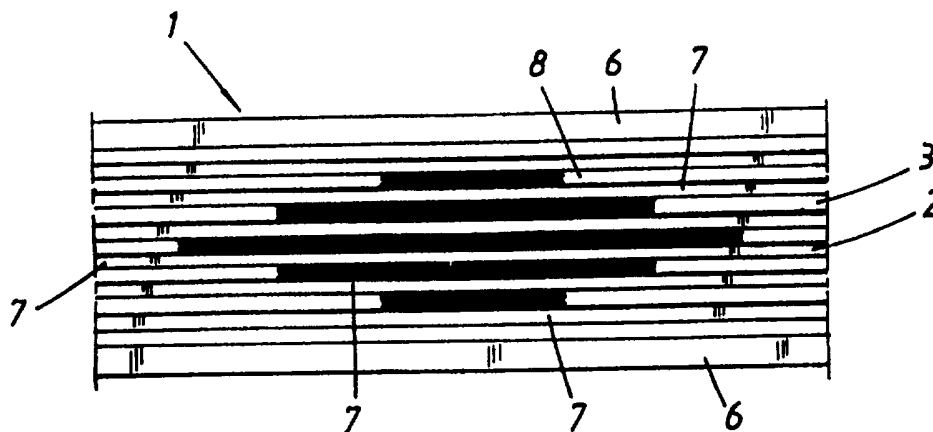




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : A61F 13/46, D21H 27/30	A1	(11) International Publication Number: WO 97/36565 (43) International Publication Date: 9 October 1997 (09.10.97)
<p>(21) International Application Number: PCT/SE97/00557</p> <p>(22) International Filing Date: 3 April 1997 (03.04.97)</p> <p>(30) Priority Data: 9601302-4 3 April 1996 (03.04.96) SE</p> <p>(71) Applicant (for all designated States except US): DUNI AB [SE/SE]; P.O. Box 523, S-301 80 Halmstad (SE).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): IVANSSON, Anders [SE/SE]; Göstorp, S-305 93 Halmstad (SE).</p> <p>(74) Agents: BJELKSTAM, Peter et al.; Kransell & Wennborg AB, P.O. Box 27834, S-115 93 Stockholm (SE).</p>	<p>(81) Designated States: AU, CA, JP, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p>Published <i>With international search report.</i> <i>In English translation (filed in Swedish).</i></p>	

(54) Title: MATERIAL LAYER AND METHOD FOR MANUFACTURING SAID LAYER



(57) Abstract

The invention relates to a material layer of soft paper, polymer fibre or polymer film intended to be used as a separate layer, or in at least one layer to be placed loosely on, or be bonded to one or more material webs for achieving a controlled diffusion capacity of a liquid deposited on at least the material layer, or for achieving a bulkier and thicker material web. The layer (1) has a plurality of slit formations (2) extending over it, which are laterally arranged in optional and mutually spaced relationship, such as to form free, separate strip formations (3), the layer (1) being intended to constitute a separate material layer or be included in a combination of at least one further, differing material layer or web, which, when the slitted layer (1) is drawn apart to a greater or less extent, positionally fixes the layer in different, given, opened-out configurations, depending on its field of use, this operation resulting in different opening widths being obtained for the slit formations (2) in the material layer.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

Material layer and method for manufacturing said layer

The present invention relates to a material layer of either wet- or dry-laid soft paper, including mixtures
5 of polymer and cellulose fibres, fibre fabric or polymer film, the layer being intended for use as a separate layer, or at least in one layer, loosely laid on, or bonded to one or more material layers or webs such as to achieve the controlled diffusion of liquid de-
10 posited on at least this separate layer or web, or such as to be a part of a bulkier and thicker material layer or web, the invention also relating to a method of manufacturing the material layer.

15 A laminate including soft paper in one or more layers is usually the basic material on the market today for table covers, napkins, cleaning rags, face-flannels, bibs, underpant protectors, sanitary towels, absorption products or other table and hygiene products, as well
20 as materials used in the packaging industry. A problem with these known laminates has been that hardly any of them is able to equal, as far as possible, a woven material with characteristics of flexibility and drapability. In addition, the materials used for absorption
25 and in particular such laminates that are used for absorbing body liquids, have limited capacity for controlled diffusion of liquid deposited on them, resulting in that the absorption layer is not optionally utilized.

30 The object of the present invention is to provide a material layer of the kind mentioned in the introduction, and comprising a quality-determining, flexible material which is able to provide a laminate with a
35 controlled diffusion capacity on the one hand and on the other hand a laminate with bulk.

With the first-mentioned ability of the inventive material layer there is achieved controlled diffusion, at least over the layer, of a liquid deposited thereon, whereby practically optimum utilization of the material absorption capacity may be reached. To this end, the layer is provided with a plurality of slit formations extending over it, laterally in optionally spaced relationship such as to form separate strip formations. These strip formations may be laterally in greater or less spaced relationship, depending on the field of use. In the case where mutual spacing is small and the layer is laminated against a material web with the propensity of being a liquid barrier, effective diffusion of liquid deposited on the layer is effected in the longitudinal direction of the strip formations. This is particularly suitable when the layer is used as a material layer in diapers, sanitary towels or under-pant protectors, and with absorption products in general, where controlled diffusion of a liquid deposited on the layer is desirable. The slits may be made with an orientation on the layer according to the functional requirements, i.e. in any attitude from longitudinally to transverse the layer. The slit formations may either be continuous along the entire layer in some suitable direction, or may consist of a plurality of discontinuous slits, between which are formed longitudinal, free-cut strips of the web. If the inventive layer is made up using a less strongly absorbent or diffusive fibre quality, only limited absorption or diffusion takes place in the layer itself, and thus the deposited liquid migrates in the longitudinal direction of the strip formations and in the spaces between the strip formations, while absorption then also occurs on the material webs laminated to the upper or lower faces of the layer.

A method of producing a material layer in accordance with the invention consists of cutting or stamping slits in different patterns in a material, e.g. soft paper, although material having other characteristics and compositions may be used. The slitted layer may be subsequently drawn apart such as to afford different covering percentages of the material surface and to the extent appropriate to the field of use to which the layer is put. It may then be positionally fixed by laminating against one or more adjacent material layers or webs.

In utilizing the other ability of the material layer in accordance with the invention it is placed interiorly in a laminate in combination with other material layers or webs included in the laminate. Since greater bulk is desired here, the layer is drawn apart as in the previous case, causing reticulations to be formed where the slits are, with the strip portions becoming warped as the reticulations are formed. The reticulations may also be filled with foam. The reticulate layer may have a colour differing from the other material webs included in the laminate, and several reticulate layers may be put together in different patterns or be provided with different fillers to obtain such as greater weight, softness, colouring, workability, embossing properties, and absorption capacity. In addition, the laminate containing the inventive reticulate layer can provide a thicker material of a lower weight than would otherwise be possible, and as a result the layer also affords the possibility of liquid being absorbed into the material better. There is also less material needed in the laminate containing the inventive, reticulate layer.

In an alternate embodiment of the invention, the material layer is drawn out so as to be reticulated, caus-

ing the strip configurations to become warped, and then cured or "frozen" in this condition with the object of forming a bulky material layer.

5 The invention will now be described in more detail below with the aid of some preferred embodiment examples, and with reference to the accompanying drawings, where

10 Fig. 1 illustrates an inventive material layer, which is laminated against a material web in the form of a liquid barrier, with the slit formations in the layer only slightly parted for forming slit openings with completely free-cut
15 strips which effectively propagate the deposited liquid in their longitudinal direction,

Fig. 2 illustrates a material layer in accordance with the invention, this layer having a plurality of discontinuous slit formations in the form of slits, situated in line over its surface and in given, mutually spaced relationship and thus forming partial strips,

25 Fig. 3 illustrates the material layer of Fig. 2 after it has been opened out transverse the slits and laminated against a material web in the form of a liquid barrier, such as to obtain controlled migration of liquid in the longitudinal direction of the strips,
30

Fig. 4 illustrates a layer of soft paper, without slit formations and with the same fibre orientation as in Fig. 3, that has been applied to
35 a material web formed as a liquid barrier, a drop of liquid having been deposited on the

soft paper layer to demonstrate the diffusion of the liquid in the laminate,

5 Fig. 5 illustrates the layer of Fig. 2 after it has been further opened out such as to form a reticulate layer with warped strip formations, this layer being positionally fixed, with the aid of a bonding agent, between two adjacent material layers, and thus constituting a
10 spacer layer between these two for providing bulkiness, and

15 Fig. 6 illustrates how completely free-cut strips in an inventive material layer are brought into given, mutually spaced relationship before being positionally fixed to an adjacent material web with the aid of deflecting apparatus.

20 In an embodiment of the invention illustrated in Fig. 2, a material layer 1 is comprised, for example, of soft paper. This layer is intended to be utilized as a separate layer, or at least in one layer to be placed loosely, or to be bonded against one or more material webs for achieving a bulkier and thicker material web.
25 This is obtained by pulling apart the layer 1, causing the layer to become reticulated as the slit formations 2 open out and the strip formations 3 are warped or twisted to suit, as will be seen from Fig. 5; or the layer may become a laminate for an absorption product
30 according to Fig. 3. The twisted or warped strip formations 3 may, after reticulation, be fixed to two adjacent material webs, the reticulated layer 4 then constituting a spacer providing bulkiness. The reticulated layer 4 is thus intended to be placed between two webs,
35 or against one web, and its reticulations may be filled with different fillers with a foam, to obtain further properties such as greater weight, softness, colouring,

workability, embossing characteristics and absorption capacity in the finished laminate.

5 The laminate containing the reticulate layer 4, with or without foam-filled reticulations, provides a thicker material with lower weight than what would otherwise be the case, and as a result of this the implementaton of the layer 4 affords the possibility of rapid absorption of any liquid spillage on the laminate.

10 The slit formations 2 allowing the formation of reticulations comprise a plurality of slits 5, arranged in lines in mutual spaced relationship both along the lines and laterally. The slits 5 in one line are displaced in relation to the slits 5 in lines on either side, thus enabling special configuration of the layer 1 in response to its field of use. In a preferred embodiment example the strip formations 3 formed by slits 5 may have a width constituting a short, given
15 portion of the length of the slits 5.
20

In the case where the inventive layer 1 is intended for inclusion in a laminate, where controlled liquid diffusion of a liquid desposited on the layer is desired,
25 e.g. for a baby's diaper or an underpant protector, the slitted layer 1 may be laminated against a material web formed as a liquid barrier 6, with the strip formations 3 only slightly parted to form small slit openings 7 according to Fig. 1, or slit openings 7' according to
30 Fig. 3, whereby a noticeable and effective migration of liquid in the longitudinal direction of the slit and strip formations is achieved when liquid is deposited on the layer. What distinguishes the layer 1 when used in absorbent materials, e.g. diapers or underpant
35 protectors, is that is has a plurality of slit formations 2. These may either be continuous slit openings 7 with completely free-cut strips 8 along the entire

layer 1 in some suitable direction, according to Fig. 1, or the slit formations 2 may comprise a plurality of slits 5 arranged one after the other in lines at small mutual spacing between the strip formations 3, according to Fig. 2. It will be seen from the embodiment example, illustrated in Fig. 3, how a drop of liquid is diffused in the slit material, irrespective of the fibre orientation in the layer 1. In Fig. 4 the layer depicted here has the same fibre orientation as that for the layer in Fig. 3, where a material layer included in the laminate is not slitted in accordance with the invention. It will be noted from this figure that a drop of liquid diffuses mostly transverse the fibre orientation, which particularly applies to soft crepe paper. From Fig. 3, illustrating the same laminate as in Fig. 4, but slitted in accordance with the invention, it will be seen how liquid migrates in the longitudinal direction of the strip formations 3, due to the slits. In addition, by slitting the material web controlled diffusion of liquid deposited on the layer may also be obtained in a direction towards regions of superabsorbent material (SAP) arranged in the laminate. This superabsorbent material (SAP) may then be blended into the fibre material of the layer 1 or disposed in the slit formations 2. The SAP is suitably applied in a pattern consistent with the intended field of use.

The invention also relates to a method of producing a material layer 1, which is intended to be placed in at least one layer, loosely against, or bonded to, one or more material webs for providing a controlled diffusion capacity for a liquid deposited at least on the layer 1, or for providing a bulkier and thicker material web. Distinguishing for the method in accordance with the invention is that the layer 1 is slit to form longitudinal strip formations 3, while the slit formations 2 thus formed extend a given distance from each other,

the layer 1 being positionally fixed to at least one material web, after the strip formations 3 have been drawn apart to a greater or less extent.

5 A deflecting apparatus 9 may be used for drawing apart the completely free-cut strips 8 in accordance with the embodiment illustrated in Fig. 1. As will be seen from Fig. 6, the parallel strips 8 forming the layer 1 are deflected about 90° over the apparatus 9. At its de-
10 flecting location 10, which can be an edge 12, the apparatus 9 has a plurality of 45° sections 11 situated one after the other and mutually relatively displaced for guiding and separating the strips 8. At the apparatus 9 the free-cut strips 8 are separated and then
15 positionally fixed in relation to each other, e.g. on a material web in the shape of a liquid barrier 6.

When a part of the inventive layer 1 is included in a diaper or underpant protector as a diffusion layer for
20 liquid deposited on the article, the material from which the layer is produced can be dry- or wet-laid soft paper, or other fibre material possessing capillary properties and which can absorb and permit diffusion, i.e. can have properties of liquid acceptance or
25 gain. The diffusion layer may be single or comprise several layers one upon the other, and they may have different densities for controlling liquid acceptance. In special embodiments, different kinds of SAP may be used in one or more layers and in different concentra-
30 tions, and of different types to suit desired product properties. The SAP type used is suitably environmentally friendly, biologically decomposeable and made, inter alia, from renewable raw materials.

35 The web-forming diffusion layer may have a coating, which is either fully covering or perforated and is, for example, a polymer film, dense paper or a liquid

product forming a film. When a polymer film is used the slit cuts also result in downwardly bent cut surfaces, which reinforce the diffusion effect, provide reduced rewetting and also a reduced feeling of moistness.

5

To achieve a "dryness feeling" for the surfaces of the diffusion layer, a coating of permeable material, e.g. nonwoven or such as perforated polymer film, is laminated to the diffusion layer, and this coating drains deposited liquid such as to give a feeling of low moistness in or on the outer material layers.

10

Different combinations of diffusion layers in accordance with the invention can be envisaged, namely several layers with varied location of any fibre layer with a coating, partially reticulate layers for concentrating absorption, reticulate layers with reticulations of varying sizes for different purposes, diffusion layers with narrow reticulations giving low feeling of moistness, and those with wide reticulations giving rapid liquid acceptance due to their large empty volumes, diffusion layers with reticulations where the slits have optional orientation, e.g. along or transverse web length. Slit length and reticulation width for the diffusion layer may be adjusted to suit requirements, and openings in multilayer products may be in register, or randomly arranged in the Z-direction.

15

20

25

Completely free-cut strips, forming the inventive diffusion layer, may be set on edge in spaced mutual relationship and uncoated, or placed close together if they are coated with film.

30

35

In the case where knives are used to make the slits, these knives may be implemented such that they provide rough cut surfaces, which results in greater absorption area, and thus better absorption. Finally, the coating

and backing may be vacuum formed to each other with an intermediate, inventive diffusion layer. In some applications it can be advantageous to have an "aspirating" backing.

Claims

1. Material layer of soft paper, polymer fibre or polymer film intended to be utilized as a separate layer, or be disposed in at least one layer loosely on, or be bonded to one or more material webs, for achieving a controlled diffusion capacity of a liquid deposited on at least the material layer, or for achieving a bulkier and thicker material web, said layer (1) having a plurality of slit formations (2) extending over it, characterized in that said slit formations (2) are laterally arranged at an optional, mutual spacing, such as to form between themselves free, separated strip formations (3), said layer (1) being intended to constitute a separate material layer, or be part of a combination of at least one further differing layer or web, which positionally fixes the slitted layer (1) when it has been drawn apart to a greater or less extent depending on its field of use, different reticulations or opening widths being then obtained at the slit formations (2) in the material layer (1).

2. Material layer as claimed in claim 1, characterized in that the slitted layer (1) is laminated to a material web in the form of a liquid barrier (6) with the slit formations (2) only slightly drawn apart, such as to form longitudinal slit openings (7) with completely free-cut strips (8), a noticeable diffusion of the liquid being achieved for liquid deposition on the layer (1) in the longitudinal direction of the slit openings (7) and the strips (8).

3. Material layer as claimed in claim 1, characterized in that the slit formations (2) comprise a plurality of slits (5) arranged in line and at given mutual spacing, alternate rows of slits being mutually, longitudinally displaced a given distance in relation to the

other rows, and in that the layer is expanded transverse the slits (5) such as to form slit openings or reticulations (7') forming strip formations (3).

5 4. Material layer as claimed in claim 1, **characterized** in that a super absorbent is blended into the material of the layer (1) or placed in the slit formations (2).

10 5. Material layer as claimed in claim 4, **characterized** in that the superabsorbent is applied to the opened-out slit formations (2) in a given pattern.

15 6. Material layer as claimed in claim 3, **characterized** in that when the layer (1) is expanded, i.e. drawn apart, different amounts of warping occur in the strip formations (3) extending between the slits (5), a net-like or reticulate layer (4) thus being formed from the layer (1), and when the strip formations (3) are in
20 their warped attitude they are positionally fixed, with the aid of a bonding agent, between adjacent material webs such as to constitute a spacer between said webs, or the reticulate layer (4) is fixed in a corresponding way to an adjacent material web to give bulkiness.

25 7. Method of producing a material layer from soft paper or polymer fibre, the layer being intended for use as a separate layer, or in at least one layer to be placed loosely on, or be bonded to one or more material
30 webs for achieving a controlled diffusion capacity for a liquid deposited at least on the layer or a bulkier and thicker material layer, **characterized** in that the layer is slitted into longitudinal strip formations, which extend in given, mutually spaced relationship,
35 said layer being positionally fixed to at least one material web after greater or less drawing apart of the strip formations.

8. Method as claimed in claim 7, **characterized** in that positional fixation of the strip formations to at least one material web is performed with the aid of vacuum.

5

9. Apparatus for carrying out a method of producing a material layer from soft paper or polymer fibre intended to be used as a separate layer, or at least one layer for placing loosely on, or being bonded to one or more material webs for achieving a controlled diffusion capacity for a liquid deposited at least on said material layer, **characterized** in that it comprises a deflecting apparatus (9), over which completely free-cut strips (8), arranged parallel to form a web, are deflected about 90°, while at its deflecting location (10) the apparatus (9) has a plurality of 45° sections (11) situated one after the other, with their extensions mutually relatively displaced for guiding and separating the strips (8).

10
15
20

10. Apparatus as claimed in claim 9, **characterized** in that the deflecting location (10) comprises an edge (12) of the apparatus (9).

1 / 2

Fig. 1

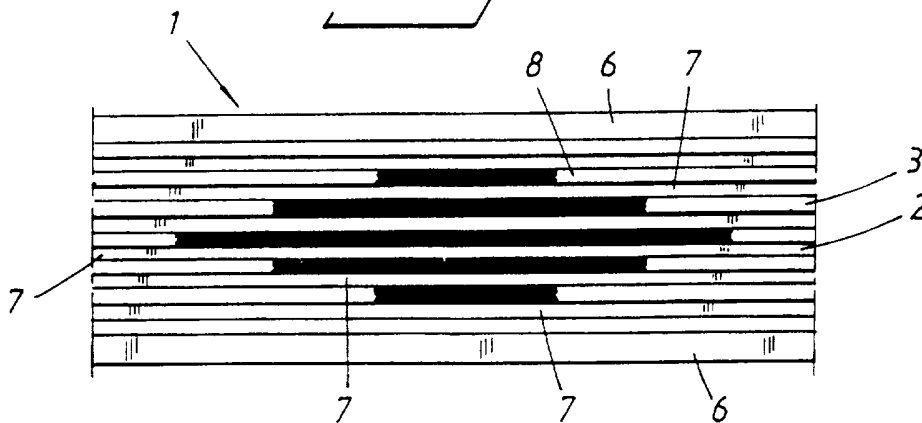


Fig. 2

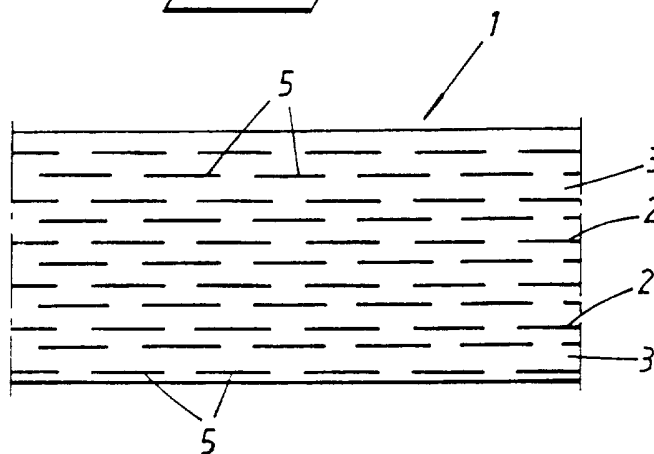
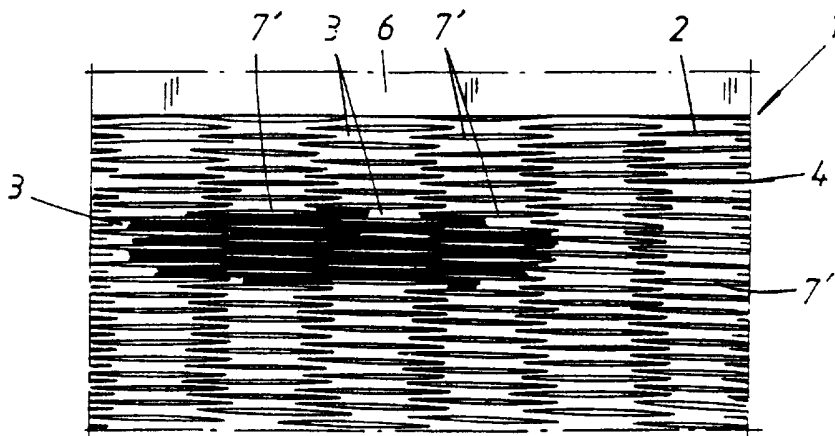


Fig. 3



2 / 2

Fig. 4

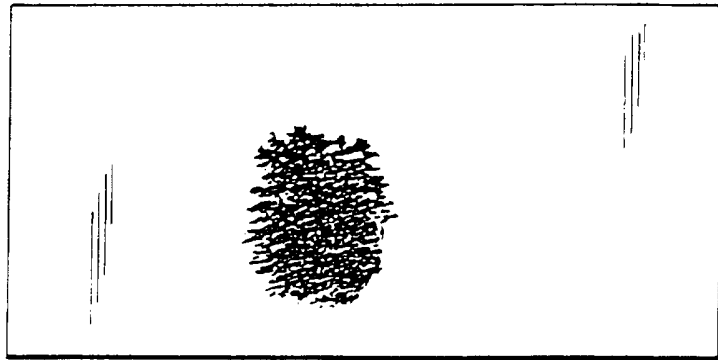


Fig. 5

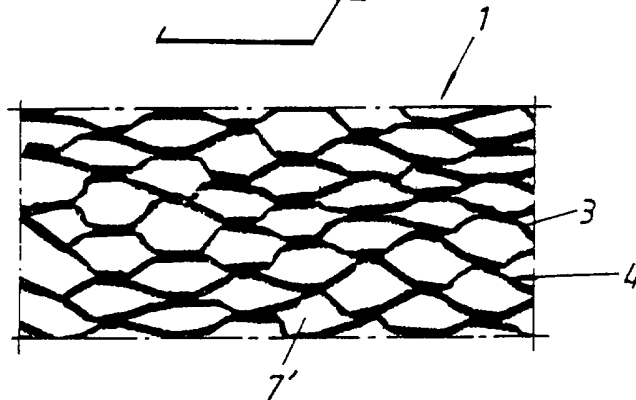
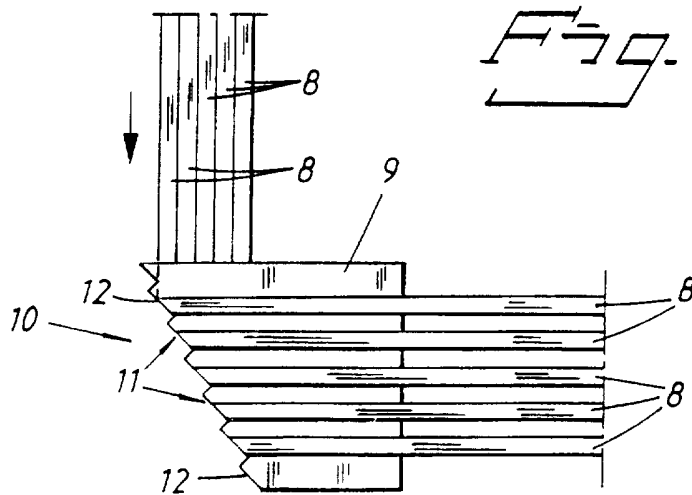


Fig. 6



INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 97/00557

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A61F 13/46, D21H 27/30

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)

IPC6: A61F, D21H

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

SE,DK,FI,NO classes as above

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

WPI, CLAIMS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	WO 9701995 A1 (SCA MÖLNLYCKE AB), 23 January 1997 (23.01.97), page 5, line 9 - line 11; page 5, line 26 - line 30, abstract, claims --	1-7
X	US 4560372 A (HEINZ A. PIENIAK), 24 December 1985 (24.12.85), column 5, line 5 - line 10; column 5, line 50 - line 53, figure 1 --	1,4-7
A	EP 0160572 A2 (PERSONAL PRODUCTS COMPANY), 6 November 1985 (06.11.85), page 13, line 15 - line 22; page 9, line 16 - line 26 -- -----	1,4-7

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

Date of mailing of the international search report

3 July 1997

19 -07- 1997

Name and mailing address of the ISA/
Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. +46 8 666 02 86

Authorized officer

Sofia Nikolopoulou
Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 97/00557

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9701995 A1	23/01/97	AU 6322496 A	05/02/97
		GB 2302811 A	05/02/97
		GB 9611631 D	00/00/00
		SE 504908 C	26/05/97
		SE 9502390 A	31/12/96
US 4560372 A	24/12/85	AU 575394 B	28/07/88
		AU 4188685 A	07/11/85
		BR 8502060 A	31/12/85
		CA 1245004 A	22/11/88
		EP 0160569 A,B	06/11/85
		SE 0160569 T3	
		HK 30591 A	26/04/91
		JP 60253447 A	14/12/85
EP 0160572 A2	06/11/85	SE 0160572 T3	
		AU 583264 B	27/04/89
		AU 4188585 A	07/11/85
		BR 8502058 A	31/12/85
		CA 1239012 A	12/07/88
		HK 30691 A	26/04/91
		JP 60249953 A	10/12/85
		US 4676784 A	30/06/87