

ELECTRONIC PASSPORT

DESCRIPTION

Technical Field of the Invention

5 The present invention relates to an identification (ID) document, in particular a so-called electronic passport of the type having a page made of plastic material, e.g. polycarbonate, bearing the ID data of a subject.

Background

10 Various types of so-called "electronic" identification documents – in particular, passports – are known, i.e. documents embedding a chip in the form of an RFID device. In such documents the chip is housed at a polycarbonate (PC) page. The latter bears ID data of the subject, also in a different and immediately readable form obtained e.g. by printing or the so-called "*laser engraving*", and can anyhow be provided with encrypted
15 elements or authentication means such as holograms and the like.

In many of the known documents, the above-mentioned polycarbonate page is connected to the remainder of the document, which is typically in the form of a booklet, by its own extension, always made of polycarbonate, having a reduced protruding region and that is sewn, at the centre line of the booklet
20 itself, to the cover and/or the remaining pages. EP 1 380 442 and EP 1 731 328 describe documents of the hereto-mentioned type. A significant drawback of the documents described hereto is the high rigidity of the data page, making it subject to a breakage by fissuring or cracking when stressed by repeated and/or marked torsions and bendings, especially considering
25 that said page is however inserted between further pages that are extremely more flexible.

The above rigidity also makes rather critical the connection modes for connecting the data page to the remaining parts of the booklet.

30 US 2008/0284155 describes instead a passport in the form of a booklet bearing a data page, the latter manufactured by two polycarbonate layers between which a flexible layer is partially interposed. The flexible layer develops past the two polycarbonate layers, forming an extension at which the data page is sewn into the booklet.

However, in this case the connection of the data page to the remainder of the document can be not very resistant.

5 Moreover, known identification documents can generally be optimised with regard to the possibility of a counterfeiting thereof.

Summary of the Invention

Therefore, the technical problem posed and solved by the present invention is that of providing an identification document, and in particular a passport,
10 allowing overcoming the drawbacks mentioned above with reference to the known art.

Such a problem is solved by an identification document according to a first aspect. In accordance to the first aspect, there is provided an identification document in the form of a booklet, having a plurality of sheets folded or
15 foldable substantially at respective longitudinal lines so as to make the pages of the booklet, which identification document comprises: a cover sheet; an electronic data storage means embedded in said cover sheet and a data sheet distinct from said cover sheet and made by a first and a second layer of plastic material, which data sheet is arranged internally to said cover sheet
20 and defines a data page bearing identification data of a subject and a connecting page made fixed with said cover sheet, wherein said data sheet further comprises an intermediate layer of flexible material, interposed between said first and second layer made of plastic material and extending between said first and second layer at least at the longitudinal folding line,
25 and wherein said sheets are connected therebetween at the respective folding lines.

Also disclosed is a method of manufacturing said identification document according to a second aspect or a third aspect.

In accordance to the second aspect, there is provided a method of manufacturing an identification document in the form of a booklet as defined above, which document bears a plurality of sheets folded or foldable substantially at respective longitudinal lines so as to make the pages of the booklet itself, which method comprises the stages of: coupling in register, preferably by hot pressure gluing, with a strip of said flexible material on said second plastic material layer; lamination of said first plastic material layer on said second layer already coupled to said flexible layer; punching for making one or more of said data sheets into a desired size; and assembling of said data sheet with the remainder of the booklet, wherein said booklet comprises said cover sheet, distinct from said data sheet and bearing an electronic data storage means, wherein said sheets are connected therebetween at the respective folding lines, and wherein said intermediate layer of flexible material extends between said first and second layer at least at the longitudinal folding line.

In accordance to the third aspect, there is provided the method of manufacturing an identification document in the form of a booklet as defined above, which document bears a plurality of sheets folded or foldable substantially at respective longitudinal lines so as to make the pages of the booklet itself, which method comprises the stages of: (a) gluing of one flyleaf layer of said cover sheet with an inlay intermediate layer bearing an electronic data storage means and with said connecting page of said data sheet, for the obtaining of a composite layer; (b) connecting of said composite layer with further sheets of the booklet, for the obtaining of an assembled structure; and (c) gluing of said assembled structure, at said flyleaf layer, with an external layer of said cover sheet, wherein said booklet comprises said data sheet having said intermediate layer of flexible material interposed between said first and second layer of plastic material and extending between said first and second layer at least at the longitudinal folding line, and wherein said sheets are connected therebetween at the respective folding lines.

Preferred features of the present invention are disclosed below.

The present invention provides some relevant advantages. One of the main advantages consists in a flexible layer positioned at the seam region of the plastic material data sheet thus allowing an optimal connection of the latter to the remainder of the document, drastically improving the overall mechanical
5 properties of the document concerning its resistance to fracture and breakage in general. Moreover, the extension of the data sheet is glued onto the cover flyleaf, besides being sewn together to the other pages, with the advantage of enhancing the firmness of connection with the booklet.

In this respect, the data page made of homogeneous plastic material is
10 specifically conceived to be bound inside the document in the form of a booklet, remaining anyhow customisable for instance by laser engraving, and capable of bearing plural security / anti-counterfeiting elements such as to make it irreproducible.

Moreover, the arrangement of the RFID chip on the document cover in a
15 separate, uncoupled position from the data page ensures a higher security standard with respect to known-art documents containing the chip inside the same polycarbonate (PC) data page. In fact, a check of the matching of data

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recorded on the polycarbonate (PC) data page with the data stored in the RFID chip inserted in the cover guarantees the authenticity of the two main elements of the booklet and any tampering could take place only by replacing both elements.

- 5 Moreover, the method according to the invention allows a quick, simple and reliable manufacturing of the identification document.

Other advantages, features and the operation steps of the present invention will be made apparent in the following detailed description of some
10 embodiments thereof, given by way of example and not for limitative purposes.

Brief description of the Figures

Reference will be made to the figures of the annexed drawings, wherein:

- 15 ▪ Figures 1A and 1B refer to a preferred embodiment of the identification document of the present invention, showing a schematic view thereof respectively in a side perspective and in an enlarged side view (the latter with magnified thicknesses, and for greater clarity not necessarily depicted in proportion), and highlighting its structure in the form of a booklet; and
- 20 ▪ Figs. 2A to 2D and 3A to 3D show each a perspective view referring to a respective stage of assembling of the identification document of Figs. 1A and 1B.

Detailed description of preferred embodiments

25 Referring initially to Figure 1, an identification document in the form of a booklet according to a preferred embodiment of the invention is generally denoted by 1.

In the present example, the document 1 is a so-called "electronic" passport, i.e. of the type embedding a storage means capable of remotely transmitting
30 data in a wireless mode, typically an RFID chip denoted by 6 and provided with an antenna 60.

The document 1 is made of a plurality of sheets, folded at respective

longitudinal lines L and sewn (as a seam) thereamong at said lines so as to make the pages of the booklet. In the present example, the folding lines correspond to the center lines of the sheets. Thus, each sheet defines two booklet pages separated at the center line of the sheet itself (corresponding to the center line of the booklet) from the above-mentioned seam, the latter denoted by 2.

In particular, the passport 1 has a cover sheet generally denoted by 3. The latter is comprised of an external layer 31 made of fabric, preferably Bukram cloth, an intermediate layer - so-called "inlay" - 600, containing the above-mentioned chips 6 and associated antenna 60 and glued onto the external fabric layer 31, and an internal flyleaf layer 32 glued on the inlay 600. The process of gluing said three layers will be described below.

The passport 1 further has a data sheet 4, distinct from the cover sheet 3 and arranged internally to the latter in a position immediately contiguous thereto. The data sheet 4 defines a first data page and a second connecting page, respectively 401 and 402, of the passport 1.

At the first page 401, the data sheet 4 bears just identification (ID) data of a subject, typically ICAO standard ones. Such data may be printed by laser engraving, etc.

At the second page 402, the data sheet 4 is glued on the cover sheet 3, and in particular on the flyleaf sheet 32, by a gluing process that will be described hereinafter.

It will be appreciated that the second page 402 is a protruding region of the actual data page 401 that can be glued and sewn into the booklet, and that such second page 402 has an extension such as to cover all or substantially all the size of the cover page to which it is adhered.

In particular, the data sheet 4 comprises a first and a second layer of plastic material, preferably thin polycarbonate, respectively 41 and 42, between which a third layer 43 made of flexible material, preferably of polyester, is interposed.

The third flexible layer 43 extends, in the present example, only in a zone of the sheet 4 concerned by said seam 2.

Therefore, the data sheet 4 comprises, at the second connecting page 402, a further intermediate filling layer 44, arranged in a position adjacent to the

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third flexible layer 43 in order to compensate for its thickness.

Preferably, also this intermediate filling layer 44 is made of plastic material, preferably thin polycarbonate.

5 In general, both the two layers 41 and 42 and the filling layer 44 may be made also of other materials, e.g. those suitable for the manufacturing of so-called "plastic cards"

Moreover, in Figure 1 further layers 45, 46, 47 and 48 of the data page 401 are depicted, preferably them also made of polycarbonate, of a number and thickness calibrated to and suitable for specific identification demands.

10 By now, it will be better appreciated that the presence of the third flexible layer 43, which typically is laminated with all the other plastic material layers and specifically with the first and the second layer 41 and 42 in order to make the sandwich structure of the present example, reduces the rigidity of the plastic material itself at the seam and allows to obtain a composite sheet
15 that can be sewn.

Preferably, the first layer 41 contains one or more safety / anti-counterfeiting elements printed astride the seam 2. Likewise, the intermediate flexible layer 43 may contain a security hologram, always at the seam 2.

20 In particular, the data page 401 and/or the connecting page 402 may be enriched with one or more of the following security elements:

- UV litho printing with iris,
- UV fluorescent printing,
- silk-screen printing with OVI inks,
- intaglio printing,
- 25 - security hologram,
- personalization by laser engraving, and/or
- embossing with micro-writings.

The passport 1 further comprises a plurality of further internal sheets/pages, generally denoted by 5, bearing or apt to receive further data.

30 As mentioned above, the passport 1 further comprises an electronic data storage means equipped with an antenna for radio transmission, preferably

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an RFID chip element 6. In particular, as described above, chip 6 and antenna 60 are embedded in a so-called "*inlay*" layer 600, in turn embedded in the cover sheet 3.

5 In the arrangement shown, the storage means 6 is positioned at the cover sheet 3 lying oppositely to the center line of sewing with respect to the data page 401.

It will be appreciated that the option of comparing the data recorded on the data page 401 with those stored in the chip 6 guarantees the authenticity of the two main identification elements of the booklet.

10 Moreover, in a variant embodiment, inside the data page 401 it is possible to laminate a circuit acting on the transmission signal and allowing reading of the RFID chip 6 only when the booklet is open (i.e., at control and identification operations). Such a device, by cutting off the resonance frequency of the chip antenna, interrupts the communication of the chip 6
15 when the passport 1 is shut, preventing fraudulent access to sensible data contained therein.

As to the specific modes of manufacturing the data page 401 and the connecting page 402, a preferred process of manufacturing the data sheet 4
20 envisages the following stages:

- registration coupling, preferably by hot pressure gluing, of a strip of material of the flexible layer 43 on the second plastic layer 42 – all other layers 41 and 44-48 should then be assembled and fixed in registration with respect to said strip;
- 25 – lamination of layers 41, 42 (already coupled to the flexible layer 43) and 44-48, performed with shaped plates and with thicknesses calibrated to compensate for the difference in thickness between data page 401 and connecting page 402 – the lamination plates could also engrave other elements in register, such as micro-writings in relief or
30 "in negative" or other graphic elements;
- punching for making passport-sized polycarbonate data sheets provided with connecting page 402 - the final thickness of the data page 401 is preferably comprised in a range of about 0.5-0.8 mm, whereas the final thickness of the connecting page 402 is preferably

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comprised in a range of about 0.2-0.5 mm – such thicknesses guarantee a good mechanical resistance of the material without producing excessive rigidity of the booklet; and

- assembling into the booklet the data sheet 4, obtained by sewing and gluing of the connecting page 402 on the cover 3 with a cold pressure process, by using water-based polyurethane or vinyl glue – this same gluing process ensures connection between electronic inlay (6+60) and external layer 31 of the cover sheet 3.

Hereinafter, a preferred embodiment of the method of manufacturing an identification document in the form of a booklet according to the invention, and in particular of the passport 1 described hereto will be described; such method is based on a sequence of gluing stages.

The method is applied in two subsequent steps, each comprised of plural stages and respectively illustrated in Figures 2A-2D and 3A-3D.

According to a first step, in a first stage shown in Figure 2A the above-mentioned inlay sheet 600 bearing the RFID chip 6 and the antenna 60 is blocked and adhesivised, preferably with polyurethane glue or vinyl glue.

According to a second step shown in Figure 2B, the inlay layer thus adhesivised is coupled in register with the flyleaf layer 32 and such coupling is pressed in order to block it, thereby producing a composite layer denoted by 7.

Subsequently, in a third step shown in Figure 2C, the composite layer 7 is adhesivised for one-half of its surface, corresponding to the extension of a page of the passport 1.

Then, in a fourth step shown in Figure 2D, the composite layer 7 is coupled in register with the data sheet 4 and the whole is pressed in order to block the coupling between the connecting page 402 and the flyleaf layer 32, obtaining a further composite layer denoted by 8.

On the basis of the above-mentioned second step, in a fifth stage shown in Figure 3A the composite layer 8 is assembled in register with the folded sheets 5 of the booklet, obtaining an assembly denoted by 9.

In a sixth stage, shown in Figure 3B, the assembly 9 is inserted in a

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machine, known *per se*, which makes the seam 2, so as to obtain an assembled structure, it also denoted by 9.

Then, in a seventh stage shown in Figure 3C, the external layer 31 of the cover sheet 3 is adhesivised.

- 5 Finally, in an eighth stage shown in Figure 3D the cover layer 31 is coupled in register with the assembled structure 9 provided with seam 2 and the whole is pressed in order to block the coupling.

- 10 The present invention has been hereto described with reference to exemplary and non-exhaustive preferred embodiments thereof. It is understood that other embodiments might exist, all falling within the concept of the same invention, and all comprised within the protective scope of the claims hereinafter.

CLAIMS

1. An identification document in the form of a booklet, having a plurality of sheets folded or foldable substantially at respective longitudinal lines so as to make the pages of the booklet, which identification document comprises:

- 5 - a cover sheet;
- an electronic data storage means embedded in said cover sheet and
- a data sheet distinct from said cover sheet and made by a first and a second layer of plastic material, which data sheet is arranged internally to said cover sheet and defines a data page bearing identification data of a
- 10 subject and a connecting page made fixed with said cover sheet,

wherein said data sheet further comprises an intermediate layer of flexible material, interposed between said first and second layer made of plastic material and extending between said first and second layer at least at the longitudinal folding line, and

- 15 wherein said sheets are connected therebetween at the respective folding lines.

2. The identification document according to claim 1, wherein said data sheet is arranged in a position immediately contiguous to said cover sheet.

3. The identification document according to claim 1 or 2, wherein said
- 20 flexible material is or comprises polyester.

4. The identification document according to any one of the preceding claims, wherein said plastic material is or comprises polycarbonate.

5. The identification document according to any one of the preceding claims, wherein said connecting page is glued onto said cover sheet.

- 25 6. The identification document according to any one of the preceding claims, wherein said data sheet comprises, at least at said connecting page, a further intermediate filling layer, arranged in a position

adjacent to said layer of flexible material in order to compensate for the thickness thereof and preferably made of polycarbonate.

5 **7.** The identification document according to any one of the preceding claims, wherein said data sheet bears one or more anti-counterfeiting security elements, for instance one or more holograms.

8. The identification document according to the preceding claim, wherein said one or more anti-counterfeiting security elements are arranged at the longitudinal folding line.

10 **9.** The identification document according to claim 7 or 8, wherein one or more of said anti-counterfeiting security elements are arranged at said intermediate flexible layer.

10. The identification document according to any one of the preceding claims, wherein said data page has a thickness comprised in a range of about 0.5-0.8 mm.

15 **11.** The identification document according to any one of the preceding claims, wherein said connecting page has a thickness comprised in a range of about 0.2-0.5 mm.

20 **12.** The identification document according to any one of the preceding claims, wherein said electronic data storage means is provided with an antenna for radio transmission, and is preferably an RFID element.

13. The identification document according to the preceding claim, wherein said storage means is arranged at the side opposite to the folding line with respect to said data page.

25 **14.** The identification document according to any one of the preceding claims, wherein said cover sheet comprises at least one external layer made of fabric, preferably Bukram cloth, and preferably further comprises also an internal flyleaf layer.

30 **15.** The identification document according to any one of the preceding claims, wherein said sheets are sewn thereamong at the respective folding lines thereof.

16. The identification document according to any one of the preceding claims, which is a passport.

17. A method of manufacturing an identification document in the form of a booklet according to any one of the preceding claims, which document bears a plurality of sheets folded or foldable substantially at respective longitudinal lines so as to make the pages of the booklet itself, which method comprises the stages of:

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- coupling in register, preferably by hot pressure gluing, with a strip of said flexible material on said second plastic material layer;
- lamination of said first plastic material layer on said second layer already coupled to said flexible layer;
- 10 – punching for making one or more of said data sheets into a desired size; and
- assembling of said data sheet with the remainder of the booklet.

wherein said booklet comprises said cover sheet, distinct from said data sheet and bearing an electronic data storage means,

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wherein said sheets are connected therebetween at the respective folding lines, and

wherein said intermediate layer of flexible material extends between said first and second layer at least at the longitudinal folding line.

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18. The method of manufacturing an identification document in the form of a booklet according to any one of the claims 1 to 16, which document bears a plurality of sheets folded or foldable substantially at respective longitudinal lines so as to make the pages of the booklet itself, which method comprises the stages of:

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- (a) gluing of one flyleaf layer of said cover sheet with an inlay intermediate layer bearing an electronic data storage means and with said connecting page of said data sheet, for the obtaining of a composite layer;
- (b) connecting of said composite layer with further sheets of the booklet, for the obtaining of an assembled structure; and
- 30 (c) gluing of said assembled structure, at said flyleaf layer, with an external layer of said cover sheet,

wherein said booklet comprises said data sheet having said intermediate

layer of flexible material interposed between said first and second layer of plastic material and extending between said first and second layer at least at the longitudinal folding line, and

wherein said sheets are connected therebetween at the respective folding lines.