

(19)



(11)

**EP 2 095 935 B2**

(12)

**NEW EUROPEAN PATENT SPECIFICATION**

After opposition procedure

(45) Date of publication and mention  
of the opposition decision:  
**21.10.2020 Bulletin 2020/43**

(51) Int Cl.:  
**B31F 1/07** <sup>(2006.01)</sup> **A47K 10/16** <sup>(2006.01)</sup>  
**D21H 27/32** <sup>(2006.01)</sup>

(45) Mention of the grant of the patent:  
**08.06.2011 Bulletin 2011/23**

(21) Application number: **09425073.5**

(22) Date of filing: **24.02.2009**

---

(54) **Embossed paper multi-ply material**

Geprägtes mehrlagiges Papiermaterial

Matériau à plusieurs épaisseurs de papier gaufré

---

(84) Designated Contracting States:  
**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 TR**

(30) Priority: **27.02.2008 IT FI20080038**

(43) Date of publication of application:  
**02.09.2009 Bulletin 2009/36**

(73) Proprietor: **SOFIDEL S.p.A.  
55016 Porcari (LU) (IT)**

(72) Inventor: **Emi, Stefani  
55016 Porcari  
Lucca (IT)**

(74) Representative: **Mannucci, Michele et al  
Ufficio Tecnico Ing.A. Mannucci S.r.l.  
Via della Scala 4  
50123 Firenze (IT)**

(56) References cited:  
**EP-A- 1 911 574 EP-A1- 0 707 674  
EP-B1- 0 564 319 EP-B1- 0 797 705  
EP-B1- 1 075 387 WO-A-99/44814  
US-A- 3 650 882 US-A- 3 953 638  
US-A- 4 469 735**

**EP 2 095 935 B2**

## Description

### Technical Field

**[0001]** The present invention relates to improvements to the multi-ply materials made of paper, in particular of so-called tissue paper, for example for the production of absorbent products, toilet paper, kitchen towels, and the like.

### State of the Art

**[0002]** In the field tissue paper manufacturing and converting it is well known to produce multi-ply products, wherein two or more embossed plies of tissue paper are joined to each other by lamination and gluing according to different techniques.

**[0003]** For example, US-A-3961119 describes a two-ply material, wherein the two plies are embossed separately with helical patterns with different inclinations and are coupled in the intersection of the helical patterns.

**[0004]** US-A-6470945 describes a machine for embossing plies which, once joined to each other, form a web material with plies coupled tip-to-tip or nested respectively. Tip-to-tip joining is intended a bonding, wherein the protuberances of one ply are at least partially at correspondence of protuberances of the other ply. Vice versa, nested joining is intended a bonding, wherein the protuberances of a ply are nested between the protuberances of the other ply.

**[0005]** Other embossed multi-ply products and devices for the production thereof are described and illustrated for example in US-A-6261666, US-A-6109326, US-A-2003/0102096, US-A-6136413, WO-A-00/78533, US-A-6681826, US-A-3414459, US-A-5173351, US-A-6032712, US-A-6245414, WO99/44814.

**[0006]** US-A-4,320,162 describes a multi-layer product with two plies embossed with equal embossing on the two faces, i.e. on the two plies. The embossings are arranged tip-to-tip and are formed by big protuberances with large front surface, between which protuberances with lower height and lower dimension are arranged.

**[0007]** The embossed multi-ply paper materials must satisfy a plurality of requirements that often contrast to each other, such as in particular: softness, absorption capacity, thickness, mechanical resistance also when they are soaked with a liquid, ability of removing materials from surfaces cleaned by using embossed paper, and also other requirements.

**[0008]** There is a constant research, in order to identify techniques for embossing, laminating and bonding the plies, that allow to optimize the yield of these materials from many points of views, also mutually contrasting.

### Summary of the Invention

**[0009]** According to one aspect, one object of the present invention is to provide a multi-ply paper web ma-

terial, in particular formed by a plurality of plies of a material made of embossed tissue paper, which has improved features with respect to the traditional products, at least for one or some aspects. The multi-ply paper web material according to the invention is defined in claim 1.

**[0010]** According to one embodiment, the multi-ply material made of embossed tissue paper according to the present invention comprises at least one first outer ply and at least one second outer ply bonded to one another at correspondence of first protuberances obtained on one and on the other of said plies and oriented towards the inside. Bonding is of the tip-to-tip type, i.e. a bonding wherein the protuberances obtained on a first ply are at correspondence of protuberances obtained on the other ply. Between the two outer plies two embossed inner plies are comprised. Contrary to the traditional tip-to-tip products, according to the present invention (in addition to a first series of tip-to-tip bonded protuberances obtained both on the first and on the second outer ply, and having a linear development in order to form decorative patterns with great surface extension) each of the two outer plies also provides for a second series of protuberances, also facing towards the inside and defining a background pattern, which is preferably constituted by a plurality of protuberances with a simple geometrical shape, for example and in particular truncated pyramid or truncated cone shapes.

**[0011]** The plies are bonded to each other by gluing and lamination at correspondence of at least the protuberances with linear development of the first and of the second ply.

**[0012]** According to an advantageous embodiment, the protuberances with truncated pyramid, truncated cone or however simple geometrical shape, defining the background embossing pattern, have a front surface of the protuberances equal to or lower than 4 mm<sup>2</sup>.

**[0013]** Preferably, the background protuberances have a density comprised between 2 and 25 and more preferably between 3 and 8 protuberances/cm<sup>2</sup>.

**[0014]** According to some advantageous embodiments, the first embossing protuberances or at least some of them, both on the first and on the second outer ply, define preferably closed lines, inside which areas or portions of the respective plies are delimited, devoid or substantially devoid of embossing, i.e. smooth areas. Preferably, these areas form swellings facing towards the outside of the multi-ply material.

**[0015]** Both the third inner ply and the fourth inner ply of the multi-ply material are embossed.

**[0016]** The embossings obtained on the third and/or on the fourth inner ply are formed by protuberances facing towards the outside, i.e. respectively facing towards the first and the second outer ply of the multi-ply material.

**[0017]** In order to obtain a product with a greater thickness, which does not tend to be pressed or to collapse during packaging, for example during winding in rolls, the geometrical protuberances of the third ply and of the fourth ply arranged inside the first outer ply and the sec-

ond outer ply are arranged, at least in some of the zones or areas devoid of embossing delimited by the linear embossing protuberances of the first ply and of the second ply, so as to support these areas devoid of embossing and to maintain them swollen and projecting towards the outside of the multi-ply material.

**[0018]** In this way, a particular soft material is obtained with a great apparent thickness and with a high aesthetic appearance, thanks to the wide embossing pattern delimited by the protuberances with linear development of the two outer plies. The thickness of the material is maintained also when the material is wound, for example to form rolls of kitchen towels, thanks to the presence of the geometrical protuberances of the two inner plies which are arranged inside the non-embossed areas delimited by the linear protuberances of the two outer plies, i.e. they nest between said linear protuberances.

**[0019]** Further advantageous features and embodiments of a multi-ply material according to the present invention are set forth in the appended claims and shall be described in greater detail hereunder with reference to some non limiting embodiments of the invention.

#### Brief description of the drawings

**[0020]** The invention shall be better understood by following the description and the accompanying drawing, which shows non-limiting practical embodiments of the invention. More in particular, with reference to the attached drawings:

- figure 1 shows a plan view of a portion of a web material according to the present invention;
- figure 2 shows a greatly enlarged schematic section according to line II-II of figure 1;
- figure 3 shows a scheme of a machine or embossing unit for the production of a web material of the type illustrated in figures 1 and 2.

#### Detailed description of embodiments of the invention

**[0021]** Figure 1 shows a top view of a portion of a multi-ply material according to present the invention, indicated as a whole with the number 1. Figure 2 shows a greatly enlarged and schematic cross section, according to the line II-II of figure 1, of the material 1, from which it is apparent that the material is formed of four plies and precisely: a first outer ply V1, a second outer ply V2, a third inner ply V3 arranged between the plies V1 and V2, and a fourth inner ply V4, also arranged between the plies V1 and V2. More precisely, the ply V3 is arranged between the ply V1 and V4, and the ply V4 is arranged between the ply V3 and the ply V2.

**[0022]** According to an advantageous embodiment, the outer plies V1 and V2 are embossed with a tip-to-tip pattern, i.e. in such a manner that the protuberances of the ply V1 have the same shape or substantially the same shape of the protuberances of the ply V2 and correspond

to each other, with an arrangement wherein the front surfaces of the protuberances of a ply are at correspondence of the front surfaces of the protuberances with equal shape of the other ply.

**[0023]** According to an advantageous embodiment, both on the ply V1 and on the ply V2 first protuberances are provided, indicated respectively with the number 5 and 7 for the plies V1 and V2, which have a linear development, i.e. an extension of greater dimension relative to the cross dimension. In some embodiments each protuberance 5, 7 has a length at least 10 and preferably 20 times and more preferably 50 times greater than the cross dimension in width of the protuberance itself.

**[0024]** According to some preferred embodiments, the protuberances 5 and the corresponding protuberances 7 or at least some of them have a closed shape, i.e. such a shape as to define areas, indicated with the letter A in figure 1, which are completely or nearly completely surrounded by respective linear protuberances 5, 7. In some embodiments, the areas A so delimited are devoid of embossing, i.e. they are substantially smooth, that is they are devoid of protuberances. They are preferably swollen, i.e. they project towards the outside of the multi-ply material 1, forming a sort of projections, bubbles or swellings, whilst the protuberances 5 and 7 face towards the inside of the multi-ply material 1.

**[0025]** In addition to the projections or linear protuberances 5, 7, each ply V1, V2 has further protuberances 9, 11, which are also arranged in a preferably tip-to-tip arrangement and, as shown in figure 1, with a simple geometric shape. In some embodiments, the protuberances 9, 11, again facing towards the inside of the multi-ply material 1, have truncated pyramid or truncated cone shapes, with a front surface preferably lower than 4 mm<sup>2</sup>.

**[0026]** In some embodiments, as shown in figures 1 and 2, the inner plies V3 and V4 are provided with respective protuberances 13, 15 facing towards the outside, i.e. the protuberances 13 provided on the ply V3 facing towards the outer ply V1 and the protuberances 15 provided on the ply V4 facing towards the outer ply V2. In some embodiments, the protuberances of the plies V3 and V4 have variable heights, as shown for example in the embodiment of figure 2. In this case, on the ply V3 projections or protuberances 13 and protuberances 13X are provided, with respective height H and h, and on the ply V4 are arranged protuberances 15X and 15 with height H and h.

**[0027]** In some embodiments, a plurality of protuberances 13 of the ply V3 and of protuberances 15 of the ply V4 are arranged at correspondence of the areas A of the plies V1 and V2 delimited by linear protuberances 5, 7. In this way, the swellings formed in the zones or areas A delimited by the linear protuberances 5, 7 are supported by the protuberances 13, 15 formed by the inner plies V3, V4 and oriented towards the outside, arranged in a nested arrangement inside the linear protuberances 5, 7. This facilitates maintaining the overall thickness, indicated with the letter S, of the multi-ply material 1 also if

this latter is wound in order to form for example a roll of kitchen towels, toilet paper or the like.

**[0028]** For the sake of simplicity of the drawing, in figure 2 the protuberances 13X are shown only in the angle right at the bottom, where the ply V1 is lifted so as to show the embossed structure below. Vice versa, in the smooth areas A surrounded by the protuberances 5, the protuberances 13 of the ply below are shown with a dashed line, so as to show how they are arranged to support the portions of ply in the areas A devoid of embossing.

**[0029]** The protuberances 13X, 15X can have a height lower than the protuberances 13, 15, as shown in figure 1, as they do not have to perform a particular supporting function. It is however possible for the projections or protuberances 13X, 15X to have a height equal to the height H of the protuberances 13, 15.

**[0030]** Finally, with a configuration of this type, it is possible to obtain a material with great thickness and high softness, which is resistant against the compression or collapse, with high detergent features thanks to the presence of protuberances 5, 7 with linear development which define, on the outer surface of the ply material 1, linear cavities for collecting the impurities, such as for example dust, liquid or other, collected from the surfaces which are cleaned by means of the material 1.

**[0031]** Advantageously, the plies V1 and V2 are glued to each other by lamination at correspondence of the protuberances 5, 7, and 9, 11, in a tip-to-tip arrangement, all these protuberances having the same height or at least the protuberances 5, 9 having the same height and analogously the protuberances 7, 11 having the same height. In a modified embodiment, the height of the protuberances 9, 11 can be different from, and in particular lower than, the height of the protuberances 5, 7.

**[0032]** The protuberances 13, 15 can be distributed with a variable density, for example the protuberances 13, 15 with a density greater than that of the protuberances 13X, 15X, so as to form a more effective support for the swollen areas A.

**[0033]** In some embodiments, the protuberances 13, 15 and/or the protuberances 13X, 15X can have a density comprised between 5 and 10 protuberances/cm<sup>2</sup>.

**[0034]** The dimensions of the protuberances 13, 15 and 13X, 15X can be such as to define surface areas on the upper ends (i.e. that facing towards the outside) of the protuberances equal to or lower than 4 mm<sup>2</sup>.

**[0035]** A multi-ply material 1 of the type described above can be obtained for example with a machine or embossing unit of the type schematically represented in figure 3 and indicated as a whole with the number 20. In some embodiments, the embossing unit comprises a first embossing roller 21 and a second embossing roller 23 provided with mirror-like engravings so as to emboss in a tip-to-tip arrangement and to laminate the first outer ply V1 with the second outer ply V2 of the multi-ply web material 1.

**[0036]** The surface configuration of the rollers 21 and

23 substantially reproduces the shape of the protuberances 5, 9 for one of the roller and 7, 11 for the other roller.

**[0037]** The embossing rollers 21 and 23 cooperate with respective pressure rollers 25, 27, for example coated with rubber or other elastically yielding material so as to emboss separately one from the other the plies V1 and V2 fed along the respective feeding paths about the pressure rollers 25, 27 and in the nip between the rollers 25, 21 and 27, 23 respectively.

**[0038]** Between the embossing rollers 21 and 23 a laminating nip 29 is defined, through which the embossed plies V1, V2 pass and at correspondence of which said plies are mutually laminated by gluing them thanks to the glue applied by one or the other of two glue dispensing units 31, 33.

**[0039]** In addition to the pairs of embossing and pressure rollers 21, 25 and 23, 27, the embossing unit 20 comprises a further third embossing roller 35 and a fourth embossing roller 37, respectively cooperating with a third pressure roller 39 and a fourth pressure roller 41, coated with an elastically yielding material, such as rubber or other.

**[0040]** The third ply V3 and the fourth ply V4 are fed along respective paths by the embossing unit 20, and they are separately embossed in the nips defined respectively between the pressure roller 39 and the embossing roller 35 and between the pressure roller 41 and the pressure roller 37. The embossing rollers 35, 37 have engravings with projections corresponding to the protuberances 13, 13X, and 15, 15X generated by the rollers to the inner plies V3 and V4. As it is shown in the diagram of figure 3, the arrangement of the rollers is such that the projections of the rollers 35 and 37 generate on the plies V3 and V4 corresponding protuberances facing towards the plies V1 and V2 in the nip between the pairs of the rollers 21, 35 and 23, 37. In this way the protuberances 13, 13X generated by the embossing roller 35 and the protuberances 15, 15X generated by the embossing roller 37 are oriented towards the outside of the multi-ply material 1.

**[0041]** The arrangement of two glue dispensing units 31, 33 allows to apply the glue on the protuberances 5, 9 obtained on the ply V1 by means of the dispensing unit 31 and on the protuberances 7, 11 generated on the ply V2 by the embossing roller 23 by means of the glue dispensing unit 33, so as to have a sufficient quantity of glue to glue by lamination in the nip 29 the four plies V1 V2, V3, and V4 to each other.

**[0042]** It is understood that the drawing only shows an example provided by way of a practical arrangement of the present invention, which can vary in forms and arrangements without however departing from the scope of the concept underlying the invention.

## 55 Claims

1. A tissue paper multi-ply material (1) comprising at least one first outer ply (V1) and at least one second

- outer ply (V2), wherein said first and said second outer ply are embossed with first protuberances (5, 7) with linear development facing towards the inside of the material and arranged tip-to-tip, and with second protuberances (9, 11) facing towards the inside of the material and defining a background motif wherein between said first outer ply and said second outer ply a third ply (V3) and a fourth ply (V4) are arranged; wherein said third and fourth plies (V3, V4) are embossed with a background pattern (13, 13X, 15, 15X); and wherein a plurality of embossing protuberances (13, 13X, 15, 15X) of each of said third and fourth ply (V3, V4) are arranged inside non-embossed areas (A) defined by corresponding protuberances (5, 7) with linear development of the respective outer ply (V1, V2), constituting reinforcing elements in order to prevent or to reduce the compression of the areas delimited by said linear protuberances (5, 7).
2. Material as claimed in claim 1, wherein the second protuberances (9, 11) of the first and of the second outer ply (V1, V2) are positioned in a tip-to-tip arrangement.
  3. Material as claimed in claim 1 or 2, wherein said two outer plies (V1, V2) are bonded by gluing at correspondence at least of said first linear protuberances (5, 7).
  4. Material as claimed in claim 1, 2, or 3, wherein said second protuberances (9, 11) have truncated cone or truncated pyramid shape, with a front surface at the top equal to or lower than 4 mm<sup>2</sup>.
  5. Material as claimed in one or more of the previous claims, wherein at least some of the first protuberances (5, 7) of said first and second outer ply (V1, V2) define at least partially closed lines, within which corresponding substantially non - embossed areas (A) of the respective outer ply (V1, V2) are defined.
  6. Material as claimed in claim 5, wherein said substantially non - embossed areas (A) form swellings projecting towards the outside of the respective outer ply (V1, V2).
  7. Material as claimed in one or more of the previous claims, wherein the second protuberances (9, 11) of the outer plies (V1, V2) have a density comprised between 1 and 25 protuberances/cm<sup>2</sup> and preferably between 3 and 8 protuberances/cm<sup>2</sup>.
  8. Material as claimed in one or more of the previous claims, wherein the background pattern (13, 13X, 15, 15X) of the third and fourth ply (V3, V4), is constituted by embossing protuberances facing towards the respective outer plies.
  9. Material as claimed in one or more of the previous claims, wherein said protuberances (13, 13X, 15; 15X) of the third and of the fourth ply (V3, V4) have at least two different heights, the protuberances with greater height (13, 15) being preferably arranged inside said non - embossed areas (A) defined by said linear protuberances (5, 7) of the respective first and second outer ply (V1, V2).
  10. Material as claimed in one or more of the previous claims, wherein said plies are glued with a colored glue.
- 15 Patentansprüche**
1. Mehrlagiges Tissuepapiermaterial (1), umfassend wenigstens eine erste äußere Lage (V1) und wenigstens eine zweite äußere Lage (V2), wobei die erste und die zweite äußere Lage mit ersten Erhebungen (5, 7) mit linearer Entwicklung geprägt sind, die zu der Innenseite des Materials gerichtet sind und Spitze-zu-Spitze angeordnet sind, und mit zweiten Erhebungen (9, 11), die zu der Innenseite des Materials gerichtet sind und ein Hintergrundmotiv definieren; wobei zwischen der ersten äußeren Lage und der zweiten äußeren Lage eine dritte Lage (V3) und eine vierte Lage (V4) angeordnet sind; wobei die dritte und die vierte Lage (V3, V4) mit einer Hintergrundstruktur (13, 13X, 15, 15X) geprägt sind; und wobei eine Vielzahl von Prägeerhebungen (13, 13X, 15, 15X) von jeder von der dritten und der vierten Lage (V3, V4) innerhalb von nichtgeprägten Bereichen (A), die von entsprechenden Erhebungen (5, 7) mit linearer Entwicklung der entsprechenden äußeren Lagen (V1, V2) definiert werden, angeordnet sind und Verstärkungselemente bilden, um die Kompression der Bereiche, die von den linearen Erhebungen (5, 7) begrenzt werden, zu verringern oder zu verhindern.
  2. Material gemäß Anspruch 1, wobei die zweiten Erhebungen (9, 11) der ersten und der zweiten äußeren Lage (V1, V2) in einer Spitze-zu-Spitze-Anordnung angeordnet sind.
  3. Material gemäß Anspruch 1 oder 2, wobei die beiden äußeren Lagen (V1, V2) durch Kleben an Entsprechungen wenigstens der ersten linearen Erhebungen (5, 7) verbunden sind.
  4. Material gemäß Anspruch 1, 2 oder 3, wobei die zweiten Erhebungen (9, 11) eine kegelstumpfförmige oder pyramidenstumpfförmige Form aufweisen, wobei die Vorderfläche an der Spitze gleich oder kleiner als 4 mm<sup>2</sup> ist.
  5. Material gemäß einem oder mehreren der vorste-

- henden Ansprüche, wobei wenigstens manche der ersten Erhebungen (5, 7) der ersten und der zweiten äußeren Lage (V1, V2) wenigstens teilweise geschlossene Linien definieren, innerhalb derer entsprechende im Wesentlichen nichtgeprägte Bereiche (A) der entsprechenden äußeren Lagen (V1, V2) definiert sind.
6. Material gemäß Anspruch 5, wobei die im Wesentlichen nichtgeprägten Bereiche (A) Wölbungen definieren, die von der entsprechenden äußeren Lage (V1, V2) nach außen ragen.
7. Material gemäß einem oder mehreren der vorstehenden Ansprüche, wobei die zweiten Erhebungen (9, 11) der äußeren Lagen (V1, V2) eine Dichte in dem Bereich zwischen 1 und 25 Erhebungen/cm<sup>2</sup> und vorzugsweise zwischen 3 und 8 Erhebungen/cm<sup>2</sup> aufweisen.
8. Material gemäß einem oder mehreren der vorstehenden Ansprüche, wobei die Hintergrundstruktur (13, 13X, 15, 15X) der dritten und der vierten Lage (V3, V4) durch Prägen von Erhebungen gebildet wird, die zu den entsprechenden äußeren Lagen zeigen.
9. Material gemäß einem oder mehreren der vorstehenden Ansprüche, wobei die Erhebungen (13, 13X, 15, 15X) der dritten und der vierten Lage (V3, V4) wenigstens zwei verschiedene Höhen aufweisen, wobei die Erhebungen mit der größeren Höhe (13, 15) vorzugsweise innerhalb der nichtgeprägten Bereiche (A) angeordnet sind, die von den linearen Erhebungen (5, 7) der entsprechenden ersten und zweiten äußeren Lage (V1, V2) definiert werden.
10. Material gemäß einem oder mehreren der vorstehenden Ansprüche, wobei die Lagen mit einem gefärbten Klebstoff verklebt sind.
- sième et quatrième couches (V3, V4) sont gaufrées avec un motif d'arrière-plan (13, 13X, 15, 15X), et dans laquelle une pluralité de protubérances de gaufrage (13, 13X, 15, 15X) de chacune desdites troisième et quatrième couches (V3, V4) sont agencées à l'intérieur de zones (A) non-gaufrées définies par des protubérances correspondantes (5, 7) avec un développement linéaire de la couche extérieure respective (V1, V2), constituant des éléments de renforcement, de manière à empêcher ou à réduire la compression des zones délimitées par lesdites protubérances linéaires (5, 7).
2. Matière selon la revendication 1, dans laquelle les deuxièmes protubérances (9, 11) des première et deuxième couches extérieures (V1, V2) sont positionnées dans un agencement bout-à-bout.
3. Matière selon la revendication 1 ou 2, dans laquelle lesdites deux couches extérieures (V1, V2) sont liées en collant en correspondance au moins certaines desdites premières protubérances linéaires (5, 7).
4. Matière selon la revendication 1, 2 ou 3, dans laquelle lesdites deuxièmes protubérances (9, 11) ont une forme de cône tronqué ou de pyramide tronquée, avec une surface avant au sommet inférieure ou égale à 4 mm<sup>2</sup>.
5. Matière selon une ou plusieurs des revendications précédentes, dans laquelle au moins certaines des premières protubérances (5, 7) desdites première et deuxième couches extérieures (V1, V2) définissent des lignes au moins partiellement fermées à l'intérieur desquelles sont définies des zones correspondantes sensiblement non gaufrées (A) de la couche extérieure respective (V1, V2).
6. Matière selon la revendication 5, dans laquelle lesdites zones sensiblement non gaufrées (A) forment des gonflements se projetant vers l'extérieur de la couche extérieure respective (V1, V2).
7. Matière selon une ou plusieurs des revendications précédentes, dans laquelle les deuxièmes protubérances (9, 11) des couches extérieures (V1, V2) ont une densité comprise entre 1 et 25 protubérances/cm<sup>2</sup> et de préférence entre 3 et 8 protubérances par centimètre carré.
8. Matière selon une ou plusieurs des revendications précédentes, dans laquelle le motif d'arrière-plan (13, 13X, 15, 15X) de la troisième et de la quatrième couche (V3, V4) est constitué en gaufrant des protubérances faisant face vers les couches extérieures respectives.
9. Matière selon une ou plusieurs des revendications

### Revendications

1. Matière multicouche de mouchoir en papier (1) comprenant au moins une première couche extérieure (V1) et au moins une deuxième couche extérieure (V2), dans laquelle ladite première couche extérieure et ladite deuxième couche extérieure sont gaufrées avec des premières protubérances (5, 7) avec développement linéaire faisant face vers l'intérieur de la matière et agencées bout-à-bout et avec des deuxièmes protubérances (9, 11) faisant face vers l'intérieur de la matière et définissant un motif d'arrière-plan, et dans laquelle entre ladite première couche extérieure et ladite deuxième couche extérieure sont agencées une troisième couche (V3) et une quatrième couche (V4), dans laquelle lesdites troi-

précédentes, dans laquelle lesdites protubérances (13, 13X, 15, 15X) des troisième et quatrième couches (V3, V4) ont au moins deux hauteurs différentes, les protubérances de hauteur supérieure (13, 15) étant de préférence agencées à l'intérieur desdites zones non gaufrées (A) définies par lesdites protubérances linéaires (5, 7) desdites première et deuxième couches extérieures (V1, V2) respectives. 5

10. Matière selon une ou plusieurs des revendications précédentes, dans laquelle lesdites couches sont collées avec une colle de couleur. 10

15

20

25

30

35

40

45

50

55

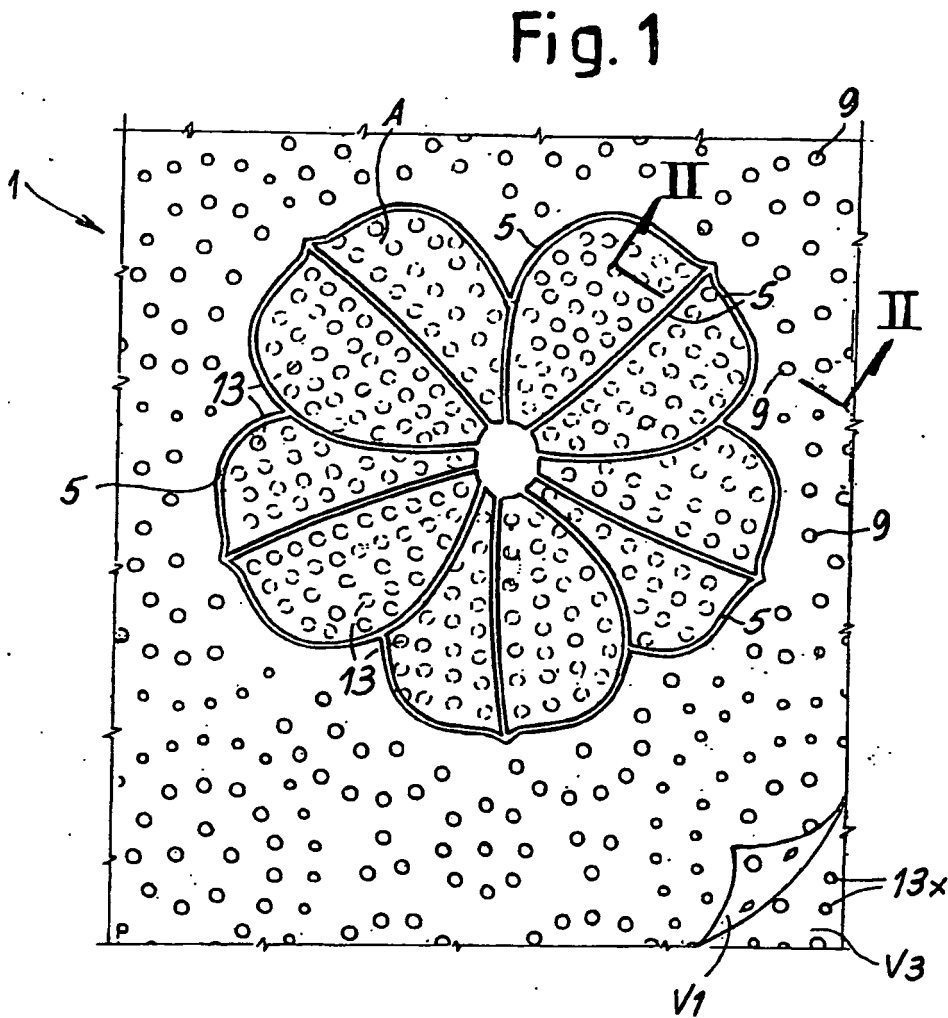
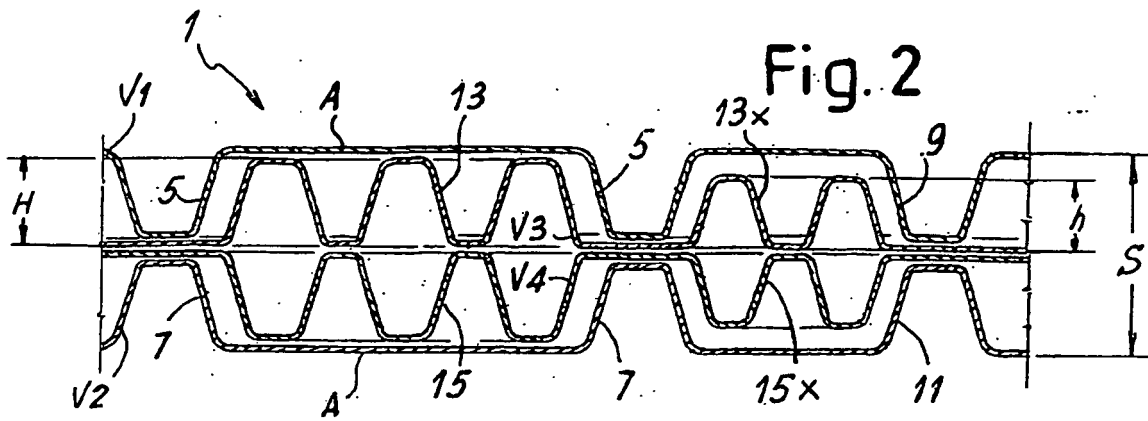
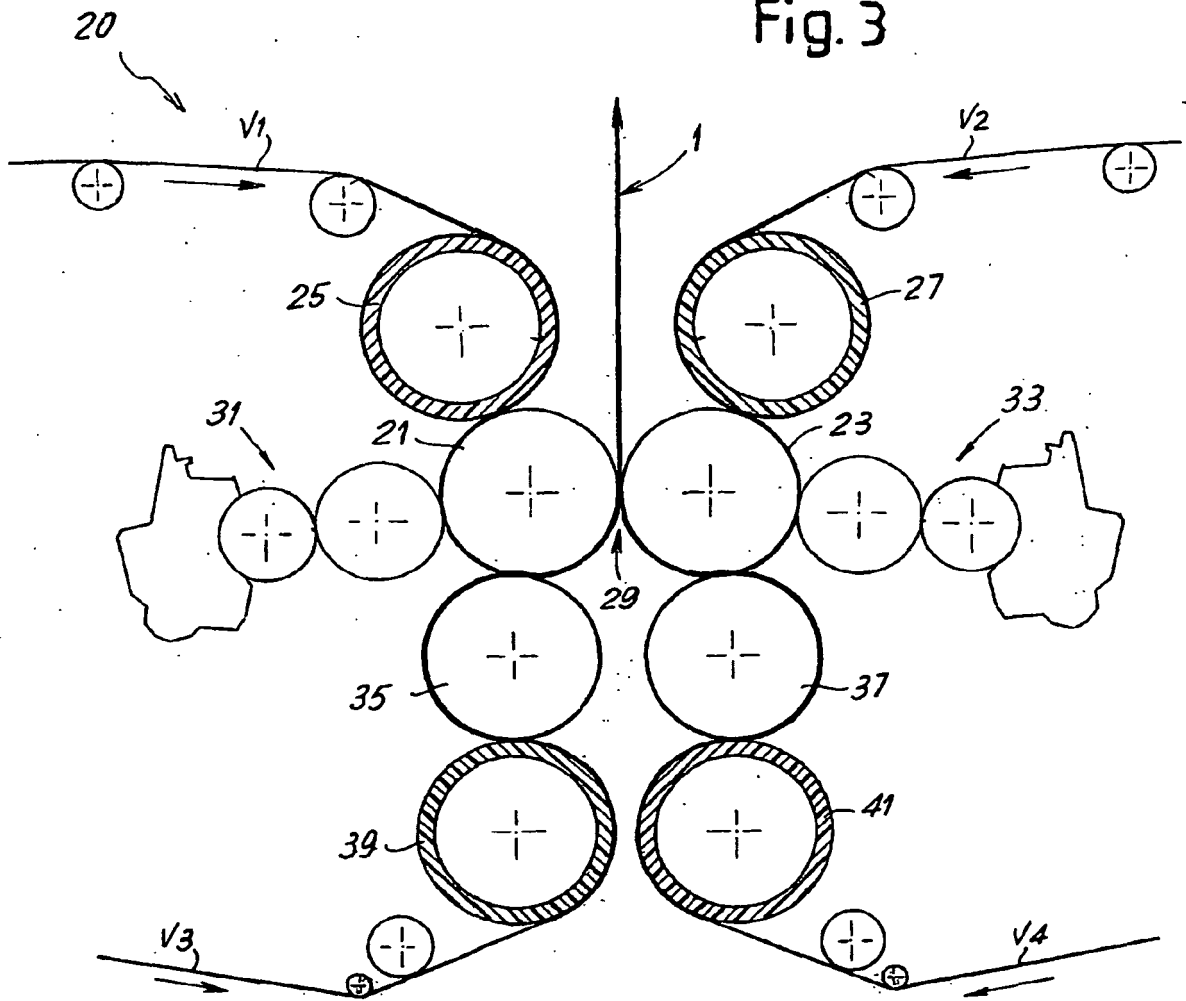


Fig. 3



**REFERENCES CITED IN THE DESCRIPTION**

*This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.*

**Patent documents cited in the description**

- US 3961119 A [0003]
- US 6470945 A [0004]
- US 6261666 A [0005]
- US 6109326 A [0005]
- US 20030102096 A [0005]
- US 6136413 A [0005]
- WO 0078533 A [0005]
- US 6681826 A [0005]
- US 3414459 A [0005]
- US 5173351 A [0005]
- US 6032712 A [0005]
- US 6245414 A [0005]
- WO 9944814 A [0005]
- US 4320162 A [0006]