(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 384 890 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
09.11.2011 Bulletin 2011/45

(21) Application number: **10162247.0**

(22) Date of filing: **07.05.2010**

(51) Int Cl.:
B41F 13/187 *(2006.01)* ***B41M 1/10*** *(2006.01)*
B41M 3/14 *(2006.01)* ***B41N 10/04*** *(2006.01)*

(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 SE SI SK SM TR
Designated Extension States:
BA ME RS

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(54) Impression cylinder for intaglio printing and intaglio printing process

(57) There is described an impression cylinder (01) for intaglio printing of security documents, especially banknotes, comprising a cylinder body (10) carrying at least one blanket (20) on its circumference, and a packing (30) disposed between the cylinder body (10) and the blanket (20). The packing (30) exhibits at least one depression (40) whose location is selected to correspond to the location of at least a selected portion of a corresponding security element (50) having optical and/or structural properties to be preserved, which security element (50) is provided or exposed on a backside (60b) of a substrate (60) to be supported against the blanket (20) during intaglio printing, the said at least one depression (40) being designed to lead to a local reduction of the printing pressure at the location of the said at least selected portion of the corresponding security element (50).

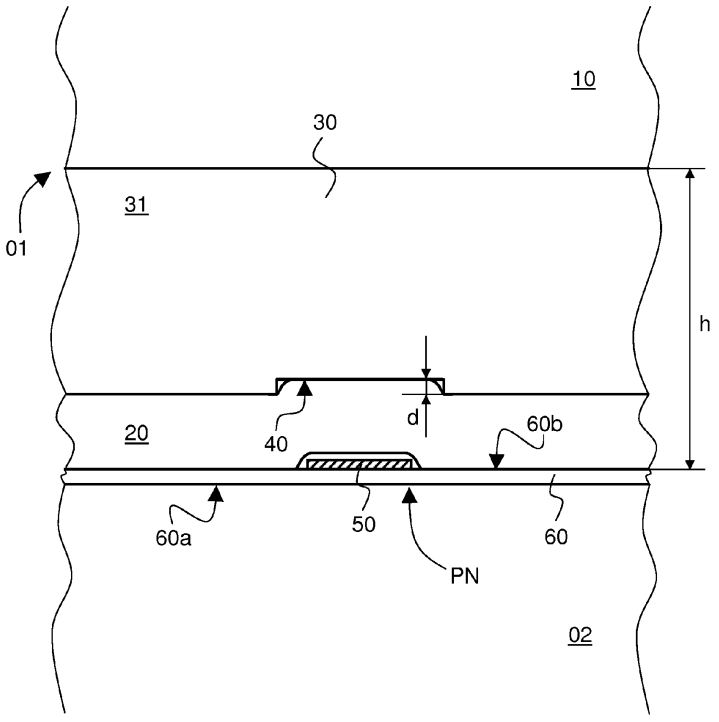

Fig. 3

EP 2 384 890 A1

Description

PREAMBLE - TECHNICAL FIELD

[0001] The present invention generally relates to an impression cylinder for intaglio printing, use thereof for carrying out intaglio printing, and a corresponding intaglio printing process.

BACKGROUND OF THE INVENTION

[0002] The expression "intaglio printing" as used herein refers to direct plate printing using engraved printing mediums (e.g. engraved plates or cylinders) as commonly applied for the production of banknotes and security documents. The expression "steel/copper engraving printing" is also sometimes used to refer to this particular printing process. Banknotes, for example, are typically provided with intaglio-printed patterns (such as portraits or other pictorial representations, latent images, guilloche patterns, denominations, bank designation, etc.) which are readily recognizable by touch due to the embossing and tactile effect inherent to intaglio printing. Intaglio printing presses for carrying out intaglio printing are for instance known from European patent applications Nos. EP 0 091 709 A1, EP 0 406 157 A1, EP 0 563 007 A1, EP 0 873 866 A1, EP 1 602 482 A1 and International Application No. WO 03/047862 A1, all in the name of the present Applicant and incorporated herein by reference.

[0003] Intaglio printing is characterized by high printing pressures applied between the intaglio printing cylinder carrying the inked intaglio printing medium (typically a plate cylinder carrying one or more intaglio printing plates) and the impression cylinder which carries or supports the substrate to be printed (typically individual sheets). These high printing pressures lead to a characteristic embossing of the substrate, resulting in embossed structures corresponding to the engravings of the intaglio printing medium, which embossed structures can be felt by touch.

[0004] The impression cylinder used in intaglio printing typically carries at least one blanket that is designed to exhibit a rough surface structure. Such rough surface structure is necessary on the impression cylinder as it ensures a proper adherence and support of the substrate to be printed onto the circumference of the impression cylinder and therefore optimum printing quality. Blankets exhibiting a rough surface structure are commercially available from suppliers such as I.T.G. GmbH Graphic Products (http://www.itg-graph.com/).

[0005] Blankets exhibiting a smooth surface structure are also available but are typically not used as blankets for impression cylinders of intaglio printing presses, but rather as blankets for inking cylinders such as for the so-called Orlof cylinder (or ink-collecting cylinder) used in indirect-inking intaglio printing presses of the type disclosed in European patent applications Nos. EP 0 091 709 A1, EP 0 406 157 A1, EP 0 563 007 A1, EP 0 873 866 A1, EP 1 602 482 A1 and International Application No. WO 03/047862 A1 already listed hereinabove. Such indirect-inking intaglio printing presses as sold by the Applicant are known under the trademark Super Orlof Intaglio®.

[0006] An inherent effect of the rough blankets used on impression cylinders for intaglio printing is that the surface structure of the blanket is impressed on the backside of the substrate being printed (i.e. the side opposite to the one which receives ink from the intaglio printing cylinder) due to the high printing pressures. This may unfortunately deteriorate the optical and/or structural properties of security elements that may have been printed, applied, embedded or otherwise provided or exposed on the backside of the substrate prior to intaglio printing of optically-variable elements, such as so-called optically variable devices (or OVD's) as supplied for instance by OVD Kinegram AG (http://www.kinegram.com/) or like optical security elements and devices, as the rough structure of the blanket is also impressed on the surface of the security elements. This may constitute a problem in case of double-sided intaglio printing where the substrates are fed twice in the intaglio printing press in order to print both sides of the substrates.

[0007] A solution to this problem may consist in applying the optically variable devices or like security features between the two intaglio printing phases and by applying the said security elements to the remaining side of the substrates that still needs to undergo intaglio printing. In this way, the security elements are brought into contact with the smooth and hard surface of the intaglio printing medium (e.g. the intaglio plate) during the subsequent intaglio printing phase.

[0008] This however does not solve the problem in all cases, especially in cases where the security elements are already embedded in the substrate or in cases where security elements are provided to both sides of the substrate prior to intaglio printing. Carrying out intaglio printing prior to application of the security elements, such as OVD's, may furthermore create problems during the subsequent application process, such as a hot-foil stamping process typically used for applying OVD's, as this process may interfere with and affect the quality of the intaglio-printed patterns already applied on the substrate.

[0009] Another solution is disclosed in European Patent Application No. EP 1 881 904 A2 which is incorporated herein by reference in its entirety. This publication discloses a blanket for intaglio printing (and a method for printing of security documents by means of intaglio printing) where the blanket exhibits a first region having a rough surface characteristic and a second region having a surface characteristic which is different from the surface characteristic of the first region, which second region is configured as a receiver for at least a section of an optically variable element. According to a first embodiment of EP 1 881 904 A2, the second region of the blanket is designed to have a surface roughness which is lower

than the surface roughness of the first region. According to a second embodiment of EP 1 881 904 A2, the second region of the blanket is designed to have a predefined depression. According to a third embodiment of EP 1 881 904 A2, the second region of the blanket is designed to have a predefined modulus of elasticity which is lower than a predefined modulus of elasticity of the first region.

[0010] While the solution disclosed in European Patent Application No. EP 1 881 904 A2 theoretically solves the above-mentioned problem, it however creates another problem in that the blanket per se has to be designed in a specific way to exhibit the necessary first and second regions of different surface characteristics. This substantially increases the complexity and manufacturing costs of the blanket which negatively affects production and maintenance costs as the blanket is not a standard consumable anymore.

[0011] As far as the first and third embodiments of EP 1 881 904 A2 are concerned, manufacturing of the required blanket is difficult for the end consumer, namely the printing plant, which does not necessarily have the necessary tools and equipment to produce such blanket. As regards the second embodiment of EP 1 881 904 A2, it is in practice improper to machine the required depressions in the blanket directly as this blanket is typically made of flexible fibrous material which is moreover relatively thin (typically 0.5 mm in thickness).

[0012] There is therefore a need for a more practical and cost-efficient solution.

SUMMARY OF THE INVENTION

[0013] A general aim of the invention is therefore to provide an improved impression cylinder for intaglio printing which solves the problem of deterioration of the optical and/or structural properties of security elements resulting from contact of the surface of the security elements with the surface of the impression cylinder during intaglio printing.

[0014] A further aim of the invention is to provide an improved intaglio printing process which similarly solves the above-mentioned problem.

[0015] Still another aim of the invention is to provide such an impression cylinder for intaglio printing that is more practical and cost-efficient to manufacture and produce, and that facilitates maintenance operations.

[0016] Yet another aim of the invention is to provide such an impression cylinder for intaglio printing which enables the use of conventional blankets.

[0017] These aims are achieved thanks to the intaglio printing press defined in the claims.

[0018] There is accordingly provided an impression cylinder for intaglio printing of security documents, especially banknotes, comprising a cylinder body carrying at least one blanket on its circumference, and a packing disposed between the cylinder body and the blanket. The packing exhibits at least one depression whose location is selected to correspond to the location of at least a selected portion of a corresponding security element having optical and/or structural properties to be preserved, which security element is provided on a backside of a substrate to be supported against the blanket during intaglio printing, the said at least one depression being designed to lead to a local reduction of the printing pressure at the location of the said at least selected portion of the corresponding security element.

[0019] Also claimed is the use of such an impression cylinder for carrying out intaglio printing of security documents, especially banknotes.

[0020] There is further provided an intaglio printing process for printing security documents, especially banknotes, wherein a backside of a substrate to be printed is brought into contact during intaglio printing with a circumference of an impression cylinder carrying at least one blanket and wherein at least one security element having optical and/or structural properties to be preserved is provided on the backside of the substrate and wherein the impression cylinder is an impression cylinder as defined above.

[0021] Further advantageous embodiments of the invention form the subject-matter of the dependent claims and are discussed below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] Features and advantages of the present invention will appear more clearly from reading the following detailed description of embodiments of the invention which are presented solely by way of non-restrictive examples and are illustrated by the attached drawings in which:

Figure 1 is a schematic and partial side view of an intaglio printing unit of an intaglio printing press showing in particular the cooperation of an impression cylinder and of an intaglio printing cylinder ;

Figure 2 is a schematic side view of a cylinder pit of the impression cylinder of Figure 1 showing an illustrative example of means for holding a blanket and associated packing onto the circumference of the impression cylinder ;

Figure 3 is a schematic transverse view illustrating the cooperation between the impression cylinder and the intaglio printing cylinder of Figure 1 at the printing nip with the blanket, packing and substrate carried by the impression cylinder being interposed between the two cylinders ; and

Figures 4A and 4B are possible variants of the packing that could be used in lieu of the packing shown in Figure 3.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0023] Within the scope of the present invention, the expression "intaglio printing cylinder" shall be understood

to designate a cylinder used for intaglio printing (especially for printing security documents such as banknotes) with at least one intaglio printing medium on its circumference. This encompasses either a cylinder with engraved intaglio patterns on its circumference or a plate cylinder carrying at least one intaglio printing plate on its circumference. In the following description, the intaglio printing cylinder is a plate cylinder carrying several intaglio printing plates on its circumference.

[0024] The expression "impression cylinder" designates the cylinder that cooperates with the intaglio printing cylinder and carries or otherwise supports the substrate to be printed.

[0025] Figure 1 schematically shows a partial side view of an intaglio printing unit of an intaglio printing press comprising an impression cylinder 01 which contacts an intaglio printing cylinder 02 designed in this example as a plate cylinder 02, the contact point between the impression cylinder 01 and the plate cylinder 02 forming a so-called printing nip PN. The impression cylinder 01 is a three-segment cylinder carrying in this example three distinct blankets 20 on its circumference. Both ends of each blanket 20 are secured by appropriate means (shown in Figure 2) located in three corresponding cylinder pits 15 distributed at regular intervals around the circumference of the impression cylinder 01. The interval between successive blankets 20 corresponds to the interval between successive substrates (in this case individual sheets) to be printed (not shown in Figure 1), which substrates are being transferred to the impression cylinder 01 at an upstream portion with respect to the printing nip PN by means of a suitable sheet transfer mechanism comprising in this particular example a transfer cylinder 04 acting as sheet in-feed. As shown by the arrow in Figure 1, the impression cylinder 01 rotates in the clockwise direction and brings the successive substrates from the transfer cylinder 04 past the printing nip PN where the substrates are printed, and to a sheet delivery system 05 by means of which the freshly-printed substrates are taken away from the impression cylinder 01 to be delivered past drying units to suitable delivery piles (not illustrated).

[0026] In the illustrated example, the plate cylinder 02 is also designed as a three-segment cylinder and accordingly carries three distinct intaglio printing plates on its circumference, which intaglio printing plates are likewise secured at both ends thereof by suitable plate clamping means located in three corresponding cylinder pits also shown in Figure 1 but not referenced. As shown by the arrow in Figure 1, the plate cylinder 02 rotates in the counter-clockwise direction.

[0027] The intaglio printing plates carried by the plate cylinder 02 are conventionally inked by means of a suitable inking system which is not illustrated in Figure 1. Different types of inking systems are possible including indirect inking systems as taught in European patent applications Nos. EP 0 091 709 A1, EP 0 406 157 A1, EP 0 563 007 A1, EP 0 873 866 A1, EP 1 602 482 A1 and International Application No. WO 03/047862 A1, which publications were introduced in the preamble hereof.

[0028] Figure 1 further shows a wiping roller assembly 03 contacting the surface of the plate cylinder 02. This wiping roller assembly 03, which will not be described in detail here, is used to wipe the surface of the intaglio printing plates which have been suitably inked by means of the inking system upstream of the wiping roller assembly 03. The wiping roller assembly 03 removes the excess of ink outside of the engravings of the intaglio printing plates and presses the inks into the engravings to ensure proper printing quality before the intaglio printing plates are brought into contact with the surface of the substrates to be printed. An illustrative example of a wiping roller assembly 03 is disclosed in International Application No. WO 2007/116353 A1 in the name of the present Applicant, which publication is incorporated herein by reference.

[0029] Figure 2 schematically shows an enlarged view of one of the cylinder pits 15 of the impression cylinder 01 of Figure 1. As illustrated in Figure 2, a holding system 25 is provided to ensure adequate support of the blankets 20 onto the circumference of the impression cylinder 01. Packing 30 is interposed between each blanket 20 and a cylinder body 10 of the impression cylinder 01, a leading end 20a of the blanket 20 and a leading end 30a of the packing 30 being both held and secured by means of a clamping bar 26. A rotatable shaft 27 for holding a trailing end 20b of the blanket 20 is further provided, which shaft comprises in this example a slit into which the trailing end 20b of the blanket 20 is inserted. Rotation of the shaft 27 in the counter-clockwise direction ensures proper tensioning of the blanket 20 onto the impression cylinder 01. In this example the trailing end 30b of the packing 30 is not held by the shaft 27, the length of the packing 30 being selected in such a way that it ends at the portion where the cylinder pit 15 starts.

[0030] Figure 3 schematically shows a transverse view (i.e. a view taken along a plane intersecting the printing nip along the contact line between cylinders 01, 02) illustrating the cooperation between the impression cylinder 01 and the intaglio printing cylinder 02 of Figure 1 at the printing nip PN. One recognizes the already described cylinder body 10 carrying the packing 30 and blanket 20 and the intaglio printing cylinder 02 itself (the intaglio printing plates carried by the intaglio printing cylinder 02 and associated engravings are not illustrated for the sake of simplicity).

[0031] Also shown in Figure 3 is a substrate 60 with a front side 60a contacting the surface of the intaglio printing cylinder 02 (i.e. the surface of the intaglio printing plates) and a backside 60b contacting the surface of the blanket 20. As illustrated a security element 50 having optical and/or structural properties to be preserved is printed, applied, embedded or otherwise provided or exposed on the backside 60b of the substrate 60. Such security element 50 may in particular be an optically-variable device (or "OVD") or the like, including for instance security elements embedded in the thickness of the sub-

strate 60 and exposed on at least the backside 60b thereof, such as windowed security threads.

[0032] In order to preserve the optical and/or structural properties of the security element 50 (or of at least a selected portion thereof), the packing 30 is provided with at least one depression 40 on its surface whose location is selected to correspond to the location of at least a selected portion of the corresponding security element 50.

[0033] While only one security element 50 is illustrated in Figure 3 it shall be appreciated that a plurality of such security elements 50 may be provided on the backside 60b of the substrate 60, typically in a matrix like arrangement and that there would accordingly be a corresponding number of depressions 40 on the surface of the packing 30 at corresponding locations.

[0034] In Figure 3, the packing 30 is shown as being constituted of only a single packing sheet 31. It will however be appreciated that the packing 30 may comprise more than one packing sheet (see for instance the variants of Figures 4A and 4B).

[0035] The depression 40 exhibits a selected depth (d) designed to lead to a local deformation of the blanket 20 and therefore a local reduction of the printing pressure applied by the impression cylinder 01 at the location of the selected portion of the corresponding security element 50. In this way, the optical and/or structural properties of the selected portion of the security element 50 can be preserved.

[0036] Tests carried out by the Applicant have shown that a selected depth (d) of 100 microns or less, preferably of 60 to 80 microns, is suitable. This assumes standard printing pressures being applied between the impression cylinder and the intaglio printing cylinder. A greater depth (d) might be necessary if the printing pressures happen to be greater than the standard levels.

[0037] To ensure proper and optimum printing quality and accuracy, a combined thickness (h) of the blanket 20 and of the packing 30 outside of the location of the depression(s) 40 is to be kept constant. This combined thickness (h) is preferably of 2 mm. In that context, a thickness of the blanket 20 is preferably of 0.5 mm meaning that the thickness of the packing 30 should be of 1.5 mm.

[0038] As shown in the example of Figure 3, the depression 40 is provided within part of the thickness of the packing sheet 31 which has a greater thickness than the required depth (d) of the depression 40. This also applies to the variant shown in Figure 4B where the packing 30 consists of two packing sheets 34, 35, the upper packing sheet 34 similarly having a greater thickness than the required depth (d) of the depression 40.

[0039] The depression 40 may be formed by any suitable technique. A suitable and preferred technique may consist in engraving the relevant packing sheet by mechanical engraving using an engraving tool or by laser engraving provided the relevant packing sheet is made of or comprises a suitable laser-engravable layer.

[0040] Alternatively, as illustrated in Figure 4A, the depression 40 may be formed by cutting a through opening in a first packing sheet 32 having the same thickness as the required thickness (d) of the depression 40, at least a second packing sheet 33 being provided underneath the first packing sheet 32 in order to achieve the required packing height. More than one packing sheet may be provided under the first packing sheet 32 if necessary.

[0041] The variant of Figure 4B which has already been briefly discussed is similar to the first embodiment of Figure 3 in that the depression 40 is formed within part of the thickness of a packing sheet 34 which has a greater thickness than the required depth (d) of the depression 40. In this example, however, at least an additional packing sheet 35 is provided underneath the first packing sheet 34.

[0042] As mentioned, the packing 30 may comprises at least two packing sheets as illustrated in Figures 4A and 4B, or even more than two if that is necessary or appropriate. In such case, it is preferable that only the uppermost packing sheet is provided with the necessary depression(s) 40 as this only requires a suitable design or machining of a single packing sheet.

[0043] A fundamental advantage of the proposed solution with respect to the known solution is that a conventional blanket exhibiting a single rough surface characteristic can be used. In addition, no special treatment or processing of the blanket as such is necessary meaning that commercially available and standard blankets can be used.

[0044] The manufacturing and maintenance costs can furthermore be kept at a very low level as packing material hardly impacts on the overall costs and can be chosen amongst packing materials that are easy to procure, process and replace.

[0045] It will evidently be appreciated that the above-described impression cylinder can be used for carrying out intaglio printing of security documents, especially banknotes.

[0046] It will furthermore be appreciated that the above-description is also directed to an intaglio printing process for printing security documents, especially banknotes, wherein a backside of a substrate to be printed is brought into contact during intaglio printing with a circumference of an impression cylinder carrying at least one blanket, wherein at least one security element having optical and/or structural properties to be preserved is provided or exposed on the backside of the substrate, and wherein the impression cylinder is an impression cylinder as described hereinbefore.

[0047] Various modifications and/or improvements may be made to the above-described embodiments without departing from the scope of the invention as defined by the annexed claims. For instance, the invention is equally applicable to the printing of substrates formed of individual sheets or of successive portions of a continuous web.

LIST OF REFERENCES USED IN THE FIGURES AND SPECIFICATION

[0048]

01 impression cylinder

02 intaglio printing cylinder / plate cylinder

03 wiping roller assembly

04 transfer cylinder (sheet in-feed)

05 sheet delivery system

10 cylinder body of impression cylinder 01

15 cylinder pit of impression cylinder 01

20 blanket

20a leading end of blanket 20

20b trailing end of blanket 20

25 holding system for holding blanket 20 onto cylinder body 10

26 clamping bar for clamping leading end 20a of blanket 20 together with the leading end 30a of the packing 30

27 rotatable shaft for holding trailing end 20b of blanket 20 and tensioning of the blanket 20

30 packing

30a leading end of packing 30

30b trailing end of packing 30

31 packing sheet (Figure 3)

32 first (upper) packing sheet (Figure 4a)

33 second (lower) packing sheet (Figure 4a)

34 first (upper) packing sheet (Figure 4b)

35 second (lower) packing sheet (Figure 4b)

40 depression in packing 30

50 security element having optical and/or structural properties to be preserved (e.g. optically-variable element, hologram, etc.)

60 substrate (e.g. sheet or web)

60a front side of substrate 60 that is brought in contact with the intaglio printing cylinder 02

60b backside of substrate 60 carrying the optically-variable element that is brought in contact with the blanket 20 of the impression cylinder 01

d depth of depression 40

h combined thickness of blanket 20 and packing 30 outside of the location of the depression 40

Claims

1. An impression cylinder (01) for intaglio printing of security documents, especially banknotes, comprising a cylinder body (10) carrying at least one blanket (20) on its circumference, and a packing (30) disposed between the cylinder body (10) and the blanket (20),
characterized in that the said packing (30) exhibits at least one depression (40) whose location is selected to correspond to the location of at least a selected portion of a corresponding security element (50) having optical and/or structural properties to be preserved, which security element (50) is provided or exposed on a backside (60b) of a substrate (60) to be supported against the said blanket (20) during intaglio printing, said at least one depression (40) being designed to lead to a local reduction of the printing pressure at the location of the said at least selected portion of the corresponding security element (50).

2. The impression cylinder (01) as defined in claim 1, wherein the said at least one depression (40) exhibits a depth (d) of 100 microns or less, preferably of 60 to 80 microns.

3. The impression cylinder (01) as defined in claim 1 or 2, wherein the said at least one depression (40) is provided within part of the thickness of a packing sheet (31; 34) having a greater thickness than a required depth (d) of the said at least one depression (40).

4. The impression cylinder (01) as defined in claim 1 or 2, wherein the said at least one depression (40) is provided as a through opening in a first packing sheet (32) having the same thickness as a required depth (d) of the said at least one depression (40) and wherein at least a second packing sheet (33) is provided underneath the first packing sheet (32).

5. The impression cylinder (01) as defined in any one of the preceding claims, wherein said packing (30) comprises at least two packing sheets (32, 33; 34,

35).

6. The impression cylinder (01) as defined in claim 5, wherein only the uppermost packing sheet (32; 34) is provided with said at least one depression (40).

7. The impression cylinder (01) as defined in any one of the preceding claims, wherein a combined thickness (h) of the blanket (20) and of the packing (30) outside of the location of said at least one depression (40) is 2 mm.

8. The impression cylinder (01) as defined in claim 7, wherein a thickness of the blanket (20) is 0.5 mm.

9. The impression cylinder (01) as defined in any one of the preceding claims, wherein the said at least one depression (40) is provided by engraving or cutting.

10. The impression cylinder (01) as defined in claim 9, wherein said packing (30) comprises or is made of an engravable layer, preferably a laser-engravable layer, which is engraved to form said at least one depression (40).

11. The impression cylinder (01) as defined in any one of the preceding claims, wherein said blanket (20) exhibits a single rough surface characteristic.

12. Use of the impression cylinder (01) as defined in any one of the preceding claims for carrying out intaglio printing of security documents, especially banknotes.

13. An intaglio printing process for printing security documents, especially banknotes, wherein a backside (60b) of a substrate (60) to be printed is brought into contact during intaglio printing with a circumference of an impression cylinder (01) carrying at least one blanket (20) and wherein at least one security element (50) having optical and/or structural properties to be preserved is provided or exposed on the backside (60b) of said substrate (60) and wherein said impression cylinder (01) is an impression cylinder as defined in any one of claims 1 to 11.

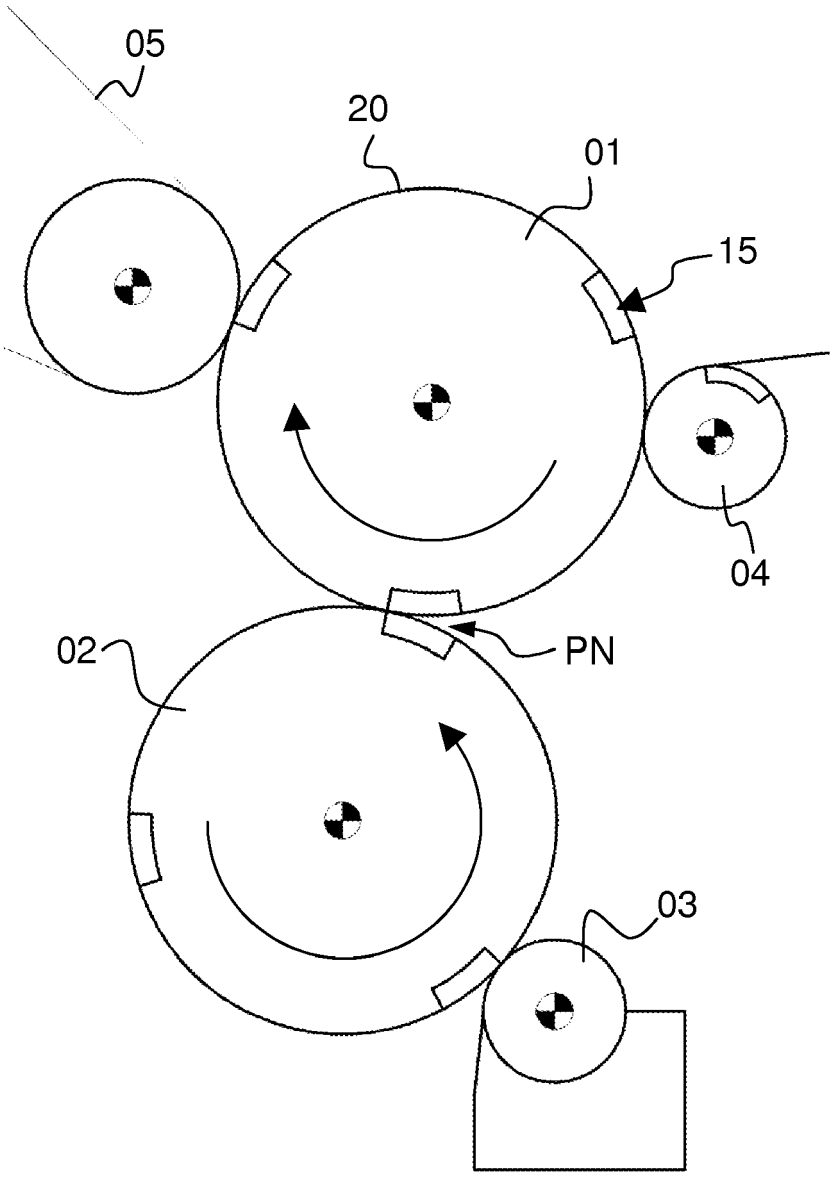

Fig. 1

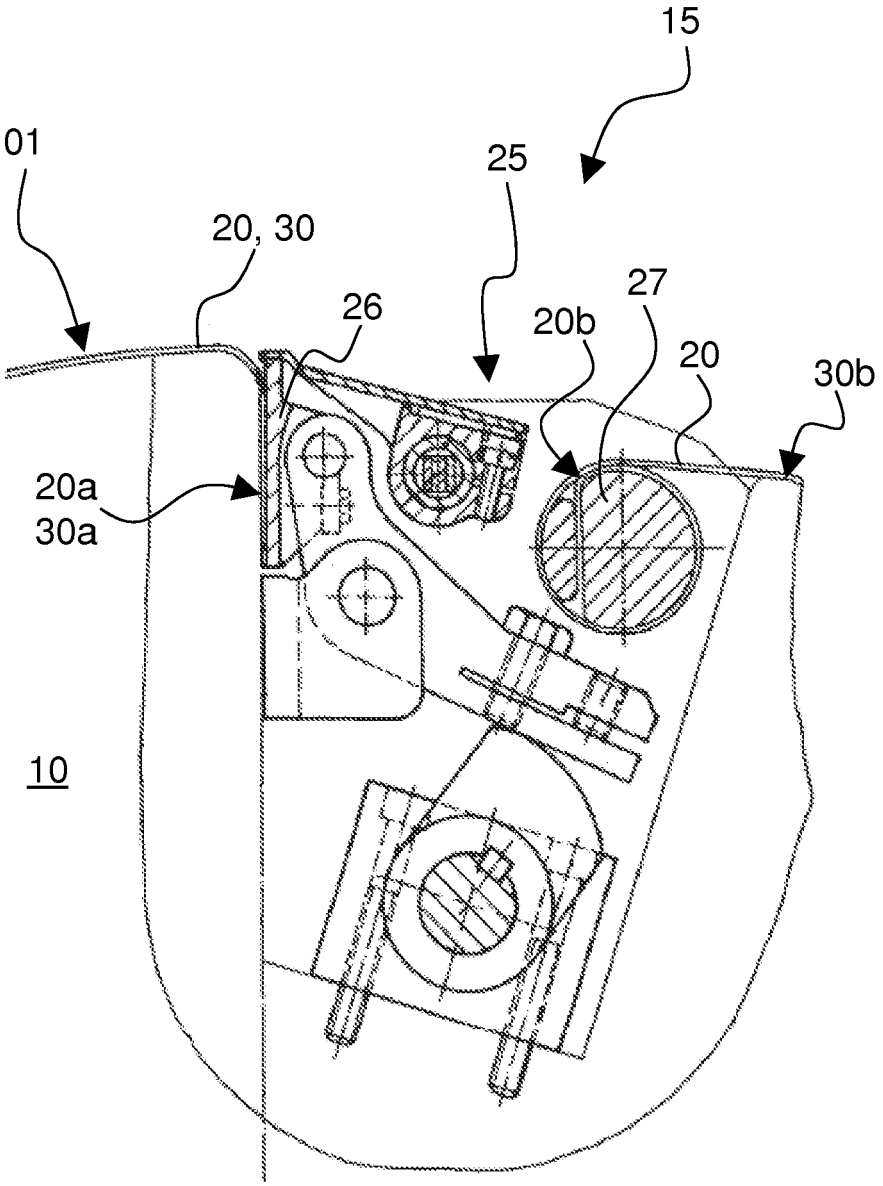

Fig. 2

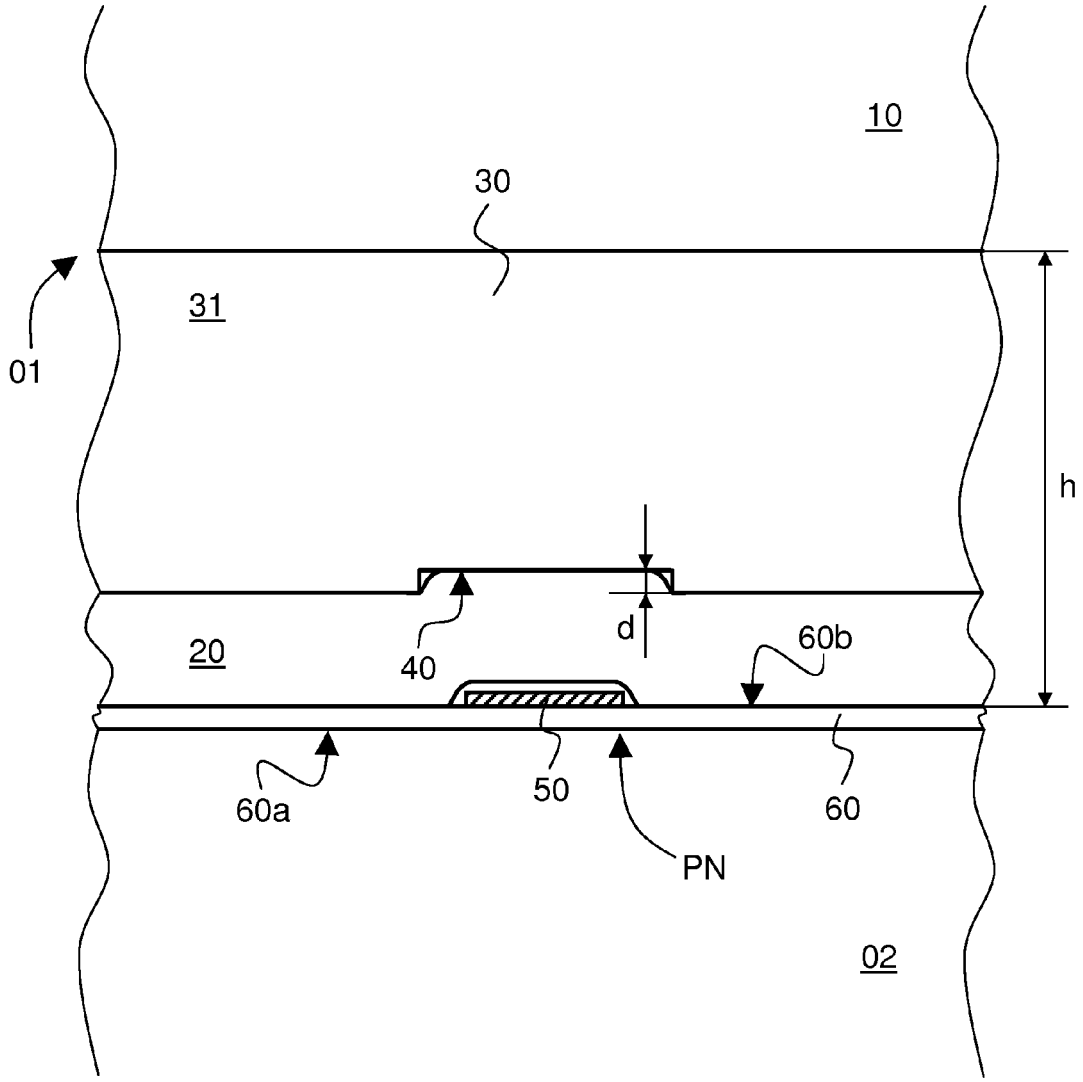

Fig. 3

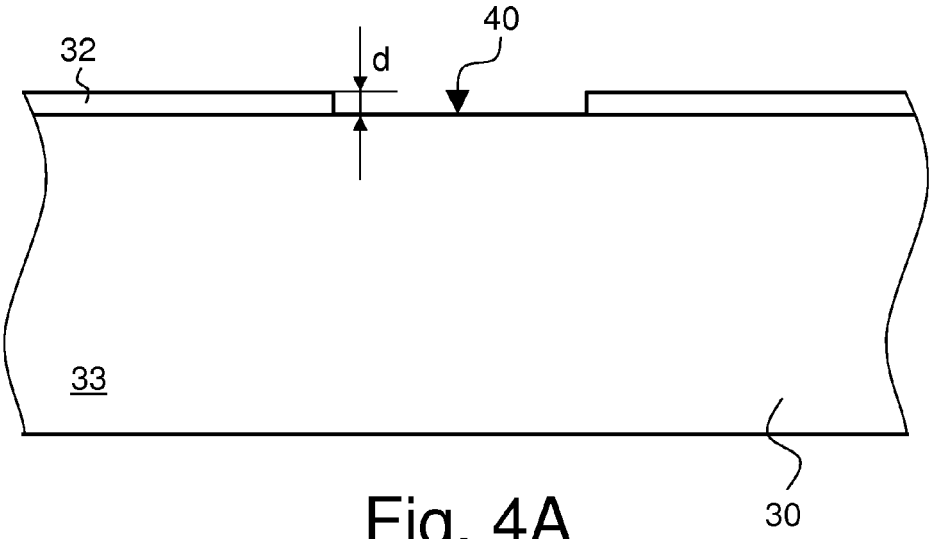

Fig. 4A

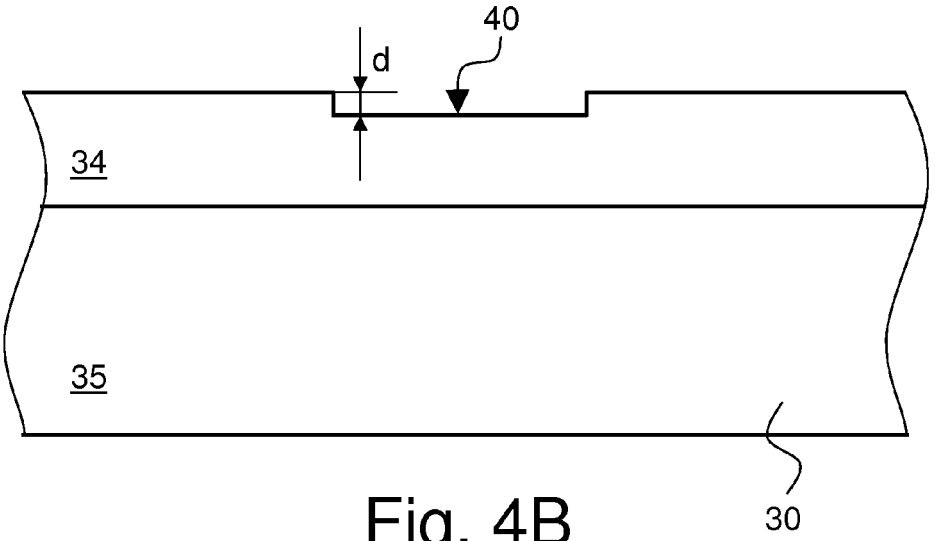

Fig. 4B

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European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 10 16 2247

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X,D	EP 1 881 904 B1 (OEBS GMBH [AT]) 13 January 2010 (2010-01-13) * figure 2 * * paragraphs [0025], [0026], [0029] - [0031] *	1-13	INV. B41F13/187 B41M1/10 B41M3/14 B41N10/04
X	US 6 176 522 B1 (JACKSON WAYNE K [AU]) 23 January 2001 (2001-01-23) * figures 1,2 * * column 5, line 52 - column 6, line 19 *	1-13	
A	DE 44 36 973 A1 (HEIDELBERGER DRUCKMASCH AG [DE]) 22 June 1995 (1995-06-22) * figures 2,3 * * column 5, lines 8-21 *	1-13	
A	US 2 804 417 A (CROSS BERT S ET AL) 27 August 1957 (1957-08-27) * figures 2,3 * * column 9, lines 36-74 *	1-13	
A	US 3 060 853 A (REMER ROBERT K) 30 October 1962 (1962-10-30) * figures 2,3 * * column 12, lines 24-39 *	1-13	TECHNICAL FIELDS SEARCHED (IPC) B41F B41M B41N

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	12 August 2010	Hajji, Mohamed-Karim

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 16 2247

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