of manufacturing a security page, comprising: arranging a plurality of layers (1) on top of each other. In order to produce a security document with a plurality of layers the method comprises: pressing said plurality of layers (1) towards each other in order to prevent said layers from moving, cutting (5) a hole through each of said plurality of layers (1), welding (5) said plurality of layers (1) to each other at edges of said hole, and attaching said plurality of layers (1) and said transparent material to each other by laminating.

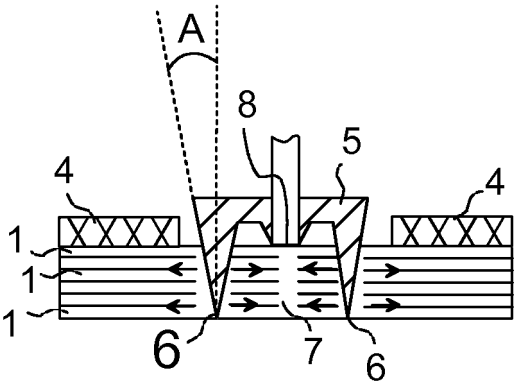

FIG. 1B

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Description

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[0001] This invention relates to manufacturing a security page of an identity card, a passport or a driver's license, for instance. The invention especially relates to a solution which makes it possible to produce a hole through a part of a security page.

[0002] One reason for producing a hole through a part of a security page, is to be able to remove non-transparent material, and to replace this non-transparent removed material with transparent material, in order to obtain a security page with a window. In the following the invention will be described by way of example by referring to manufacturing of a security page with a window, though it should be clear that the present invention may be utilized also for other purposes than to manufacturing of security pages with windows.

DESCRIPTION OF PRIOR ART

[0003] Previously there is known a security page with a transparent area or a window extending throughout the entire security page. This prior art security page has been manufactured such that a hole has been punched through one single material layer of the security page. This material layer into which the hole has been punched, is relatively thick, stiff and durable, as required by security pages.

[0004] After punching, the hole is filled with a piece of a transparent material. The transparent material is attached to the security page by laminating. Before laminating the security page can be provided with a transparent top layer and a transparent bottom layer, which both cover substantially the entire surface area of the security page. If so, the parts of the security page can be attached to each other in one single lamination step.

[0005] A problem involved with the above mentioned prior art solution is that it is suitable for use only when the hole needs to be punched through one single layer. If there is a need to produce a hole through several layers arranged on top of each other, it is not sufficient to simply punch a hole through the layers, because the layers will move out of their predetermined mutual positions while punching and while moving to a next production phase. However, in order to obtain a useful security page it is necessary that the layers of the security page are perfectly aligned with each other when they become laminated to each other.

SUMMARY OF THE INVENTION

[0006] An object of the present invention is to solve the above mentioned drawback and to provide a method which can be used for producing a hole through a plurality of layers of a security page. This object is achieved by the method of independent claim 1.

[0007] In the present invention, the layers are initially pressed towards each other in order to prevent them from moving while a hole is cut through the layers. In order to ensure that the layers remain fixed in this correct mutual position, the layers are welded to each other at the edges of the hole. In this way any movement during transfer to a subsequent production phase, for instance, can be eliminated. The weld or welds ensure that the mutual positions of the layers are exactly as intended until the lamination is carried out, where the layers are finally attached to each other.

[0008] An object of the invention is also to obtain a security page including a plurality of layers on top of each other, and from which plurality of layers material has been removed. This object is achieved by a security page according to independent claim 8.

[0009] A further object is to obtain an apparatus which can be used for processing material layers utilized in the method of claim 1 and in the security page of claim 8. This object is achieved by the apparatus of independent claim 11.

[0010] Preferred embodiments of the invention are disclosed in the dependent claims.

BRIEF DESCRIPTION OF DRAWINGS

[0011] In the following, the present invention will be described in closer detail by way of example and with reference to the attached drawings, in which

Figures 1A to 1E illustrate an embodiment for manufacturing a security page,

Figure 2 illustrates a sheet with a plurality of security pages before cutting them apart, and

Figure 3 illustrates an embodiment of a security page.

DESCRIPTION OF AT LEAST ONE EMBODIMENT

[0012] Figures 1A to 1E illustrate an embodiment for manufacturing a security page. It is assumed by way of example that the security page is for an identity card, though also a security page for a driver's license or a passport can be manufactured in a similar way. In this example the invention will be described with an embodiment where a security page with a transparent area or a window is produced. However, it should be observed that the invention can be utilized also in other connections, and not only for including transparent material in a hole cut through the layers, but instead some other material or elements can be arranged in the hole instead of transparent material.

[0013] A plurality of material layers 1 are arranged on top of each other in Figure 1A. The material of the layers can be of a suitable plastic material such as PC (Poly Carbonat), PET (PolyEthylene Terephthalate),

PVC/ABS (PolyVinylChloride/Acrylonitrile Butadiene Styrene) or PETG (PolyEthylene Terapthalate Glycol), for instance. It is also possible to use material layers which consist of combinations of different materials, such as combinations of the previously mentioned materials.

[0014] At least one of the layers 1 can be a layer suitable for laser engraving. In laser engraving energy originating from a laser beam causes the plastic material to darken at points at which energy has been directed. In this way the security page can be personalized, in other words the data (name, birthday and social security number and so on) of the holder of the identity card, can be written to this layer by utilizing a laser. One alternative is to utilize a layer of clear carbonized polycarbonate for such a purpose. The security page can, however, be personalized also in other ways, and a layer suitable for laser engraving is therefore not absolutely necessary.

[0015] One or more of the layers 1 can be provided with text, numbers, patterns or graphics by conventional printing techniques before the layers 1 are arranged on top of each other as illustrated in Figure 1A. In this way information which needs to be included in each one of the manufactured identity cards, for instance, can be included in the security page. In this way also the outer appearance, such as the colour of the security page, can be accomplished as desired.

[0016] If the intention is to embed additional elements inside the security page, such additional elements can be arranged between layers 1 once they are arranged on top of each other. In the following example it will be assumed that an antenna 3 and a microchip 2 (see Figure 3) are included between some of the layers 1 at the production phase illustrated in Figure 1A. Naturally such additional elements as an antenna and a microchip are not absolutetly necessary in all embodiments.

[0017] Once the layers 1 are arranged on top of each other as shown in Figure 1A the production phase of Figure 1B can be entered without attaching the layers 1 to each other in any way. Alternatively, it is possible to preliminary attach layers 1 to each other by spot welding in order to ensure that the layers stay in desired mutual positions. However, the layers should not be permanently attached to each other over their entire surfaces by laminating, for instance. The reason is that a more solid and secure attachment between the layers 1 and the material arranged in the hole, such as the transparent material (window), is accomplished when the separate layers and the material or element arranged into the hole, are attached to each other in one single lamination step (later on).

[0018] A clamp 4 has In Figure 1B been pressed towards an upper surface of the pile of layers 1 arranged on top of each other. The clamp 4 may consist of a metal plate with a hole in it in order to allow a cutting and welding tool 5 to access the layers 1 via said hole, for instance.

[0019] In this embodiment, an ultrasonic cutter or sonotrode is used as a combined cutting and welding tool 5, though it is naturally also possible to utilize other types of tools, such as a separate cutting tool and a separate welding tool. In Figure 1B the cutting and welding tool 5 is shown in cross section. The tool 5 has cutting edges with a V shape for generating a pressure towards the edges of the hole while cutting, as illustrated by the arrows in Figure 1B. Ultrasonic vibration of the tool 5 with a frequency in the range of 15kHz to 70kHz, for instance, causes the sharp lower edges 6 of the cutting and welding tool 5 to cut through the layers 1. As the tool penetrates deeper into the material of the layers, the wider upper base of the tool generates the pressure illustrated by the arrows towards the edges of the hole which has been cut. As a result of this pressure, the edges of the layers are welded to each other. In order to ensure that welding occurs, the side of the cutting and welding tool 5 should be inclined to form a sufficient angle A with a vertical line. An angle A of about 5° has in practical tests turned out to be sufficient.

[0020] In the example it is assumed that besides the remaining parts of the plurality of layers 1, also the waste parts are welded together by the cutting and welding tool 5. This makes it easier to handle the waste parts, because instead of a plurality of waste parts (one for each layer 1) only one single piece 7 of waste is produced and it is sufficient to remove this single waste part 7. However, naturally in another embodiment, it is not necessary to weld the waste parts to each other if an alternative and efficient way of removing these waste parts is in use.

[0021] In Figure 1C the cutting and welding tool 5 has penetrated through each layer and welded the layers and the waste parts to a single waste part 7. At this stage an orifice 8 located in the cutting and welding tool is used to create suction at the cutting and welding tool. The suction can be obtained with a compressor, for instance, that acts as a low pressure source. Due to the suction, a pressure lower than the surrounding pressure is generated between the single waste part 7 and the cutting and welding tool 5. Due to this lower pressure, the single waste part 7 attaches to the cutting and welding tool 5, and it can be lifted off with the cutting and welding tool and moved to a waste bin 9, as shown in Figure 1D. By shutting off the suction once the cutting and welding tool 5 is located above the waste bin 9, the single waste part 7 can be dropped into the waste bin. After this the cutting and welding tool 5 is ready for transfer to a next location where a hole needs to be produced.

[0022] If the intention is to only cut a hole through the plurality of layers 1 without filling this hole with any particular material or element, then the plurality of layers can, as a final method step, be attached to each other by laminating. If, however, the intention is to fill the hole with a material that is different than the material of the layers, or alternatively with an element, then this can be done as shown in Figure 1E.

[0023] Figure 1E illustrates insertion of material, in this example a transparent material 11, into a hole 10 produced in the plurality of layers 1. At this stage the layers have previously been welded to each other at the edges

of the hole 10. The transparent material 11 should have a volume substantially close to the volume of the hole 10. In this way it can be ensured that the outcome is a security page which has a uniform thickness also at the transparent section. One alternative is to use a piece of transparent material 11 that is slightly thicker that the total thickness of the plurality of layers, however, with an area which is slightly smaller than the area of the hole 10, while looking at the hole and the transparent material from above in Figure 1E. In this way, it is easy to arrange the piece of transparent material into the hole 10.

[0024] When the material has been inserted into the hole 10 as illustrated in Figure 1E, it is possible to add additional layers to the security page before lamination. One alternative is to arrange transparent upper and lower layers, that cover substantial the entire surface area of the security page.

[0025] The lamination is carried out with a raised pressure and a raised temperature. Therefore the transparent material softens, its height is reduced and area increased to efficiently fill up the hole in the layers 1. The result of the lamination is a uniform security page where each layer 1 and the transparent material 11 are permanently and securely attached to each other over their entire surfaces.

[0026] Figure 2 illustrates a sheet 12 with a plurality of security pages before cutting them apart along lines 13. In this way each security page will include one window consisting of transparent material 11.

[0027] In this embodiment it has by way of example been assumed that the production is carried out by manufacturing a sheet 12 including several security pages. However, naturally it is as an alternative possible to manufacture one security page at a time by arranging on top of each other layers which in advance have been cut into the size of one security page, in which case the cutting of the hole, the welding and the lamination is carried out from the beginning separately for each security page.

[0028] Figure 3 illustrates an embodiment of a security page 14. In Figure 3 the security page is a contactless card having a microchip 2 and an antenna coil 3 for enabling wireless communication with the microchip, which are embedded in the plastics material of the security page 14.

[0029] An area of a material which is a different material that the material of the layers of the security page, in this case a transparent material 11, extends through the entire security page 14, thus acting as a visually transparent and clear window. This window is located inside the antenna coil 3, where it is surrounded on all sides by areas of non-transparent material.

[0030] In the embodiment of Figure 3 the security page 14 has been personalized by a photo 15 of the holder and with data 16 such as the name, birthday and social security number of the holder.

[0031] The transparent material 11 can be a clear window, or alternatively it can be provided with text, numbers, graphics or a pattern. In the embodiment of Figure 3, the transparent material 11 has been provided with numbers by way of example. The numbers can be applied by laser engraving, for instance.

[0032] It is to be understood that the above description and the accompanying figures are only intended to illustrate the present invention. It will be obvious to a person skilled in the art that the invention can be varied and modified without departing from the scope of the invention.

Claims

1. A method of manufacturing a security page (14), comprising:

   arranging a plurality of layers (1) on top of each other, **characterized in that** said method comprises:

   pressing said plurality of layers (1) towards each other in order to prevent said layers from moving,
   cutting a hole (10) through each of said plurality of layers (1),
   welding said plurality of layers (1) to each other at edges of said hole (10), and
   attaching said plurality of layers (1) to each other by laminating.

2. The method of claim 1, **characterized in that** said method comprises filling said hole (10) with a transparent material (11) before said attaching by laminating.

3. The method of claim 1 or 2, **characterized in that** said method comprises
   welding waste parts of said plurality of layers (1), which waste parts are released from said plurality of layers by the cutting, to each other to form a single piece (7) of waste, and
   removing said single piece (7) of waste.

4. The method of one of claims 1 to 3, **characterized in that** said cutting and said welding are carried out in a single method step by utilizing a cutting and welding tool (5), which cuts said hole through said plurality of layers (1) and simultaneously welds said plurality of layers to each other at the edges of said hole (10).

5. The method of one of claims 2 to 4, **characterized in that** said method comprises providing said transparent material (11) with text, numbers, patterns or figures.

6. The method of one of claims 1 to 5, **characterized in that** a plurality of security pages (14) is manufactured from said plurality of layers (1) arranged on top

of each other by
carrying out said cutting and welding for each one of said plurality of security pages (14) in predetermined locations, and
cutting said plurality of layers (1) into individual security pages (14) at predetermined locations (13) after said plurality of layers (11) have been attached to each other by laminating.

7. The method of one of claims 1 to 6, **characterized in that** said method is a method for producing an information page (14) of an identity card, a passport or a driver's license.

8. A security page manufactured according to one of claims 1 to 7, **characterized in that** said security page (14) comprises:

a plurality of layers (1) attached to each other, and
an area of a material which is a different material than the material of said plurality of layers, extending throughout said plurality of layers (1).

9. A security page of claim 8, **characterized in that** said different material is a transparent material (11).

10. A security page of claim 8 or 9, **characterized in that** said security page (14) comprises:

a microchip (2) arranged between said plurality of layers (1), and
an antenna coil (3), which is connected to said microchip (2) for enabling wireless communication with said microchip, and which is arranged between said plurality of layers.

11. An apparatus for processing material layers (1) of a security page (14), **characterized in that** said apparatus comprises:

a clamp (4) for pressing a plurality of layers (1) arranged on top of each other against each other,
a cutting and welding tool (5) for cutting a hole (10) through said plurality of layers pressed against each other by the clamp (4), and for welding said plurality of layers (1) to each other at edges of said hole (10).

12. The apparatus of claim 11, **characterized in that** said apparatus comprises a waste disposal apparatus (8, 9) for removing waste parts or a waste part (7) of said plurality of layers which have been released from said plurality of layers by the cutting and welding tool (5).

13. The apparatus of claim 11 or 12, **characterized in that** said cutting and welding tool (5) is an ultrasonic cutter having cutting edges (6) with a V shape for generating a pressure towards the edges of the hole (10) while it is being cut for welding said edges of the plurality of layers (1) to each other and said waste parts to each other, respectively.

14. The apparatus according to one of claims 11 to 13, **characterized in that**
said waste disposal apparatus (8, 9) comprises an orifice (8) arranged in said cutting and welding tool (5), and
said apparatus comprises a low pressure source which is connected to said orifice (8) for generating suction at said cutting and welding tool (5) in order to remove said waste part (7) or said waste parts by utilizing the suction from said orifice.

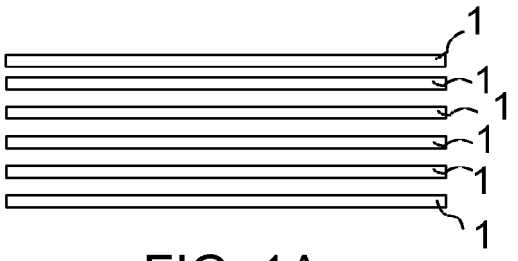

FIG. 1A

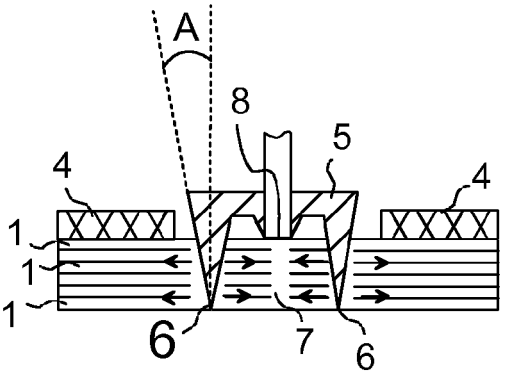

FIG. 1B

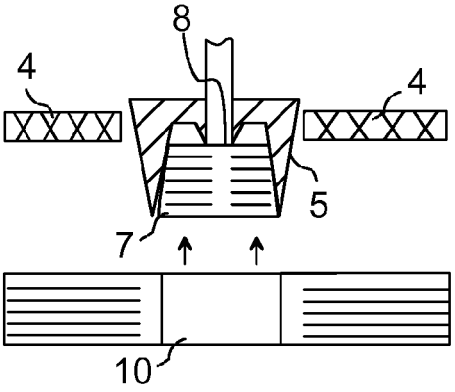

FIG. 1C

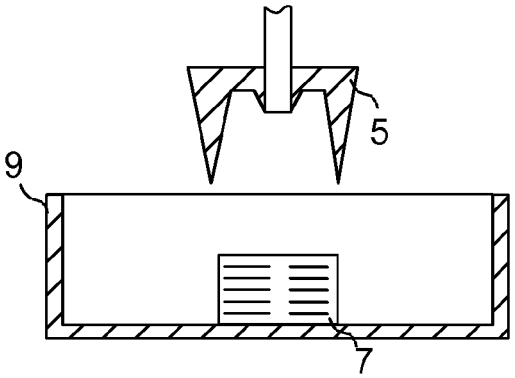

FIG. 1D

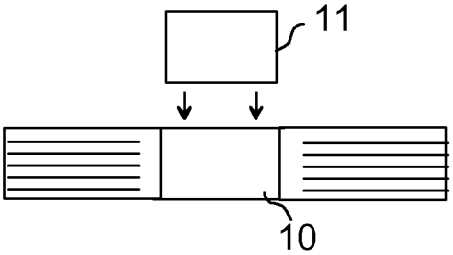

FIG. 1E

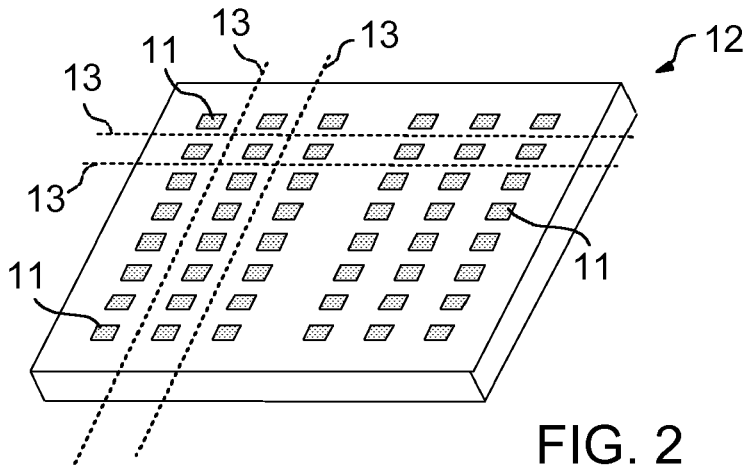

FIG. 2

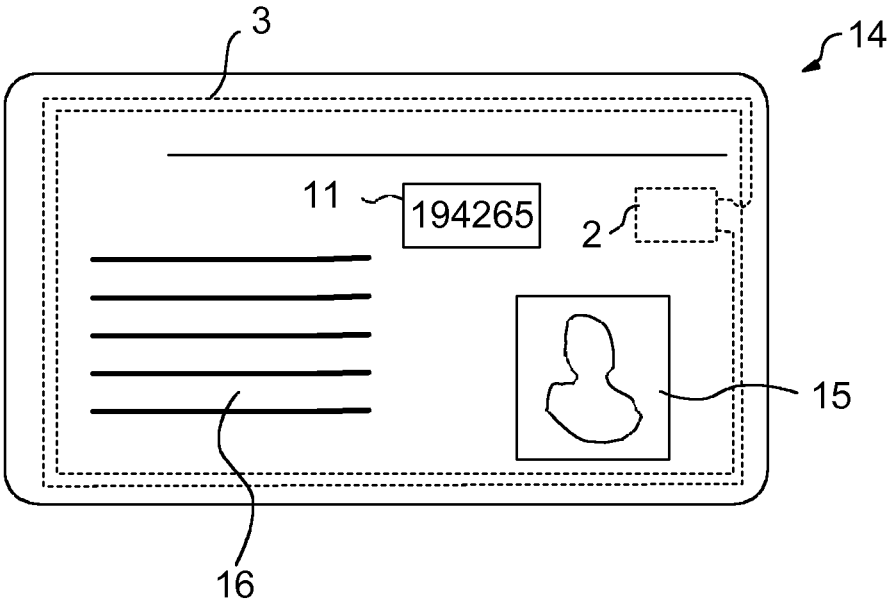

FIG. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 09 16 2538

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	27 November 2009	Dewaele, Karl

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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