



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
07.10.2020 Bulletin 2020/41

(51) Int Cl.:
B42D 25/405 (2014.01) B42D 25/24 (2014.01)

(21) Application number: **19166656.9**

(22) Date of filing: **01.04.2019**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
 Designated Extension States:
BA ME
 Designated Validation States:
KH MA MD TN

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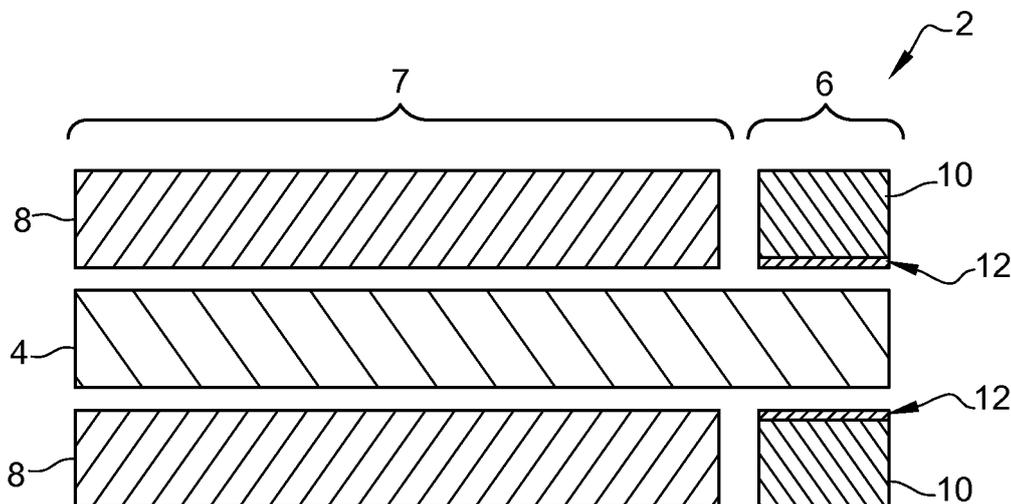
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(54) **METHOD OF PRINTING SECURITY FEATURES ON A THERMOPLASTIC SHEET**

(57) The invention relates to a method of printing a sheet (4) intended to form an attachment part (6) of a data page for an identification document, characterized in that it comprises the following steps:
 - providing a first sheet (4) made of a first thermoplastic material and intended to form the attachment part (6),
 - placing at least one second sheet (10) made of a second thermoplastic material at least locally against one face

of the first sheet (4), the at least one second sheet (10) comprising at least one security feature (12) printed on it,
 - laminating the first sheet (4) and the at least one second sheet (10) at a temperature and a pressure lower than the melting point of the second thermoplastic material and allowing to transfer the printed security feature (12) to the first sheet (4).

Fig. 1



Description

[0001] The invention relates to a multilayer structure forming a data page and intended to be inserted in an identification document, and more specifically a method of printing at least one security feature on a layer intended to be a part of the multilayer structure.

[0002] A data page (or biodata page) is a part of an identification document, such as a passport, comprising a data area including personal information of the passport holder, such as name, date of birth etc. The data page is sewn into the passport booklet using a flexible attachment part, extending beyond the data area, and called the "hinge". The data page consists of several layers, which can contain holes, and thermoplastic material, and which are laminated together. The data page can include electronic means such as a transponder coil (antenna and chip) for radio frequencies communication with a reader. It might contain a clear window (transparent window or aperture) and include security features that link the hinge to a clear window.

[0003] Consequently, it is interesting to print one or several security features, for example a secure ink, on the layer intended to form the hinge, in a portion of this layer forming the hinge and/or on a portion intended to be a layer of the data area. The printing of security features on a security document such as a passport, especially on visible areas as the hinge or the data area (through a clear window) allows to improve the safety of these documents.

[0004] Among the various printing process, some of them are more interesting. The offset printing (printing technique in which an inked image is transferred (or "offset") from a plate to a rubber blanket, then to the printing surface) is very interesting because it allows to product precise designs, especially with micro-text.

[0005] The layer forming the hinge is made of a material having good elasticity properties that allow the sewing the data page to the booklet assembly without tearing, as well as flexibility for avoiding booklet self-opening.

[0006] However, good elasticity properties of a material constituting a layer intended to form the hinge of a data page does not allow to print this latter with a large range of printing processes, for example the offset printing.

[0007] For example, a sheet made of thermoplastic polyurethane (TPU) of a thickness adapted to be inserted in a data page as explained above cannot be printed using offset printing because thermoplastic polyurethane is to flappy and soft to be directly printed (the sheet folds on itself and is then destroyed by the mechanical rollers, even when it is reinforced with a thin sheet of a stiffer material).

[0008] Therefore, it is an objective of the invention to provide a method allowing to print a large range of materials forming sheets intended to form a hinge of a data page with a large range of printing processes.

[0009] This object is achieved by providing a method

of printing a sheet intended to form an attachment part of a data page for an identification document, characterized in that it comprises the following steps:

- 5 - providing a first sheet made of a first thermoplastic material and intended to form the attachment part,
- placing at least one second sheet made of a second thermoplastic material at least locally against one face of the first sheet, the at least one second sheet comprising at least one security feature printed on it,
- 10 - laminating the first sheet and the at least one second sheet at a temperature and a pressure lower than the melting point of the second thermoplastic material and allowing to transfer the printed security feature to the first sheet.
- 15

[0010] Thus, the printed security feature is transferred and absorb from the second sheet to the first sheet during the lamination. Consequently, and regardless of the printing process used to print a security feature on the second sheet (for example by offset printing), the security feature is finally present on the first sheet. Therefore, the method allows to obtain a large range of materials forming sheets intended to form a hinge of a data page, for example made of thermoplastic polyurethane, comprising at least one printed security feature obtained using a large range of printing processes, for example offset printing. The second sheet can be removed after lamination because the temperature is lower than the melting point of the second sheet. The second thermoplastic material is consequently stable during the lamination step. Therefore, the second thermoplastic is not deform and the printing is of good quality, allowing printing of micro text, guilloche, moire effect... Whereas a printing directly on the first thermoplastic which latter is laminated and therefore deformed would lead to deformation of the printing and then bad quality, and worse durability or printing that can be more easily removed by counterfeiter.

[0011] The method of printing according to the invention can comprise one or several following characteristics:

- two second sheets made of the second thermoplastic material are placed on two opposite faces of the first sheet, at least one of the two second sheets comprising at least one security feature printed on it;
- the two second sheets comprise at least one security feature forming, after transfer to the first sheet, a single security element visible in transmitted light;
- 45 - the temperature is at least equal to a temperature 10% lower than the softening point of the first thermoplastic material, preferably equal or higher than this softening point;
- the at least one second sheet is coated with silicone on a face in contact with the first sheet;
- 50 - the first sheet is made of thermoplastic polyurethane;
- the thickness of the first sheet is comprised between 100 μm and 300 μm ;
- 55

- the at least one second sheet (10) is chosen among polyethylene terephthalate or acrylonitrile butadiene styrene;
- the thickness of the at least one second sheet is comprised between 100 μm and 300 μm ; and
- the temperature of lamination is comprised between 120°C and 200°C and the pressure of lamination is comprised between 50 and 200 N/cm², preferably between 100 and 150 N/cm².

[0012] The invention also relates to a method of manufacturing a data page intended to be inserted in an identification document, the method of manufacturing executing a method of printing according to one of the preceding claims.

[0013] The method of manufacturing according to the invention can comprise one or several following characteristics:

- the at least one security feature is only transferred on a portion of the first sheet intended to form the attachment part.

[0014] In this case, the first sheet is also a layer of a data area comprising several layers laminated together, the method of manufacturing comprises the following steps :

- providing the first sheet,
- placing at least one second sheet against one face of the first sheet on a portion of the first sheet intended to form the attachment part,
- placing at least one third sheet made of a third thermoplastic material against one face of the first sheet on a portion of the first sheet intended to form a data area,
- laminating simultaneously the first sheet, the second and the third sheet together, and
- removing the at least one second sheet.
- the at least one security feature is transferred on a portion of the first sheet intended to be a layer of a data area.

[0015] In this case, and according to a first alternative, the method of manufacturing comprises the following steps:

- executing the method of printing according to the invention,
- removing the at least one second sheet,
- placing at least one third sheet made of a third thermoplastic material against one face of the first sheet, and
- laminating the first sheet and the third sheet together.

[0016] In this case, and according to a second alternative, the method of manufacturing comprises the following steps:

- providing the first sheet,
- placing at least one third sheet made of a third thermoplastic material against one face of the first sheet on a portion of the first sheet intended to form the data area, the third sheet comprising at least one through hole,
- placing a second sheet against the third sheet, the at least one security feature of the second sheet extending on the at least one through hole,
- laminating simultaneously the first sheet, the second and the third sheet together, and
- removing the second sheet.
- according to the second alternative, the second sheet extends on a portion intended to form the data area; and
- according to the second alternative, the second sheet extends on a portion intended to form the data area and on a portion intended to form the attachment part.

[0017] We are going to describe some embodiments of the invention given as non-limiting examples in support of the attached figure on which:

- figure 1 is a section view of a construction according to an embodiment of the invention.

[0018] As mentioned above, the printing method according to the invention comprises in a first time the provision of a first sheet 4 made of a first thermoplastic material and intended to form the attachment part 6 (the hinge). Due to its function, this sheet has good elasticity properties to allow to obtain the effects listed herein above. For example, it can be made of thermoplastic polyurethane (TPU). This material has the advantage to easily adhere to polycarbonate sheets 8 which can be laminated with this latter in order to form the data area 7 of a data page. Alternatively, the first sheet 4 can be made of other thermoplastic elastomeric material, as thermoplastic elastomers based on olefin (TPO), thermoplastic copolyesters (TPE), styrene block copolymers (SBS, SEBS, SEPS, SEEPS and MBS), thermoplastic copolyamides, etc.

[0019] The first sheet 4 has advantageously, and according to its function, a thickness comprised between 100 μm and 300 μm .

[0020] The size of the first sheet 4 is more important than the sheets laminated with it to form the data page, the portion of the sheet 4 extended beyond the other sheets (from one side of those sheets) forms the attachment part 6. Such a structure is well known to one skilled in the art and will not be described in detail.

[0021] The second step consists of placing at least one second sheet 10 made of a second thermoplastic material against one face of the first sheet 4, the at least one second sheet 10 comprising at least one security feature 12 printed on it.

[0022] This second thermoplastic material is printable,

as mentioned in this step. Advantageously, it is selected to be easily printed with a large range of printing processes, for example offset printing for the reasons cited above or other processes as screen printing, etc. It is possible to print one or several security features 12 with special ink such as UV-visible ink (for instance rainbow printing).

[0023] For example, the second sheet 10 can be made of polyethylene terephthalate (PET), which is easily printable, or of acrylonitrile butadiene styrene (ABS). The use of a hard material (compare to first sheet material 4) such as polyethylene terephthalate allows to transfer the at least one printed security feature 12 to the first sheet 4 during the lamination step described after.

[0024] The second sheet 10 has advantageously a thickness comprised between 100 μm and 300 μm .

[0025] In the method according to the invention, only one second sheet 10 comprising at least one printed security feature 12 can be applied to one face of the first sheet 4 in order to transfer the printed security feature 12 on one face of the first sheet 4. Alternatively, two second sheets 10 made of the second thermoplastic material can be placed on two opposite faces of the first sheet 4, one of the two second sheets 10 or both of them comprising at least one security feature 12 printed on it. Consequently, the first sheet 4 can have one or more printed security features 12 on one or on both sides. For example, both of the two second sheets 10 can comprise at least one security feature 12, the security features 12 forming, after transfer to the first sheet (4), a single security element visible in transmitted light. For example, one second sheet 10 can comprise a security feature 12 visible using UV light or visible light, and the other second sheet 10 can comprise two security features visible using UV light only.

[0026] After the mounting of the first sheet 4 with one or more second sheets 10, this assembly is laminated at a temperature and a pressure lower than the melting point of the second thermoplastic material and allowing to transfer the printed security feature to the first sheet 4.

[0027] The lamination allows to transfer the at least one printed security feature 12 from the at least one second sheet 10 to the first sheet 4.

[0028] The lamination temperature at a specific lamination pressure is lower than the melting point of the at least one second sheet 10 in order to remove this latter after the lamination step.

[0029] For example, when the first sheet 4 is made of thermoplastic polyurethane and the at least one second sheet 10 is made of polyethylene terephthalate, the temperature of lamination can be comprised between 120°C and 200°C at a pressure of lamination comprised between 50 and 200 N/cm², preferably between 100 and 150 N/cm². In this range of temperature, the polyethylene terephthalate does not fuse and can be removed after the lamination step. When the transfer takes place on the attachment part 6, the final data page only comprised the sheet 4 in the portion forming the attachment part 6.

Polyethylene terephthalate can also be used to have a multi-layered structure which is flat and which can be easily manipulated.

[0030] Advantageously, the temperature of lamination is at least equal to a temperature 10% lower than the softening point of the first thermoplastic material, more preferably equal or higher than this softening point. This allows to facilitate the transfer of the at least one printed security feature 12 to the first sheet 4. The softening point of the material can be determined using the ring and ball method. For example, the thermoplastic polyurethane becomes softer at a lamination temperature comprised between 120°C and 180°C.

[0031] Furthermore, the at least one second sheet 10 is advantageously coated with silicone in its face comprising the at least one printed security feature 12 at contact with the first sheet 4 during the lamination step. This helps the transfer of the at least one security feature 12 which does not remain stuck to the at least one second sheet 10.

[0032] After the lamination step, the at least one security feature 12 is transferred without flakes or missing areas of ink. The first sheet 4, for example made of thermoplastic polyurethane, absorbs the ink in its entirety. The ink cannot be removed by scratching the thermoplastic material. It is better than tampon printing where the ink stays at the surface and can be removed easily.

[0033] As mentioned before, the at least one printed security feature 12 can be transferred to the attachment part 6 and/or to a data area 7 of the data page. When the first sheet 4 comprises such printed security feature 12 on the data area 7, they can be visible through at least one window (i.e. a through opening made in a layer laminated with the first sheet 4, this latter being visible through this opening).

[0034] Figure 1 illustrates a first embodiment of a multilayer structure 2 for a method of printing according to the invention.

[0035] In this embodiment, several security features 12 are printed on two second sheets 10 forming wedges (for instance, the second sheets 10 can be printed and then cut into a form of wedges), for example made of polyethylene terephthalate, and are placed on two opposite faces of a first sheet 4, for example made of thermoplastic polyurethane (the number and the nature of the second sheets 10 can be different, as well as the number of the security features 12 printed on them). The printed security features 12 can be made of visible ink, UV-visible ink, etc.

[0036] In this embodiment, the printed security features 12 are only transferred to the attachment part 6 only constituted by the first sheet 4. The data area 7 is constituted by the first sheet 4 laminated with two third sheets 8 made of a third thermoplastic material, for example of polycarbonate (the number (it is possible to have only one third sheet 8 placed against one face of the first sheet in order to obtain the data area), the nature and the disposal of these third sheets 8 can be different than

the example of figure 1).

[0037] The third sheets 8 can be made of clear and/or white material and can comprise one or more windows as mentioned above.

[0038] In order to limit the needed steps to obtain the data page, it is relevant to perform the lamination allowing to transfer the printed security features 12 and to laminate the first sheet 4 and the third sheets 8 in a single step. That is why a structure as illustrated on figure 1 is built (with a data area 7 made of the first sheet 4 combined with two third sheets 8 and an attachment part 6 made of the first sheet 4 combined with two second sheets 10). The lamination step allows the transfer of the printed security features 12 as explained above and the lamination of the first sheet 4 with the third sheets 8. If the first sheet is made of thermoplastic polyurethane, the second sheets made of polyethylene terephthalate and the third sheets made of polycarbonate, the range of temperature and the pressure enounced above allow to obtain the desired effects. The two second sheets 10 can be removed after the lamination step.

[0039] In two other embodiments not illustrated, at least one security feature 12 is transferred to the first sheet 4 in a portion intended to be a layer of a data area, with or without a transfer in the attachment part 6.

[0040] In these embodiments, the method of printing according to the invention is executed in a first time. Then, the at least one second sheet 10 is removed and at least one third sheet 8 is placed against the first sheet, for example as illustrated on figure 1. Finally, the first sheet 4 and the at least one third sheet 8 are laminated together in order to form the data page. Thus, the at least one printed security feature 12 is visible in the data area (through a clear portion of at least one third sheet 8 or through a clear window) and in the attachment part 6 if at least one printed security feature 12 is transferred on it.

[0041] In another embodiment not shown on the figures, at least one security feature 12 can also be printed in a portion intended to be a layer of a data area, with or without a transfer in the attachment part 6.

[0042] In this embodiment, two third sheets 8 are placed on both sides of the first sheet 4 (it is possible to use only one third sheet 8 on one face of the first sheet 4). These third sheets 8 comprise one or several through holes.

[0043] A second sheet 10 is placed against each third sheet 8 (two second sheets 10 with two third sheets 8), the second sheet 10 comprising at least one printed security feature 12 extending on the through hole(s). The second sheet 10 is used as "released paper" in order to prevent the first and third sheets to adhere to the lamination plates.

[0044] The structure obtained is then laminated. The first sheet 4 flows into the through hole(s) and the at least one security feature 12 is transferred on the first sheet 4. It is possible to transfer security feature(s) on the third sheets 8 during the lamination step if needed.

[0045] Finally, the second sheets 10 are removed.

[0046] Thanks to this embodiment, it is possible to transfer at least one security feature 12 to the first sheet 4 only on the through hole(s) (also called clear window as mentioned above).

5 **[0047]** The invention is not limited to the embodiments described and other embodiments will become apparent to a person skilled in the art. For example, the use of other thermoplastic materials than the ones cited herein above is possible, as the use of other printed processes to print the second sheet(s), is possible.

Nomenclature

[0048]

15 2 : multilayer structure
4 : first sheet
6 : attachment portion
7 : data area
20 8 : third sheets
10 : second sheets
12 : security features

25 **Claims**

1. Method of printing a sheet (4) intended to form an attachment part (6) of a data page for an identification document, **characterized in that** it comprises the following steps:

- 30 - providing a first sheet (4) made of a first thermoplastic material and intended to form the attachment part (6),
35 - placing at least one second sheet (10) made of a second thermoplastic material at least locally against one face of the first sheet (4), the at least one second sheet (10) comprising at least one security feature (12) printed on it,
40 - laminating the first sheet (4) and the at least one second sheet (10) at a temperature and a pressure lower than the melting point of the second thermoplastic material and allowing to transfer the printed security feature (12) to the first sheet (4).

2. Method of printing according to claim 1, wherein two second sheets (10) made of the second thermoplastic material are placed on two opposite faces of the first sheet (4), at least one of the two second sheets (10) comprising at least one security feature (12) printed on it.

3. Method of printing according to claim 2, wherein the two second sheets (10) comprise at least one security feature (12) forming, after transfer to the first sheet (4), a single security element visible in transmitted light.

4. Method of printing according to one of the preceding claims, wherein the temperature is at least equal to a temperature 10% lower than the softening point of the first thermoplastic material, preferably equal or higher than this softening point. 5
5. Method of printing according to one of the preceding claims, wherein the at least one second sheet (10) is coated with silicone on a face in contact with the first sheet (4). 10
6. Method of printing according to one of the preceding claims, wherein the first sheet (4) is made of thermoplastic polyurethane. 15
7. Method of printing according to claim 6, wherein the thickness of the first sheet (4) is comprised between 100 μm and 300 μm .
8. Method of printing according to one of the preceding claims, wherein the at least one second sheet (10) is chosen among polyethylene terephthalate or acrylonitrile butadiene styrene. 20
9. Method according to claim 8, wherein the thickness of the at least one second sheet (10) is comprised between 100 μm and 300 μm . 25
10. Method of printing according to one of claims 8 and 9, wherein the temperature of lamination is comprised between 120°C and 200°C and the pressure of lamination is comprised between 50 and 200 N/cm², preferably between 100 and 150 N/cm². 30
11. Method of manufacturing a data page intended to be inserted in an identification document, the method of manufacturing executing a method of printing according to one of the preceding claims. 35
12. Method of manufacturing according to claim 11, wherein the at least one security feature (12) is only transferred on a portion of the first sheet (4) intended to form the attachment part (6). 40
13. Method of manufacturing according to claim 12, wherein the first sheet (4) is also a layer of a data area comprising several layers laminated together, the method of manufacturing comprising the following steps : 45
- providing the first sheet (4),
 - placing at least one second sheet (10) against one face of the first sheet (4) on a portion of the first sheet (4) intended to form the attachment part (6), 50
 - placing at least one third sheet (8) made of a third thermoplastic material against one face of the first sheet (4) on a portion of the first sheet (4) intended to form a data area, 55
 - laminating simultaneously the first sheet (4), the second (10) and the third sheet (8) together, and
 - removing the at least one second sheet (10).
14. Method of manufacturing according to claim 11, wherein the at least one security feature (12) is transferred on a portion of the first sheet (4) intended to be a layer of a data area.
15. Method of manufacturing according to claim 14, the method of manufacturing comprising the following steps : 55
- executing the method of printing according to one of the claims 1 to 10,
 - removing the at least one second sheet (10),
 - placing at least one third sheet (8) made of a third thermoplastic material against one face of the first sheet (4), and
 - laminating the first sheet (4) and the third sheet (8) together.
16. Method of manufacturing according to claim 14, the method of manufacturing comprising the following steps : 60
- providing the first sheet (4),
 - placing at least one third sheet (8) made of a third thermoplastic material against one face of the first sheet (4) on a portion of the first sheet (4) intended to form the data area, the third sheet (8) comprising at least one through hole,
 - placing a second sheet (10) against the third sheet (8), the at least one security feature (12) of the second sheet (10) extending on the at least one through hole,
 - laminating simultaneously the first sheet (4), the second (10) and the third sheet (8) together, and
 - removing the second sheet (10). 65
17. Method of manufacturing according to claim 16, wherein the second sheet (10) extends on a portion intended to form the data area.
18. Method of manufacturing according to claim 16, wherein the second sheet (10) extends on a portion intended to form the data area and on a portion intended to form the attachment part (6). 70



EUROPEAN SEARCH REPORT

Application Number
EP 19 16 6656

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ANNEX TO THE EUROPEAN SEARCH REPORT
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