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(71) Applicant (for all designated States except US): **TOC-CHIO S.R.L.** [IT/IT]; Viale Agricoltura, 252, I-27029 Vigevano (IT).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **NASATTI, Maurizio** [IT/IT]; Via Bremio, 19, I-15033 Casale Monferrato (IT).

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(74) Agents: **JORIO, Paolo** et al.; Studio Torta S.r.l., Via Viotti, 9, I-10121 Torino (IT).

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(54) Title: METHOD AND SYSTEM FOR PRODUCING DECORATIVE PAPER AND LAMINATED PANELS INCORPORATING SUCH DECORATIVE PAPER, IN PARTICULAR DECORATIVE PAPER AND PANELS FOR COVERING FLOOR, FURNITURE OR WALL SURFACES

(57) Abstract: A system (1), for producing decorative paper and laminated panels incorporating such decorative paper, in particular decorative paper and panels for covering floor, furniture or wall surfaces, has a coating unit (8) for applying at least one layer (61) of a polymer composition (29) onto one face (21) of a flexible substrate (5) in sheet or strip form; the layer (61) is applied by a flathead coating device (15) having at least one feed slit (16) bounded by a continuous peripheral edge, and through which the polymer composition is dispensed.



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5 METHOD AND SYSTEM FOR PRODUCING DECORATIVE PAPER AND
LAMINATED PANELS INCORPORATING SUCH DECORATIVE PAPER, IN
PARTICULAR DECORATIVE PAPER AND PANELS FOR COVERING
FLOOR, FURNITURE OR WALL SURFACES

10 TECHNICAL FIELD

The present invention relates to a method and system
for producing decorative paper and laminated panels
incorporating such decorative paper, in particular
decorative paper and panels for covering floor, furniture
15 or wall surfaces.

BACKGROUND ART

Commonly used methods of producing decorative paper
(subsequently laminated to produce floor panels or panels
for covering various types of surfaces) substantially
20 comprise impregnating a paper substrate (normally fed
continuously off a reel) with a polymer resin; applying a
mixture of polymer resin and abrasion-resistant particles
(normally corundum) to the impregnated substrate (wet or
dry); and, finally, applying a protective layer of
25 polymer resin, preferably containing extremely hard,
mildly abrasive particles (e.g. glass spheres).

In known methods, the various polymer layers,
possibly containing particulate fillers, are coated on

using various types of roller coating units.

Such methods have various drawbacks. In particular, various roller coating units are required, each for applying a particular layer, i.e. a given polymer composition; the amount of resin applied is regulated by metering rollers on the roller coating units, which rarely provides for precise control, so that surplus resin is often applied (and must therefore be recovered and recirculated); and, unless complex, high-cost regulating systems are used, layer thickness regulation is normally also inaccurate.

DISCLOSURE OF INVENTION

It is an object of the present invention to provide a method and system for producing decorative paper and laminated panels incorporating such decorative paper, in particular decorative paper and panels for covering floor, furniture or wall surfaces, designed to eliminate the drawbacks of the known art.

According to the present invention, there are provided a method and system as claimed respectively in the accompanying Claims 1 and 12.

Using flathead coating devices according to the invention (i.e. coating devices, in which the coating material is dispensed through a substantially rectangular feed slit elongated crosswise to the substrate and bounded by a continuous peripheral edge) eliminates all the drawbacks typically associated with the use of conventional roller coating units. In particular,

dispensing of the polymer composition and layer thickness can be controlled extremely accurately, by the polymer composition being dispensed through a slit having a precisely defined flow section, and by regulating the amount of polymer composition dispensed by simply and precisely controlling feed pressure.

The same flathead coating device can also be used to apply layers of different thicknesses and widths by simply adjusting the size of the feed slit (in particular, by changing the spacer between the members of the head, as explained below).

The same flathead coating device can safely be used to apply different types of layers, i.e. different polymer compositions, even with various types of particulate fillers; and one flathead coating device may be provided with respective feed slits to simultaneously apply two or more superimposed layers.

BRIEF DESCRIPTION OF THE DRAWINGS

A number of non-limiting embodiments of the invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic view of a system in accordance with the invention;

Figure 2 shows a schematic exploded view of a coating head forming part of the Figure 1 system;

Figure 3 shows a section of the Figure 2 coating head assembled;

Figure 4 shows a section of a variation of the

Figure 3 coating head;

Figure 5 shows a schematic view of a further embodiment of the system according to the invention.

BEST MODE FOR CARRYING OUT THE INVENTION

5 Number 1 in Figure 1 indicates as a whole a system for producing decorative paper and laminated panels incorporating such decorative paper, in particular decorative paper and panels for covering floor, furniture or wall surfaces. System 1 comprises conveying means 2
10 (known and shown schematically by feed rollers 3, 4) for feeding a flexible (in particular, paper) substrate 5 in sheet or, preferably, continuous strip form through system 1; an impregnating unit 7; a first coating unit 8; and a second coating unit 9.

15 In the example shown, impregnating unit 7, which is known, is located upstream from coating unit 8 in the travelling direction of substrate 5 through system 1, and comprises a tank 10 containing an impregnating bath 11; and means 12 for feeding substrate 5 into tank 10 and
20 bath 11.

 Coating unit 8 comprises a flathead coating device
15 having at least one feed slit 16; and a guide unit 17 - defined, in the example shown, by two rollers 18, 19, between which substrate 5 is fed - for supporting a
25 portion 20 of substrate 5 close to slit 16, with a face 21 of substrate 5 facing slit 16. The portion 20 of substrate 5 facing slit 16 winds about and rests on the outer surface of roller 19.

Coating device 15 comprises a coating head 25 having slit 16 and fitted to an actuating system 26; slit 16 is connected by a conduit 27 to a tank 28 containing a polymer composition 29 to be applied; and a pump 30 pumps
5 polymer composition 29 from tank 28 to slit 16.

Actuating system 26 (known and shown only schematically) provides for moving head 25 with respect to substrate 5 and, in particular, for adjusting the distance between slit 16 and face 21, and possibly the
10 tilt of head 25.

With reference also to Figures 2 and 3, slit 16 is substantially rectangular, is elongated crosswise to the travelling direction of substrate 5, and is bounded by a continuous peripheral edge.

15 Head 25 comprises two fixed facing members 31, 32 separated by a spacer 33. Members 31, 32 have respective substantially flat surfaces 34, 35 parallel to and facing each other; and respective lips 36, 37 fixed with respect to each other and defined by respective front edges of
20 surfaces 34, 35. Surface 34 of member 31 has a groove 38 substantially parallel to lip 36 and connected to conduit 27 by a channel 39 formed through member 31.

Spacer 33 is defined by a substantially C-shaped plate having opposite surfaces 41, 42 cooperating
25 respectively with surfaces 34, 35, comprises a central recess 43 superimposed over a portion 44 of groove 38 and located between two sides 45 extending flush with lips 36, 37, and is gripped between members 31 and 32 by

means, for example, of screws (not shown) inserted inside holes 46.

The size of recess 43 and the thickness of spacer 33 determine the width and height of slit 16 and, therefore, the size of the layer of polymer composition 29 issuing from slit 16 and applied to substrate 5. The width and/or thickness of the applied layer can therefore be adjusted by changing spacer 33.

With reference to Figure 1, coating unit 9 is located downstream from coating unit 8, and is a conventional known roller coating unit not described in detail for the sake of simplicity. It is understood, however, that coating unit 9 may also feature one or more flathead coating devices of the type described above.

In the example shown, coating unit 9 comprises two coating assemblies 51, 52 located on opposite sides of substrate 5 and defined by respective pairs of rollers 54, 55, between which respective polymer compositions 56, 57 are fed.

System 1 implementing the method according to the invention operates as follows.

Substrate 5 is fed into and impregnated in bath 11 of impregnating unit 7. Bath 11 is preferably an aqueous solution of one or more polymer components, in particular, melamine resin or similar and/or polyvinyl alcohol.

The impregnated substrate 5 is then fed to coating unit 8. In the preferred embodiment referred to, the

impregnated substrate 5 is fed wet to coating unit 8, with no drying steps in between.

A layer 61 of polymer composition 29 is deposited through slit 16 onto face 21 of substrate 5, and
5 preferably comprises at least one polymer component, in particular a melamine resin or similar or polyvinyl alcohol, and a particulate filler, in particular an abrasion-resistant substance such as corundum.

Substrate 5 with layer 61 is fed from coating unit
10 8, possibly via a drier (not shown), to coating unit 9; coating assembly 51 applies onto layer 61 a layer 62 of polymer composition 56 (preferably comprising at least one polymer component, e.g. melamine resin, and a mildly abrasive particulate filler, e.g. glass spheres); and
15 coating assembly 52 applies a layer 63 of polymer composition 57 (comprising in particular a polymer resin, e.g. melamine resin, with no particulate fillers) onto a face 64, opposite face 21, of substrate 5.

An important aspect of the invention is that, to
20 form two or more superimposed layers of respective like or different polymer compositions simultaneously, head 25 of coating device 15 has two or more superimposed slits for dispensing respective like or different polymer compositions.

25 In the Figure 4 variation, for example, head 25 again comprises members 31, 32 described with reference to Figures 2 and 3, but, in this case, member 32, like member 31, also comprises a groove 38, and a channel 39

(connected to a tank of polymer composition); a substantially wedge-shaped auxiliary member 66 is interposed between members 31 and 32, and has two surfaces 67, 68 facing surfaces 34, 35 of members 31, 32 respectively; and two spacers 33a, 33b are interposed between member 31 and member 66 and between member 32 and member 66 respectively, to define two slits 16a, 16b.

In actual use, one of slits 16a, 16b dispenses, for example, a polymer composition comprising at least one polymer component, in particular a melamine resin, and a particulate filler, e.g. corundum or other abrasion-resistant substance, and the other slit dispenses a polymer composition with no particulate fillers (e.g. a melamine resin). In this case, layer 61 applied by coating device 15 is therefore defined by two superimposed layers applied simultaneously onto substrate 5 : a bottom first layer of polymer material containing the particulate filler, and a top second layer of polymer material only and superimposed on the first layer.

In the Figure 5 variation, in which any details similar or identical to those already described are indicated using the same reference numbers, impregnating unit 7 is located downstream from coating unit 8 comprising flathead coating device 15.

In this case, substrate 5 is first coated with layer 61 (comprising polymer resin and an abrasion-resistant substance, or comprising two superimposed layers : one bottom layer of polymer resin and abrasion-resistant

substance, and a top layer of polymer resin only), and is then impregnated.

CLAIMS

1) A method of producing decorative paper and laminated panels incorporating such decorative paper, in particular decorative paper and panels for covering floor, furniture or wall surfaces; the method comprising a first coating step, wherein at least one first layer (61) of a polymer composition (29) is applied to one face (21) of a flexible substrate (5) in sheet or strip form; and the method being characterized in that said first coating step is performed by a flathead coating device (15), and the polymer composition is dispensed through a feed slit (16) of said flathead coating device.

2) A method as claimed in Claim 1, characterized in that, in said first coating step, the polymer composition (29) is dispensed through a slit (16) bounded by a continuous peripheral edge.

3) A method as claimed in Claim 1 or 2, characterized in that said slit (16) is defined between two fixed, facing members (31, 32) of said flathead coating device (15).

4) A method as claimed in one of Claims 1 to 3, characterized in that said slit (16) is substantially rectangular and elongated crosswise to the travelling direction of the substrate (5).

5) A method as claimed in one of Claims 1 to 4, characterized in that said polymer composition comprises at least one polymer component in which a particulate

filler is dispersed.

6) A method as claimed in Claim 5, characterized in that said polymer composition comprises a polymer resin or polyvinyl alcohol or a mixture thereof.

5 7) A method as claimed in Claim 5 or 6, characterized in that the particulate filler is an abrasion-resistant substance, such as corundum.

8) A method as claimed in one of the foregoing Claims, characterized by comprising, before or after said
10 first coating step, a step of impregnating the substrate with one or more polymer components, preferably melamine resin and/or polyvinyl alcohol.

9) A method as claimed in one of the foregoing Claims, characterized in that, in said first coating
15 step, two or more superimposed layers of respective like or different polymer compositions are applied simultaneously, one on top of the other, to said face of the substrate.

10) A method as claimed in Claim 9, characterized in
20 that said polymer compositions are dispensed through respective superimposed slits (16) of the flathead coating device (15).

11) A method as claimed in Claim 10, characterized in that said layers include a first layer of a polymer
25 material containing a particulate filler; and a second layer of polymer material having no particulate filler and superimposed on the first layer.

12) A system (1) for producing decorative paper and

laminated panels incorporating such decorative paper, in particular decorative paper and panels for covering floor, furniture or wall surfaces; the system comprising conveying means (2) for conveying a flexible substrate
5 (5) in sheet or strip form, and a first coating unit (8) for applying at least one first layer (61) of a polymer composition (29) onto one face (21) of the substrate; and the system being characterized in that said first coating unit (8) comprises a flathead coating device (15) having
10 at least one feed slit (16) through which said polymer composition is dispensed.

13) A system as claimed in Claim 12, characterized in that said slit (16) is bounded by a continuous peripheral edge.

15 14) A system as claimed in Claim 12 or 13, characterized in that said flathead coating device (15) comprises two fixed, facing members (31, 32) defining said slit (16).

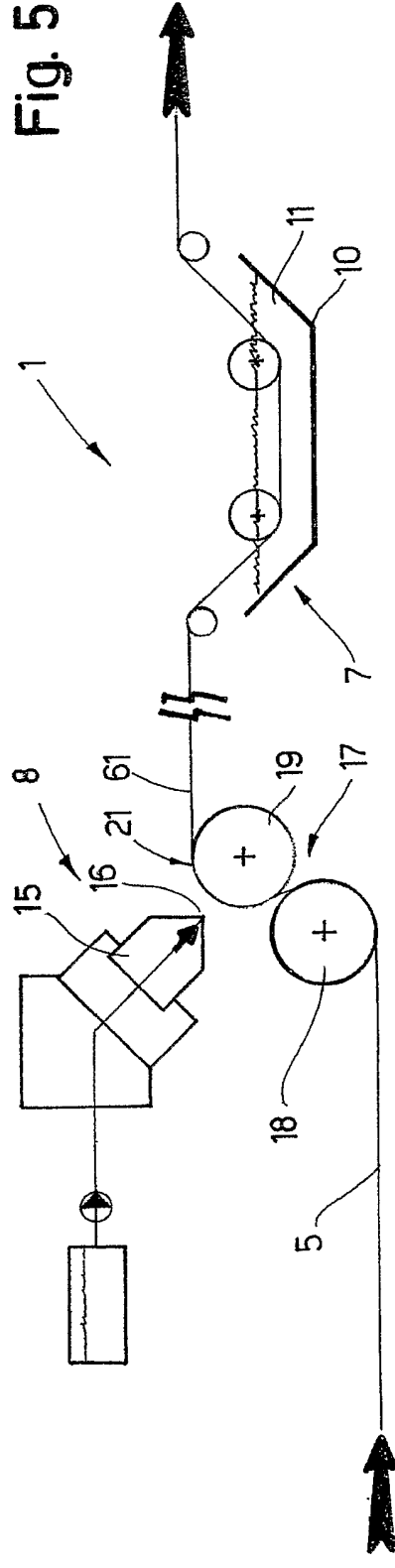
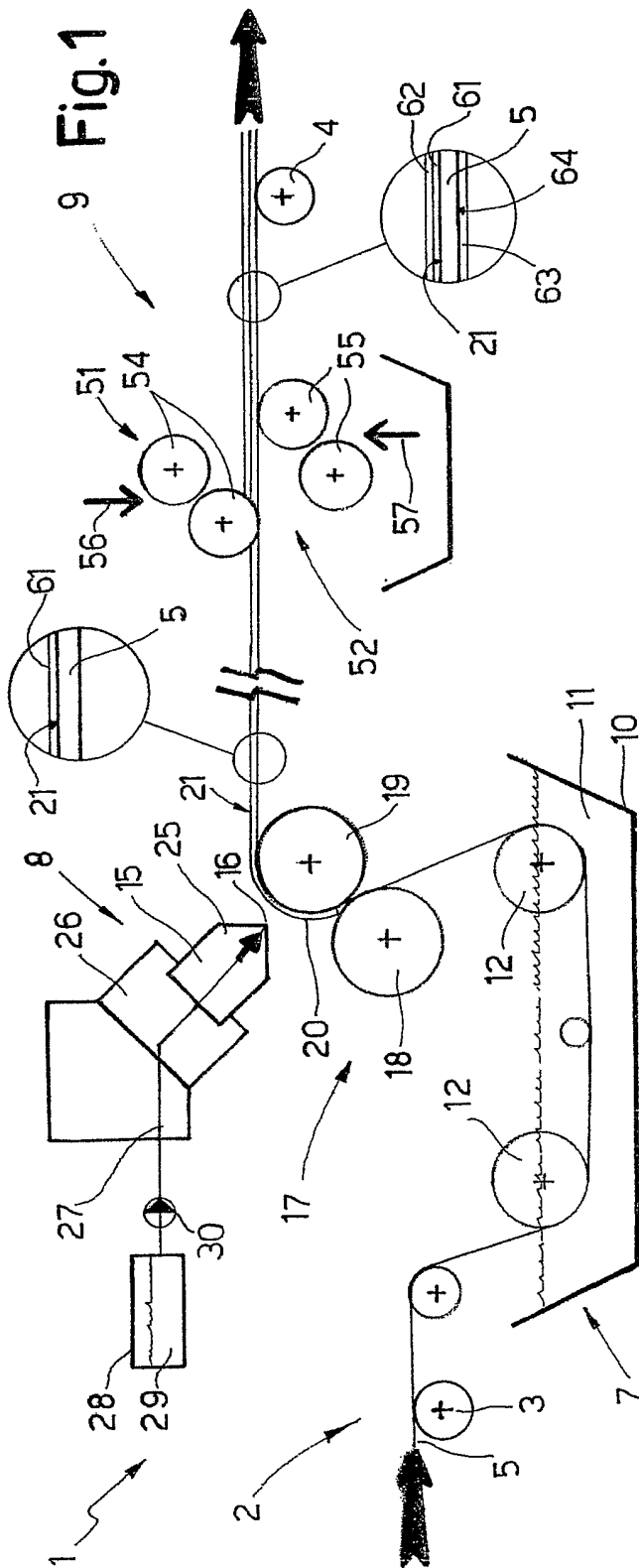
15 15) A system as claimed in one of Claims 12 to 14, characterized in that said slit (16) is substantially rectangular and elongated crosswise to the travelling direction of the substrate (5).

16) A system as claimed in one of Claims 12 to 15, characterized by comprising an impregnating unit (7)
25 located downstream or upstream from said first coating unit (8) in the travelling direction of the substrate (5), and in turn comprising a tank (10) containing an impregnating bath (11), and means (12) for feeding the

substrate into the bath.

17) A system as claimed in one of Claims 12 to 16, characterized in that said flathead coating device (15) has two or more superimposed feed slits (16a, 16b),
5 through which respective like or different polymer compositions are dispensed.

18) A system as claimed in Claim 17, characterized in that said flathead coating device (15) comprises three or more fixed members (31, 32, 66) substantially facing
10 one another; said slits (16a, 16b) being defined between respective pairs of facing members.



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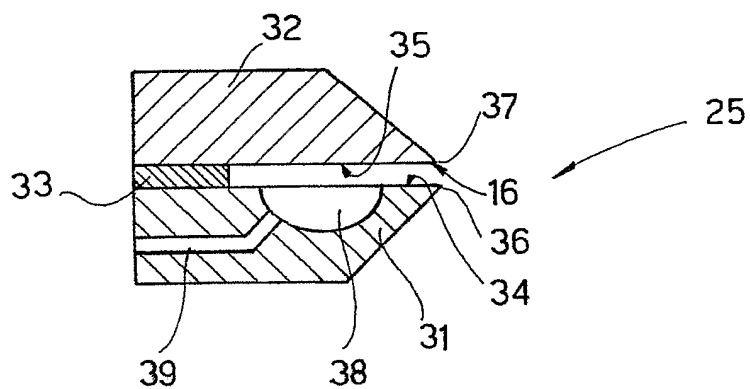


Fig. 3

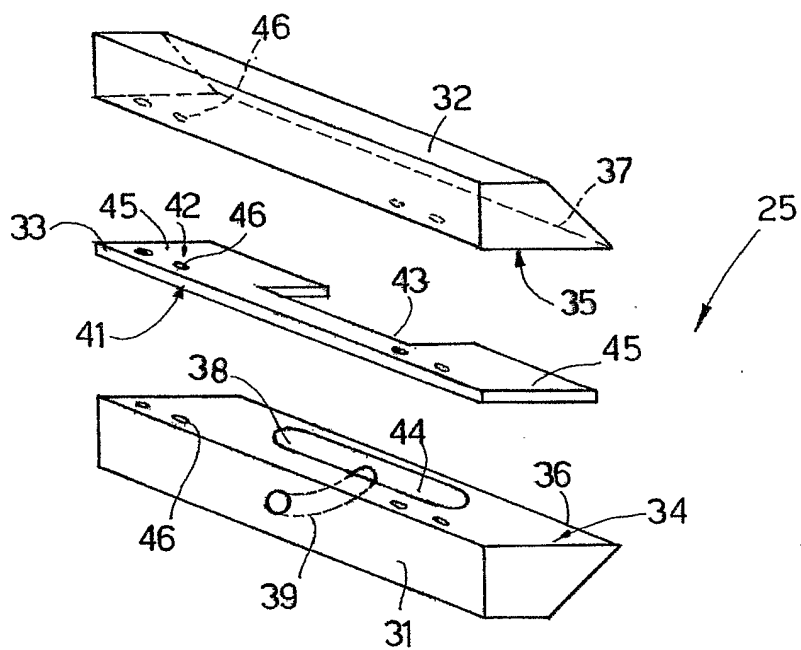


Fig. 2

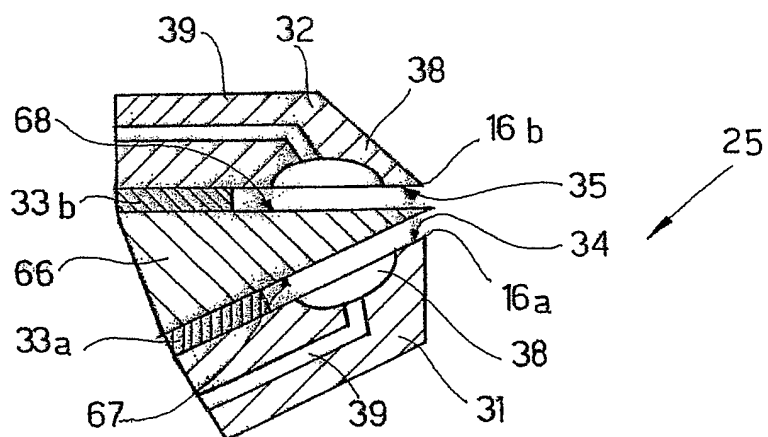


Fig. 4

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP2005/051751

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B44C5/04 B32B27/00 B32B29/00 D21H27/00 D21H23/00

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)

IPC 7 B44C B32B D21H

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, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 820 937 A (CRABTREE ET AL) 13 October 1998 (1998-10-13) column 2, line 67 - column 4, line 45; figure 1	1-18
X	DE 197 16 466 A1 (BACHOFEN & MEIER AG, BUELACH, CH) 22 October 1998 (1998-10-22) column 2, line 64 - column 4, line 52; figures 1,2	1-18
A	US 6 231 670 B1 (FISCHER SIEGFRIED ET AL) 15 May 2001 (2001-05-15) column 5, line 16 - column 6, line 35; figure 2	1-18
A	US 2004/011486 A1 (WAGNER ERIC ET AL) 22 January 2004 (2004-01-22) paragraph '0016! - paragraph '0023!; figure 3	1-18



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents:

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- *E* earlier document but published on or after the international filing date
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- *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
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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

Santor, M

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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