

(19) World Intellectual Property Organization
International Bureau(43) International Publication Date
18 December 2008 (18.12.2008)

PCT

(10) International Publication Number
WO 2008/153877 A1(51) International Patent Classification:
B41C 1/05 (2006.01)

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BI, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(21) International Application Number:
PCT/US2008/007020

(22) International Filing Date: 3 June 2008 (03.06.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
11/758,152 5 June 2007 (05.06.2007) US

(71) Applicant (for all designated States except US): EASTMAN KODAK COMPANY [US/US]; 343 State Street, Rochester, New York 14650 (US).

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(72) Inventor; and
(75) Inventor/Applicant (for US only): SHISHKIN, Igor [IL/IL]; 3 Hamada Street, 46103 Herzliya (IL).

(74) Common Representative: EASTMAN KODAK COMPANY; 343 State Street, Rochester, New York 14650 (US).

Published:
— with international search report

(54) Title: PLATE CUTTING

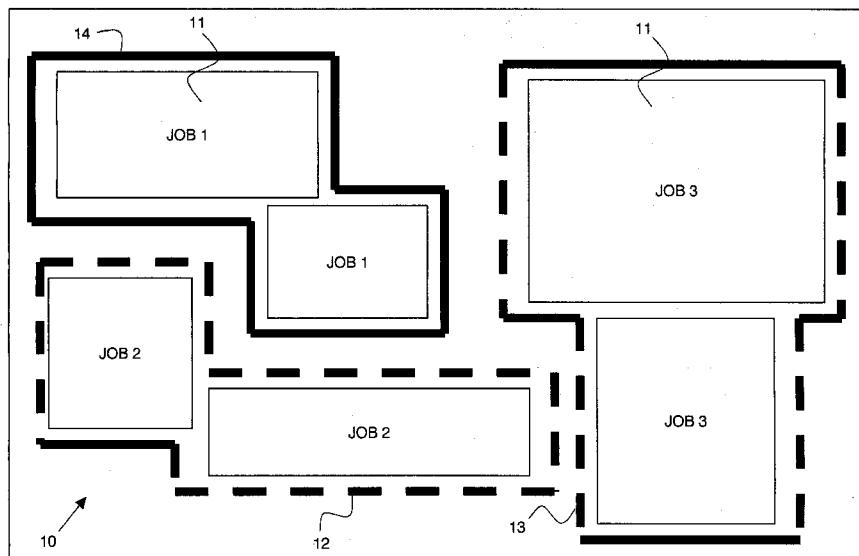


FIG. 1

(57) Abstract: A method for cutting flexographic plates (10) while plate imaging process is performed is described. The method includes mounting a flexographic plate (10) on an imaging drum (30); imaging at least one graphical element or piece (11) on the flexographic plate; cutting the graphical piece using the imaging device (31); and removing at least one graphical piece from the imaging device drum.

PLATE CUTTING

FIELD OF THE INVENTION

This invention relates in general to precision cutting of a flexographic plate while positioned on a flexographic imaging device, and in particular to utilizing the flexographic imaging device and high power laser diodes for cutting.

BACKGROUND OF THE INVENTION

The flexographic plate, using current technologies is imaged (or engraved) using a specially designed flexographic imaging device. Flexographic plates are relatively expensive, therefore flexographic plates will usually accommodate more than one distinct graphical art piece. For example, if a packaging job of a consumer product is requested, the job will usually include several different graphic art pieces, such as the front, back and sides of the package. The imaging of the flexographic plate, will include in this case the imaging of all those graphic art pieces in one imaging step. At this point the imaged flexographic plate comprises several distinct graphic art pieces. Those graphic art pieces are usually cut before they are positioned on a printing press.

In current printing technologies, the plate cutting is performed as a post imaging step. Often cutting is done manually on a manual cutting table, using a cutting blade. There are also automatic cutting machines, which receive the cutting geometry for a specific plate from a dedicated workstation. The supplied cutting geometry is translated to machine cutting commands for implementing the actual plate cutting. Cutting the flexographic as an extra step, in addition to the flexographic imaging machine process, is time consuming and costly, and manual cutting may result in lack of precision.

SUMMARY OF THE INVENTION

Briefly, according to one aspect of the present invention a method for cutting flexographic plates while plate imaging process is performed, comprises the steps of: mounting a flexographic plate on an imaging drum; imaging at least one graphical piece on the flexographic plate; cutting the graphical piece using the imaging device; and removing at least one graphical piece from the imaging device drum.

According to one embodiment of the present invention the precise cutting that is proposed by this invention, is based on utilization of the flexographic output device imaging means. At the point that the flexographic plate is fully exposed by the imaging device, the imaged plate is still mounted on the imaging device drum. At this stage, the lasers of the output device are deployed to cut around or mark the cutting of the various graphic art pieces by laser engraving around the proposed cutting piece. This process will yield a very precise cutting of the individual pieces, and will almost finalize the cutting process, before unmounting the flexographic plate from the imaging output device.

These and other objects, features, and advantages of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings wherein there is shown and described an illustrative embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic of a flexographic printing plate, illustrating the cutting areas around various graphic art pieces positioned on the flexographic printing plate.

Figure 2 is a sectional schematic view of a flexographic printing plate, illustrating an area where the plate cutting is performed, elevated ink transfer areas, and blank areas.

Figure 3 is schematic of printhead and an imaging drum, with a flexographic printing plate mounted on the drum.

DETAILED DESCRIPTION OF THE INVENTION

The present description is directed in particular to elements forming part of, or cooperating more directly with, apparatus in accordance with the invention. It is to be understood that elements not specifically shown or described may take various forms well known to those skilled in the art.

In flexographical printing, it is common to image more than one graphical element on a single flexographic printing plate. The graphical elements, which will eventually be separated into more than one flexographical plate piece, may be independently printed on a printing machine at more than one printing

session. The main reason for ganging the imaging of the plurality of graphical elements in one imaging session, lies in the high cost of the flexographical plates.

The present invention describes methods and apparatus for cutting graphical elements of flexographic plates, during the flexographical plates

5 imaging process. This invention eliminates the need to perform an additional step in flexographical pre press workflow to cut the plate into more than one piece.

The plate cutting step is performed today at the stage when the plate is un mounted from the imaging device. The plate cutting today can be done by:

- 10 1. A manual process using a special cutting table using precision tools and cutting blades.
2. Applying a post imaging cutting machine, such a machine is produced by Misomex International of Nashua, NH. Misomex offers a range of flatbed x-y plotting machines with cutting heads.

15 Figure 1 illustrates an example of an imaged flexographic plate, with cutting areas according to the present invention. The printing plate 10 shows three different flexographic graphical elements 11, each element belongs to a distinct printing job. Each graphical element or printing job, is separated by cut areas 12. The cutting process of the areas 12, in the present invention, is 20 performed at the imaging stage of the flexographic plate.

The same laser engraving means used for imaging the plate, are utilized to produce the cutting areas 12, 13, or 14 while the flexographic printing plate 10 is mounted on the imaging drum 30 as is depicted in Figure 3. Figure 3 shows printhead 31, which is used for imaging of the graphical elements 11 on the 25 flexographic printing plate 10. Printhead 31 is used for cutting the graphical elements 11, as well, while printing plate 10 is mounted on the imaging drum 30.

Referring again to Figure 1, plate cutting can be performed in various manners; for example, full cutting as is illustrated in cutting area 14 or partial cutting as is illustrated in 13. Cutting area 13 illustrates full cutting in the 30 x-axis and partial cutting in the y-axis. The reason for using those various cutting styles depends on the available means for attaching the plate to the imaging device drum. Whenever the attaching means are such that a fully cut piece of plate is

firmly attached, for example, plates are held on the drum by a strong vacuum, a full cut can be used. Otherwise partial cut such as illustrated by cutting area 12 or 13 should be used.

Figure 2 illustrates a sectional view of flexographic printing plate 5 10. It shows an imaged area 21, which belongs to an imaged graphical element. On both sides of imaged area 21, there are additional imaged areas 23, each belong to a different graphical element. The imaged areas 21 and 23, are separated by a cutting area 22. The cutting areas shows that the flexographic plates is engraved as deep as the entire thickness of the printing plate, reaching up 10 to the level of the imaging device drum 20.

The cutting areas 22 can be made by the imaging device in the same imaging step at the same time as the imaging of the graphical elements. The plate cutting can be also performed as a separate step, while the plate is still mounted on the imaging device by utilizing a high power coarse laser as is 15 disclosed in commonly-assigned copending U.S. Patent Application Serial No. 11/615,025, or by multiple passes with a lower power laser. Parts of the cutting areas 22 maybe partially cut, as was discussed above. The reason for applying a partial cut is, for firmly attaching the plate pieces to the imaging device drum, to avoid plate staggering or plate pieces leaving the drum.

20 When imaging of more than one graphical element is completed, and there is a need to remove it from the imaging device for further processing; the imaging device is stopped, and the required graphical elements are unmounted from the imaging device drum. This is performed by completing a manual cutting of the thin areas which were originally left uncut. As mentioned above, the partial 25 cut is used when there are no alternative means available for firmly attaching the graphical elements to the imaging device drum. In the case of partial imaging of the flexographic plate, the further imaging of at least one graphical element can be performed by applying an additional imaging pass.

It another embodiment of the invention, the flexographic plate is 30 imaged in a first step in. In a second step, the rotation of the drum 30 is slowed and the cutting step in is performed. Slowing the rotation of the drum during the

cutting step, reduces the possibility of one of the cut, graphical elements leaving the surface of the drum due to centrifugal forces.

PARTS LIST

- 10 flexographic printing plate
- 11 imaged graphical element or piece
- 12 fully cut area
- 13 partially cut area
- 14 cutting area at which one axis is fully cut, and the other is partially cut
- 20 level of the imaging device drum
- 21 cut around imaged area (elevated ink transfer areas and blank areas are shown)
- 22 cutting areas
- 23 separated imaged areas
- 30 imaging drum
- 31 printhead

CLAIMS:

1. A method for cutting flexographic plates while plate imaging process is performed, comprising the steps of:
 - mounting a flexographic plate on an imaging drum;
 - imaging at least one graphical piece on said flexographic plate;
 - cutting said graphical piece using the imaging device; and
 - removing said at least one graphical piece from said imaging device drum.
2. The method of claim 1, wherein the plate imaging and graphical piece cutting is performed in a single imaging step.
3. The method of claim 1, wherein the plate is imaging is performed in first step, and graphical piece cutting is performed in an additional step.
4. The method of claim 1, wherein cutting the graphical piece is performed in full.
5. The method of claim 1, wherein cutting the graphical piece is performed partially.
6. The method of claim 1, wherein cutting the graphical piece is partially performed in first axis, and a full cut in second axis.
7. The method of claim 1, wherein at least one graphical piece is removed from the imaging device drum, and imaging continued in an additional steps.
8. The method of claim 1, wherein the imaging step is performed at a first speed at the cutting step is performed at a second speed.

9. An apparatus for imaging and cutting a flexographic plate comprising:
a drum for mounting the flexographic plate; and
a printhead for imaging the flexographic plate and for
5 cutting graphical elements from the flexographic plate.

10. The apparatus of claim 1 wherein the imaging and cutting of the flexographic plate take place in a single step.

10 11. The apparatus of claim 1 wherein the imaging of the flexographic plate takes place in a first step and the cutting of the graphical elements takes place in a second step.

12. The apparatus of claim 1 wherein at least one of the
15 graphical elements is partially cut from the plate.

13. The apparatus of claim 1 wherein at least one of the graphical elements is fully cut from the plate.

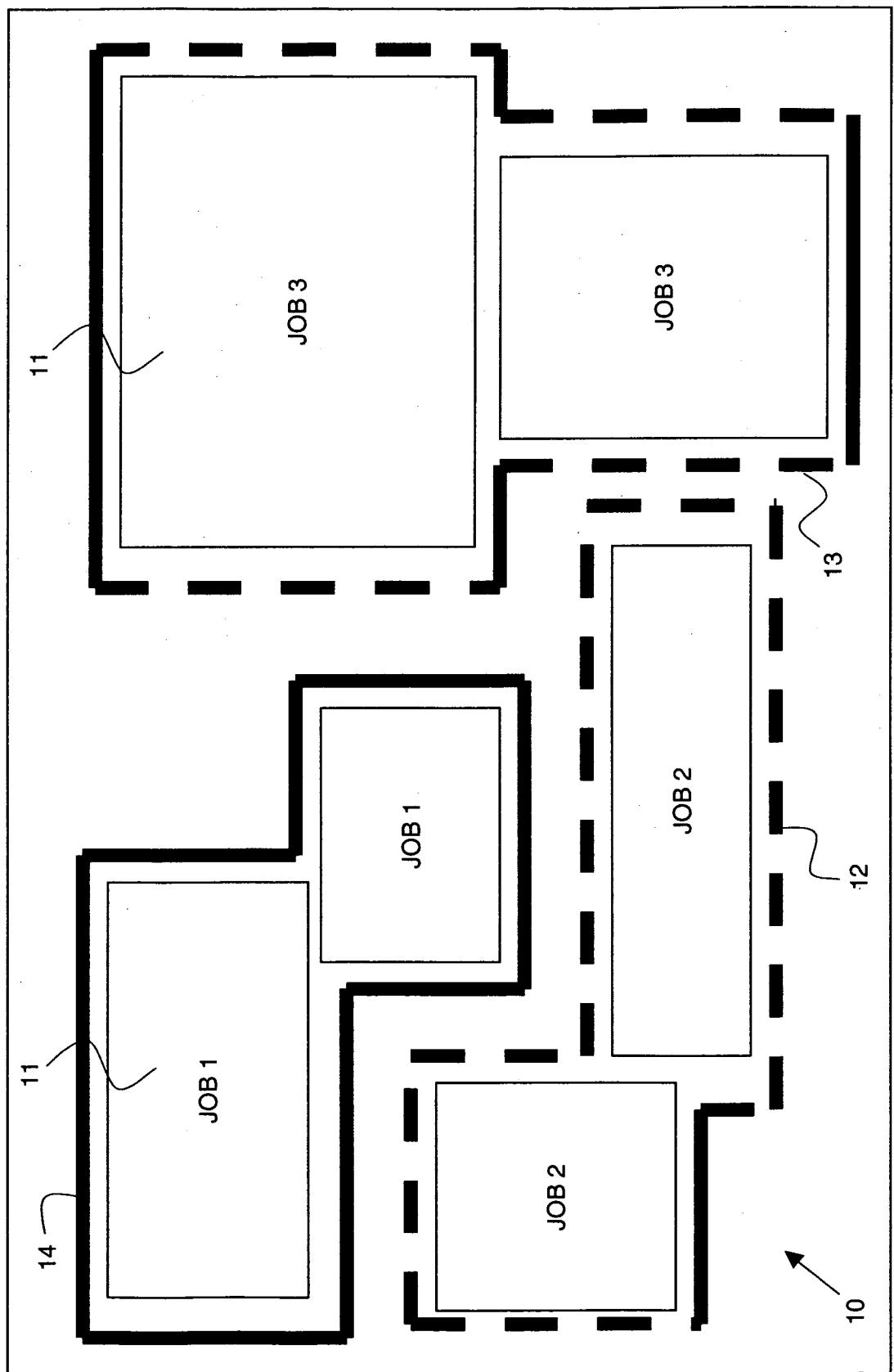
20 14. The apparatus of claim 1 wherein at least one of the graphical elements is fully cut in only one horizontal or vertical direction.

15. The apparatus of claim 1 wherein at least one graphical element is imaged, fully cut from the plate, and removed from the plate prior to
25 imaging other graphical elements.

16. The apparatus of claim 1 wherein the drum is rotated at a first speed during imaging and rotated in a second speed during cutting.

30 17. The apparatus of claim 1 wherein the flexographic plate is held on a surface of the drum by a vacuum.

1/3

**FIG. 1**

2/3

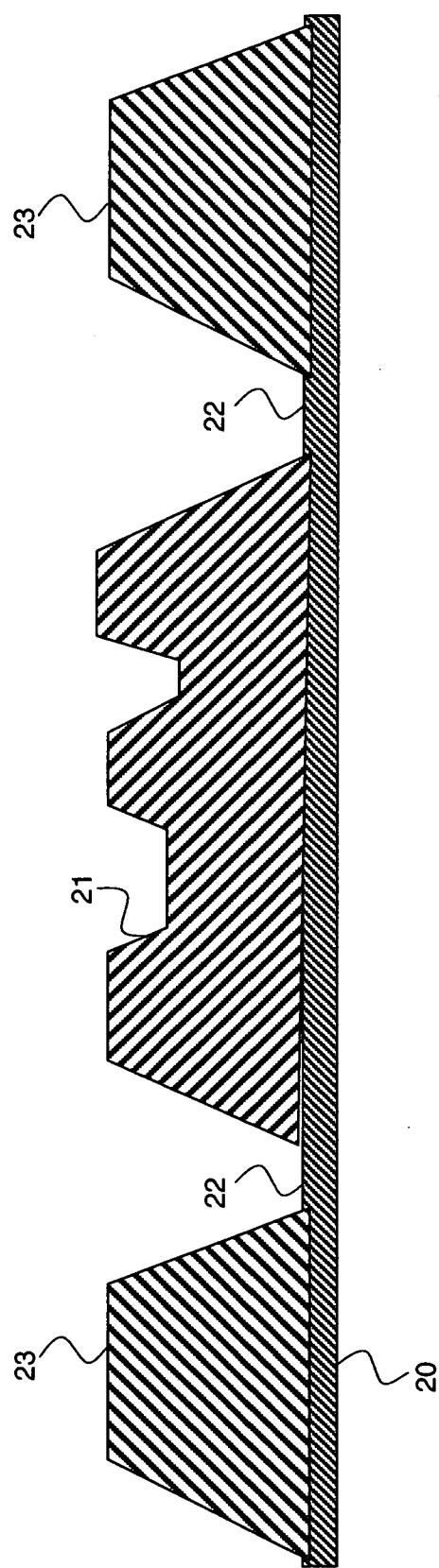


FIG. 2

3/3

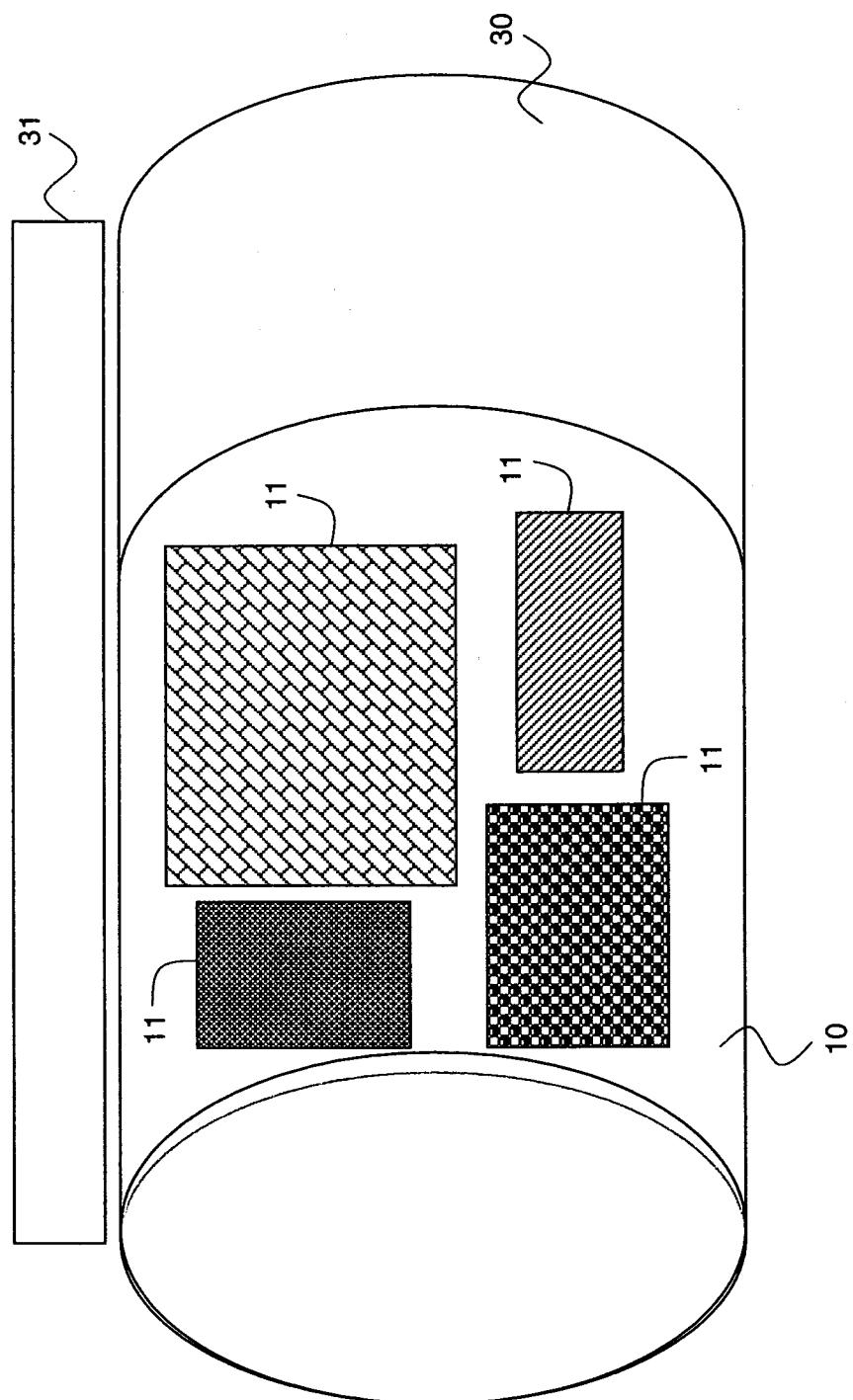


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2008/007020

A. CLASSIFICATION OF SUBJECT MATTER
INV. B41C1/05

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B41C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 760 880 A (FAN ROXY NI [US] ET AL) 2 June 1998 (1998-06-02) column 1, lines 8-12; figure 2 column 6, line 25 – column 10, line 27; claim 1. -----	1-17
X	US 2006/249488 A1 (JURGENSEN HEINRICH [DE]) 9 November 2006 (2006-11-09) paragraphs [0003], [0132], [0141], [0142], [0281]; figure 3 -----	1-17



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

& document member of the same patent family

Date of the actual completion of the international search

1 August 2008

Date of mailing of the international search report

18/08/2008

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Findeli, Bernard

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2008/007020

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US 5760880	A 02-06-1998	DE	69610658 D1	23-11-2000
		DE	69610658 T2	31-05-2001
		EP	0741335 A1	06-11-1996
		JP	8300600 A	19-11-1996
		US	5654125 A	05-08-1997
US 2006249488	A1 09-11-2006	US	2006250658 A1	09-11-2006
		US	2006255023 A1	16-11-2006
		US	2006279794 A1	14-12-2006