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(54) **An absorbent sheet products strip having limited liquid strike-through property**

(57) An absorbent sheet products strip (1), the strip comprising a continuous succession of individual absorbent sheets (1A, 1B, 1C) separated from each other by tear lines (4), the absorbent sheets being made of at least two plies bonded together by means of bonding points or lines or curves forming pattern units (3), multiple pattern units being distributed all over a surface of the individual absorbent sheets, wherein the pattern units (3) are

distributed all over a surface of the individual absorbent sheets (1A, 1 B, 1 C) such that the pattern units (3) of one individual absorbent sheet does not superpose with other pattern units (3) of a determined number of successive individual absorbent sheets in the strip when said successive individual absorbent sheets are disposed on each other.

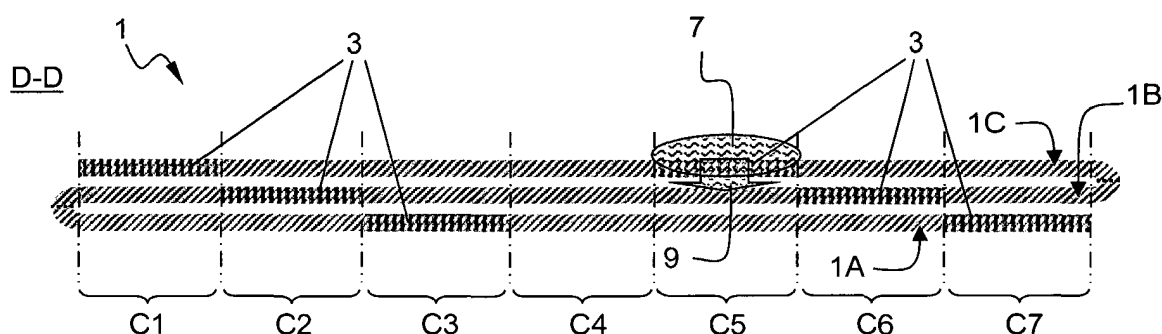


FIG. 4

Description

FIELD OF THE INVENTION

[0001] An aspect of the invention relates to an absorbent sheet product strip having property against or limiting liquid strike-through. The absorbent sheet products strip may be manufactured from a web of tissue paper (obtained by a Conventional Wet Press or Through Air Drying manufacturing method or other manufacturing method) or a nonwoven fabric (obtained by an air-laid manufacturing method or spun-laid manufacturing method or other manufacturing method). Such absorbent sheet products strip finds a particular, though non exclusive, use as sanitary or domestic purposes. As an example, such an absorbent sheet products strip may be used as a toilet paper. Others uses as towels, bath tissues, handkerchiefs, etc... may be possible.

BACKGROUND OF THE INVENTION

[0002] A tissue paper relates to an absorbent paper based on cellulose fibers which is also called tissue paper base-sheet in this field of technology. A typical absorbent paper has a low basis weight, in the range from 10 to 50 g/m².

[0003] A nonwoven fabric comprising cellulosic fibers relates to an absorbent paper which is also called nonwoven or web made of fibers like air-laid web in this field of technology. A typical absorbent paper has a basis weight, in the range from 30 to 250 g/m², preferably 40 to 200 g/m².

[0004] FIG. 1 is a perspective view schematically illustrating a strip of absorbent sheet products 1 according to the prior art. The strip of absorbent sheet products 1 is a rolled strip packaged as a roll 2. Though not shown, a typical absorbent sheet product comprises multiple plies superposed on each other in order to improve thickness and bulk characteristic of the absorbent sheet product. These plies are coupled, more precisely bonded to each other by gluing points or lines or curves 3 distributed on the absorbent sheet product surface. This coupling aims at ensuring cohesion of the sheet and preventing delamination between each ply during use of the absorbent sheet product. This coupling by an adhesive (e.g. polyvinyl alcohol PVA diluted in water) may be further combined with a purely mechanical joining technique consisting in locally deforming the plies (embossing). Further, these gluing points or lines or curves 3 are typically distributed such as to form aesthetic pattern units repeated on the surface of the product. For example FIG. 1 depicts aesthetic pattern units as lotus flowers. Multiple absorbent sheet products 1A, 1B, 1C are separated from each other by tear lines 4. A tear line 4 is a line of weakness comprising alternating perforated segments and unperforated segments, said line of weakness being positioned between two adjacent absorbent sheet products 1A and 1B, 1B and 1C, etc... The tear lines ease separation of an absorbent sheet product from the strip by the user.

According to a first kind of use (indicated by arrow I), a user seize with hand one absorbent sheet product 1 and separates it from the roll by cutting 5 the tear line 4. According to a second kind of use (indicated by arrow II), a user separates multiple absorbent sheet products 1, for example a strip of three consecutive absorbent sheet products 1, from the roll by cutting 5 the appropriate tear line 4 at the end of the three consecutive absorbent sheet products 1A, 1B and 1C. According to a third kind of use (indicated by arrow III) that is preponderant, the user further folds the strip of three consecutive absorbent sheet products 1 according to a Z-folding. This enables giving more thickness and bulk to the product in order to protect the hand of the user before using the strip of three consecutive absorbent sheet products 1 to clean liquid from a surface or from a body part.

[0005] FIG. 2 is a side cross-section view according to plane D-D of FIG. 1 schematically illustrating a strip of three absorbent sheet products 1A, 1B and 1C of the prior art folded according to a Z-folding. When gluing points or lines or curves 3 of each absorbent sheet product 1A, 1B and 1C are superposed on two consecutive sheets (as illustrated by pattern unit superposition zones 6A and 6B), liquids 7 above gluing points or lines or curves 3 easily and rapidly strike-through 8 the superposed absorbent sheet products.

[0006] US 8,383,223 describes a roll of fibrous cellulosic product that includes a rolled strip of sheets of tissue separated by perforated or pre-cut lines, the individual plies of each sheet being bonded over a peripheral surface area of between 4% and 60% of the total surface area of each sheet. The bonding is carried out via bonding points in the form of large protrusions distributed only over the peripheral zone of the sheet. Namely, the central zone of the sheet is unbounded. This solution overcomes the drawbacks of the prior art but does not authorize having aesthetic designs in the central zone.

[0007] Thus, there is a need to improve the protection of the user hand from liquid striking-through a strip of multiple superposed absorbent sheet products, while at the same time proposing absorbent sheet products having a pleasing appearance, namely aesthetic pattern units substantially all over the product surface.

SUMMARY OF THE INVENTION

[0008] It is an object of the invention to propose a strip of absorbent sheet products that overcomes the drawbacks of the prior art. In particular, it is desirable to improve protection of the hand of the user and at the same time to dispose aesthetic pattern units substantially all over the absorbent sheet product surface.

[0009] The invention relates to an absorbent sheet products strip, the strip comprising a continuous succession of individual absorbent sheets separated from each other by tear lines, the absorbent sheets being made of at least two plies bonded together by means of bonding

points or lines or curves forming pattern units, multiple pattern units being distributed all over a surface of the individual absorbent sheets, wherein the pattern units are distributed all over the surface of the individual absorbent sheets such that the pattern units of one individual absorbent sheet does not superpose with other pattern units of a determined number of successive individual absorbent sheets in the strip when said successive individual absorbent sheets are disposed on each other.

[0010] The determined number of successive individual absorbent sheets may be at least two, preferably three.

[0011] The determined number of successive individual absorbent sheets may be disposed on each other by Z-folding.

[0012] The strip may comprise a single pattern unit distributed over the surface of the individual absorbent sheets.

[0013] The strip may comprise multiple pattern units distributed over the surface of the individual absorbent sheets.

[0014] Each individual absorbent sheet may be defined between two consecutive tear lines extending according to a cross-machine direction, each individual absorbent sheet being subdivided in a determined number of zones along a defined direction, and wherein the pattern unit having a size that does not exceed a zone size, the pattern unit being repeated every n zones, n being a pattern repeat, adjacent zones following the zone comprising the pattern unit being free of pattern unit, said repetition continuing over the determined number of successive individual absorbent sheets.

[0015] The zones may be columns extending according to the cross-machine direction and distributed along a machine direction.

[0016] The strip may comprise a single pattern unit distributed all over the surface of the individual absorbent sheets and the determined number of zones is odd.

[0017] The determined number of zones may be seven, the pattern repeat n may be four, and the determined number of successive individual absorbent sheets may be three.

[0018] The pattern units in the zones may be stripes extending in an inclined manner relatively to the cross-machine direction and distributed along a machine direction.

[0019] The pattern units may be of different sizes such that the pattern units are homothetic and homocentric when superposed one over the other, wherein a size of the greatest pattern units does not exceed a zone size, each zone comprising one pattern unit according to the machine direction, and multiple pattern units according to the cross-machine direction.

[0020] The pattern units may be arranged in such a manner to be imbricated in each other without superposing one over the other.

[0021] The pattern units may be ellipsis, or circle, or square, or rectangle, or triangle. All the zones may have

the same zone size, or alternatively may have variable zone size.

[0022] According to another aspect, there is provided a stack of absorbent sheet product of the invention.

[0023] According to a further aspect, there is provided a roll of absorbent sheet product of the invention.

[0024] According to still another aspect, there is provided a use of the absorbent sheet product according to the invention as towels, kitchen towels, hand towels, toilet papers, wipes and facial tissues.

[0025] With the invention, it is possible to precisely control the positioning of the aesthetic pattern units that constitutes the label of the absorbent sheet products. Such a label may be a trademark of the product. Further, it is possible to emboss the aesthetic pattern units in a more marked way. These help in rendering the corresponding label more visible to the users. Thus, this greatly improves the situation with respect to the prior art products like the ones described in US 8,383,223. This advantage is combined to the further one related to the limitation of the speed of liquid strike-through. Furthermore, with the invention, the coupling / association between the plies is improved, thus ensuring improving cohesion of the sheet and preventing delamination between each ply during use of the absorbent sheet product. Furthermore, with the invention, it is also possible to ensure ply bonding all over the surface of the absorbent sheet product, in particular in the central portion of the sheets.

[0026] Other advantages will become apparent from the hereinafter description of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] The present invention is illustrated by way of examples and not limited to the accompanying drawings, in which like references indicate similar elements:

- FIGS. 1 and 2 are a perspective view and a side cross-section view according to plane D-D schematically illustrating an absorbent sheet products strip according to the prior art, respectively;
- FIGS. 3 and 4 are a top plan view and a side cross-section view according to plane D-D schematically illustrating an exemplary embodiment of an absorbent sheet products strip according to the invention, respectively;
- FIG. 5 is side cross-section view schematically illustrating a test protocol for measuring liquid strike-through;
- FIGS. 6 and 7 are a top plan pictures showing liquid strike-through through a recto of an absorbent sheet products strip according to the prior art (left part of the picture) compared to an exemplary embodiment of an absorbent sheet products strip according to the invention (right part of the picture) and a verso of the

same, respectively;

- FIGS. 8 and 9 are a top plan view and a side cross-section view according to plane D-D schematically illustrating another exemplary embodiment of an absorbent sheet products strip of the invention, respectively;
- FIGS. 10, 12 and 14 are top plan views schematically illustrating various exemplary embodiments of an absorbent sheet products strip of the invention;
- FIGS. 11, 13 and 15 show transparent and superposed top plan views (top part) and side cross-section views according to plane D-D of FIG. 10, 12 and 14 (bottom part) schematically illustrating the various exemplary embodiment of the absorbent sheet products strip of FIGS. 10, 12 and 14, respectively; and
- FIG. 16 is a perspective view schematically illustrating packaging the strip of absorbent sheet products of the invention as a stack.

DETAILED DESCRIPTION OF THE INVENTION

[0028] In the drawings and in the hereinafter description, the multiple superposed plies of an individual absorbent sheet or a strip of absorbent sheets have not been represented or described in details for sake of clarity, and also because they are well known in the art and not germane to the present invention.

[0029] FIG. 3 is a top plan view schematically illustrating an exemplary embodiment of an absorbent sheet product strip 1 of the invention. FIG. 4 is a side cross-section view according to plane D-D of FIG. 3 when the strip is Z-folded. In this exemplary embodiment, a strip of three consecutive individual absorbent sheets 1A, 1B and 1C comprises pattern units 3 made of glued points or lines or curves. The pattern units 3 are distributed over the surface of each individual absorbent sheet such that they do not superpose when the three consecutive individual absorbent sheets 1A, 1B and 1C are folded according to a Z-folding. This embodiment gives the best results when three consecutive individual absorbent sheets are Z-folded together. However, such results would not be impaired by a user combining more individual absorbent sheets together in a Z-folded manner, for example four, five, etc... Usually, the individual absorbent sheets are folded on the tear lines 4 because the presence of tear lines 4 eases the performance of this operation by a user. The FIGS only show a sub-strip of three absorbent sheets, the complete strip that may be wound as roll being a continuous succession of such sub-strips.

[0030] As an example, a single sheet or three consecutive individual absorbent sheets Z-folded together forms a rectangle having a size around 11 cm x 14 cm.

[0031] In this exemplary embodiment, the absorbent sheets comprise a single pattern unit 3, for example a

lotus flower. Each individual absorbent sheet 1A, 1B and 1C is defined between two consecutive tear lines 4. Each tear line 4 substantially extends according to the cross-machine direction CD. Each individual absorbent sheet 1 A, 1B and 1C is subdivided in seven zones along the machine direction MD, for example seven columns C1, C2, C3, C4, C5, C6 and C7 extending parallel to the cross-machine direction CD. The left end of the first column and the right end of the seventh column should be aligned with the two respective consecutive tear lines 4 defining the individual absorbent sheet. The pattern unit size is such that it should not exceed the size of a column in the machine direction MD. The pattern unit should be repeated every four columns, meaning that the three columns following a column comprising a pattern unit should be free of pattern unit. This repetition continues over three consecutive individual absorbent sheets 1 A, 1 B, 1C.

[0032] As a result, when the three consecutive individual absorbent sheets 1 A, 1B and 1C are folded according to a Z-folding, the gluing points or lines or curves 3 of each absorbent sheet product 1 A, 1B and 1C are not superposed. As a consequence, liquids 7 above gluing points or lines or curves 3 only strike-through 9 the externally positioned absorbent sheet product 1C and then liquids 7 are substantially blocked, meaning that the liquids 7 do not further strike-through towards the internally positioned absorbent sheet product 1A. The strike-through that is mentioned here is the one relative to the pattern unit, not the one inherent to the absorption capacity of the material (tissue paper or non-woven) forming the absorbent sheet product itself.

[0033] FIG. 5 is side cross-section view schematically illustrating a test protocol for measuring liquid strike-through. The test protocol comprises the steps of:

- Z-folding a continuous succession of three absorbent sheet products 1;
- Depositing a drop of liquid 7 (defined quantity, e.g. 100 μ l of distilled colored water) on a supporting non-absorbing surface 10;
- Laying the Z-folded absorbent sheet products 1 on the drop of liquid 7 by substantially centering the products respectively to the drop;
- Applying a weight 11 (e.g. around 2 kg) during a determined period of time (e.g. 10 s);
- Unfolding the Z-folded absorbent sheet products and visually controlling the liquid strike-through on the recto face R and the verso face V; and
- Repeating the above steps for other absorbent sheet products embodiment and comparing liquid strike-through.

[0034] FIG. 6 is a top plan picture showing liquid strike-

through through a recto R of an absorbent sheet products strip according to the prior art (left part of the picture - PA) compared to an exemplary embodiment (e.g. first embodiment) of an absorbent sheet products strip according to the invention (right part of the picture - INV).

[0035] FIG. 7 is a top plan picture showing liquid strike-through through a verso V of an absorbent sheet products strip according to the prior art (left part of the picture - PA) compared to an exemplary embodiment (e.g. first embodiment) of an absorbent sheet products strip according to the invention (right part of the picture - INV).

[0036] In both FIGS. 6 and 7, all the strips are made of three plies. The strike-through that is visualized here is the one relative to the pattern unit in addition to the one inherent to the absorption capacity of the material (tissue paper or non-woven) forming the absorbent sheet product itself.

[0037] One can visually see that the liquid drop strikes-through the absorbent sheet products strip according to the prior art (the spot of liquid strike-through 8 is surrounded by plain line circle), while there is not any visible sign of liquid strike-through at the verso of the last absorbent sheet product 1C according to the invention (the spot of liquid strike-through 9 is surrounded by dotted line circle).

[0038] FIG. 8 is a top plan view schematically illustrating another exemplary embodiment of an absorbent sheet products strip 1. FIG. 9 is a side cross-section view according to plane D-D of FIG. 8 when the strip is Z-folded. In this exemplary embodiment, a strip of three consecutive individual absorbent sheets 1A, 1B and 1C comprises four kinds of different pattern units 3A, 3B, 3C and 3D made of glued points or lines or curves. In the present example, these four pattern units are ellipsis of different size. The dimensions of the four pattern units 3A, 3B, 3C and 3D are such that the ellipses are concentric when superposed one over the other. The FIGS only show a sub-strip of three absorbent sheets, the complete strip that may be wound as roll being a continuous succession of such sub-strips.

[0039] This embodiment gives the best results when three consecutive individual absorbent sheets are Z-folded together. However, such results would not be impaired by a user combining more individual absorbent sheets together in a Z-folded manner, for example four, five, etc...

[0040] Again, each individual absorbent sheet 1A, 1B and 1C is defined between two consecutive tear lines 4 substantially extending according to the cross-machine direction CD. Each individual absorbent sheet 1A, 1B and 1C is subdivided in seven zones along the machine direction MD, for example seven columns C1, C2, C3, C4, C5, C6 and C7 extending parallel to the cross-machine direction CD. The left end of the first column and the right end of the seventh column should be aligned with the two respective consecutive tear lines 4 defining the individual absorbent sheet. The pattern unit size of the greatest ellipsis 3A is such that it should not exceed

the size of a column in the machine direction MD. Each column comprises a pattern unit. A succession of the four different pattern units, for example 3A, 3C, 3B, 3D is repeated over four columns. This succession continues over three consecutive individual absorbent sheets 1A, 1B, 1C. The repetition is resumed on the fourth consecutive individual absorbent sheet (not shown).

[0041] As a result, when the three consecutive individual absorbent sheets 1A, 1B and 1C are folded according to a Z-folding, the gluing points or lines or curves 3 of each absorbent sheet product 1A, 1B and 1C are not superposed, they are imbricated in each other over the three superposed layer (see FIG. 9). As a consequence, a drop of liquid 7 above gluing points or lines or curves 3C only strike-through 9 the externally positioned absorbent sheet product 1C and then liquids 7 are substantially blocked, meaning that the liquids 7 do not further strike-through towards the internally positioned absorbent sheet product 1A.

[0042] This embodiment may also be implemented with other kind of pattern units representing geometric figures, for example circles, or squares, or rectangles, or triangle (not shown). Each kind of pattern unit is characterized by various scale factors (homothety) and a substantially identical center (homocentric) in order to imbricate either circles, or squares, or rectangles, or triangle in each other without superposition of their perimeters. Other geometric figures may also be considered.

[0043] FIG. 10 is a top plan view schematically illustrating another exemplary embodiment of an absorbent sheet products strip 1. FIG. 11 shows a transparent and superposed top plan view (top part) and side cross-section views according to plane D-D of FIG. 10 (bottom part) when the strip is Z-folded. In this exemplary embodiment, a strip of three consecutive individual absorbent sheets 1A, 1B and 1C comprises three kinds of different pattern units 3A, 3B and 3C made of glued points or lines or curves. In the present example, these three pattern units are circles 3A, triangles 3B and hexagons 3C. The FIGS only show a sub-strip of three absorbent sheets, the complete strip that may be wound as roll being a continuous succession of such sub-strips.

[0044] Each individual absorbent sheet 1A, 1B and 1C is subdivided in ten zones along the machine direction MD, for example ten columns C1, C2, C3, C4, C5, C6, C7, C8, C9 and C10 extending parallel to the cross-machine direction CD. The left end of the first column and the right end of the seventh column should be aligned with the two respective consecutive tear lines 4 defining the individual absorbent sheet.

[0045] As an example, the first absorbent sheet 1A comprises only circles, the second absorbent sheet 1B comprises only triangles, and the third absorbent sheet 1C comprises only hexagons distributed over the sheet surface. Further, on the first absorbent sheet 1A, the circles 3A are distributed in the first column C1, fourth column C4, seventh column C7 and tenth column C10. On the second absorbent sheet 1B, the triangles 3B are dis-

tributed in the second column C2, fifth column C5 and eighth column C8. On the third absorbent sheet 1C, the hexagons 3C are distributed in the third column C3, sixth column C6 and ninth column C9.

[0046] The above example is not limitative because other kind of distribution of the pattern unit in a specific column or in the entire columns can be different. What is important is that the various pattern units 3A, 3B, 3C are distributed over a defined number of columns, e.g. ten columns of the three absorbent sheets 1A, 1B and 1C in such a way that, when the three absorbent sheets 1A, 1B and 1C are superposed (see FIG. 11), not any pattern unit 3A, 3B, 3C is superposed with another pattern unit. When three consecutive individual absorbent sheets 1A, 1B and 1C are folded according to a Z-folding, the pattern units 3A, 3B and 3C of each absorbent sheet product 1A, 1B and 1C are not superposed (see FIG. 11). As a consequence, liquid strike-through from one side of the first absorbent sheet product 1A towards another side of the third absorbent sheet product 1C through the pattern units is stopped, at least very limited.

[0047] FIG. 12 is a top plan view schematically illustrating another exemplary embodiment of an absorbent sheet products strip 1. FIG. 13 shows a transparent and superposed top plan view (top part) and side cross-section views according to plane D-D of FIG. 12 (bottom part) when the strip is Z-folded. This exemplary embodiment differs from the preceding embodiment (the embodiment of FIG. 10 and 11) in that the strip of four consecutive individual absorbent sheets 1A, 1B, 1C and 1D comprises four kinds of different pattern units 3A, 3B, 3C and 3D made of glued points or lines or curves. In the present example, these four pattern units are circles 3A, triangles 3B, hexagons 3C and sun 3D. The FIGS only show a sub-strip of four absorbent sheets, the complete strip that may be wound as roll being a continuous succession of such sub-strips.

[0048] Each individual absorbent sheet 1A, 1B, 1C and 1D is subdivided in twelve zones along the machine direction MD, for example twelve columns C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11 and C12 extending parallel to the cross-machine direction CD. The left end of the first column and the right end of the seventh column should be aligned with the two respective consecutive tear lines 4 defining the individual absorbent sheet.

[0049] As an example, the first absorbent sheet 1A comprises only circles, the second absorbent sheet 1B comprises only triangles, the third absorbent sheet 1C comprises only hexagons, and the fourth absorbent sheet 1D comprises only suns distributed over the sheet surface. The distribution of the various pattern units 3A, 3B, 3C and 3D over the twelve columns of the four absorbent sheets 1A, 1B, 1C and 1D is such that, when the four absorbent sheets 1A, 1B, 1C and 1D are superposed (see FIG. 13), not any pattern unit 3A, 3B, 3C, 3D is superposed with another pattern unit. The anti liquid strike-through effect is analogous to the one described in relation with the other embodiments.

[0050] FIG. 14 is a top plan view schematically illustrating another exemplary embodiment of an absorbent sheet products strip 1. FIG. 15 shows a transparent and superposed top plan view (top part) and side cross-section views according to plane D-D of FIG. 14 (bottom part) when the strip is Z-folded. This exemplary embodiment differs from the embodiment of FIG. 10 and 11 in that the strip of three consecutive individual absorbent sheets 1A, 1B and 1C comprises three kinds of different pattern units 3A, 3B and 3C made of bonding areas under the form of inclined stripes. The FIGS. 14 and 15 only show a sub-strip of three absorbent sheets, the complete strip that may be wound as roll being a continuous succession of such sub-strips. Again, each individual absorbent sheet 1A, 1B and 1C is defined between two consecutive tear lines 4 substantially extending according to the cross-machine direction CD. Each individual absorbent sheet 1A, 1B and 1C is subdivided in ten zones that are inclined relatively to the cross-machine direction CD, for example ten inclined columns C1, C2, C3, C4, C5, C6, C7, C8, C9 and C10 of variable size (for sake of drawing clarity, the columns are only shown with respect to third absorbent sheet 1C). It means that this embodiment differs from the preceding embodiment in that there is no alignment between the columns and the tear lines 4. In the present example, the inclined stripes pattern units 3A, 3B, 3C are mingled with the inclined columns C1, C2, C3, C4, C5, C6, C7, C8, C9 and C10, namely the pattern units fully covers the corresponding zones.

[0051] Further, the directions D1 and D2 of the inclined columns of two consecutive individual absorbent sheets are symmetrical relative to the machine direction MD. It means that the direction D1 of the inclined columns of the first absorbent sheet 1A and of the third absorbent sheet 1C is different from the direction D2 of the inclined columns of the second absorbent sheet 1B, both directions D1 and D2 being symmetrical relative to the machine direction MD. As an example, the first absorbent sheet 1A comprises two stripes inclined according to the first direction D1, the second absorbent sheet 1B comprises three stripes inclined according to the second direction D2, and the third absorbent sheet 1C comprises five stripes inclined according to the first direction D1, all of these stripes being distributed over the various sheets surfaces. Further, on the first absorbent sheet 1A, the stripes are completely mingled with the fourth column C4 and eighth column C8. On the second absorbent sheet 1B, the stripes are completely mingled with the second column C2, sixth column C6 and tenth column C10. On the third absorbent sheet 1C, the stripes are completely mingled with the first column C1, third column C3, fifth column C5, seventh column C7 and ninth column C9. Therefore, the distribution of the various stripes 3A, 3B and 3C over the ten columns of the three absorbent sheets 1A, 1B and 1C is such that, when the three absorbent sheets 1A, 1B and 1C are superposed (see FIG. 15), not any stripe 3A, 3B, 3C is superposed with another stripe. The anti liquid strike-through effect is analogous

to the one described in relation with the other embodiments.

[0052] As illustrated in FIG. 16, the absorbent sheet products 1 may be packaged as a stack 12. Similarly to the use depicted of the right side of FIG. 1, once a strip of absorbent sheet products 1 is separated from the stack 12 by cutting 5 the tear line 4, it can be folded according to a Z-folding and used to clean liquid from a surface or from a body part. The invention is not limited to the two examples of packaging that have been depicted (roll and stack), the absorbent sheet products 1 may also be packaged as individual pieces in soft pack or box.

[0053] The drawings and their descriptions hereinbefore illustrate rather than limit the invention.

[0054] Though the drawings show three or even four individual absorbent sheets, the effect of the invention of limiting liquid strike-through applies to the whole roll or stack, namely whatever the determined number of successive individual absorbent sheets taken successively from either the whole roll, or the whole stack.

[0055] The invention has been described with respect to various embodiments of absorbent sheet products made of sheets strips or sections comprising multiple plies. The skilled person will readily recognize that the absorbent sheet product may be formed with two, three, four, five, etc... plies while still being within the scope of the present invention. Further, the shape of the individual sheets has always been depicted as rectangular while other shapes, e.g. a square shape, may be appropriate for the intended use.

[0056] The numbers, positions and shapes of the pattern units in the depicted embodiments are non limitative examples. The skilled person will readily recognize that these numbers, positions and shapes may be changed if desired or deemed necessary with respect to for example the tridimensional structure effect, commercial, advertising and/or aesthetic effect that is/are intended to be achieved by the absorbent sheet products.

[0057] The pattern units includes embossed/knurled areas or lines or curves in combination with an adhesive used to associate/bond plies together, but are not intended to include or to interfere with micro-embossed areas, namely areas comprising protrusions at a density of at least 20 protrusions/cm² that may be typically employed to give softness to the sheet.

[0058] Any reference sign in a claim should not be construed as limiting the claim. The word "comprising" does not exclude the presence of other elements than those listed in a claim. The word "a" or "an" or "at least one" preceding an element does not exclude the presence of a plurality of such element.

Claims

1. An absorbent sheet products strip (1), the strip comprising a continuous succession of individual absorbent sheets (1 A, 1 B, 1 C) separated from each other

by tear lines (4), the absorbent sheets being made of at least two plies bonded together by means of bonding points or lines or curves forming pattern units (3), multiple pattern units (3) being distributed all over a surface of the individual absorbent sheets (1A, 1 B, 1 C),

characterized in that the pattern units (3) are distributed all over the surface of the individual absorbent sheets (1A, 1B, 1C) such that the pattern units (3) of one individual absorbent sheet does not superpose with other pattern units (3) of a determined number of successive individual absorbent sheets in the strip when said successive individual absorbent sheets are disposed on each other.

2. The absorbent sheet products strip (1) of claim 1, wherein the determined number of successive individual absorbent sheets is at least two.
3. The absorbent sheet products strip (1) of claim 1, wherein the determined number of successive individual absorbent sheets is preferably three.
4. The absorbent sheet products strip (1) according to any one of the claims 1 to 3, wherein the determined number of successive individual absorbent sheets are disposed on each other by Z-folding.
5. The absorbent sheet products strip (1) according to any one of the claims 1 to 4, wherein the strip comprises a single pattern unit (3) distributed over the surface of the individual absorbent sheets.
6. The absorbent sheet products strip (1) according to any one of the claims 1 to 4, wherein the strip comprises multiple pattern units (3) distributed over the surface of the individual absorbent sheets.
7. The absorbent sheet products strip (1) according to any one of the claims 1 to 6, wherein each individual absorbent sheet (1A, 1 B, 1 C) is defined between two consecutive tear lines (4) extending according to a cross-machine direction (CD), each individual absorbent sheet (1A, 1B, 1C) being subdivided in a determined number of zones (C1, C2, C3, C4, C5, C6, C7) along a defined direction (MD, D1, D2), and wherein the pattern unit (3) having a size that does not exceed a zone size, the pattern unit being repeated every n zones, n being a pattern repeat, adjacent zones following the zone comprising the pattern unit being free of pattern unit, said repetition continuing over the determined number of successive individual absorbent sheets (1A, 1B, 1C).
8. The absorbent sheet products strip (1) of claim 7, wherein the zones are columns extending according to the cross-machine direction (CD) and distributed along a machine direction (MD).

9. The absorbent sheet products strip (1) of claims 7 and 8, wherein the strip comprises a single pattern unit (3) distributed all over the surface of the individual absorbent sheets and the determined number of zones is odd. 5
10. The absorbent sheet products strip (1) according to any one of the claims 7 to 9, wherein the determined number of zones is seven, the pattern repeat n is four, and the determined number of successive individual absorbent sheets is three. 10
11. The absorbent sheet products strip (1) of claim 7, wherein the pattern units in the zones are stripes extending in an inclined manner relatively to the cross-machine direction (CD) and distributed along a machine direction (MD). 15
12. The absorbent sheet products strip (1) according to claim 6 and 7, wherein the pattern units are of different sizes such that the pattern units (3) are homothetic and homocentric when superposed one over the other, wherein a size of the greatest pattern units (3A) does not exceed a zone size, each zone comprising one pattern unit (3) according to the machine direction (MD), and multiple pattern units (3) according to the cross-machine direction (CD). 20 25
13. The absorbent sheet products strip (1) according to claim 6 and 7, wherein the pattern units (3) are arranged in such a manner to be imbricated in each other without superposing one over the other. 30
14. The absorbent sheet products strip (1) of claim 12 or 13, wherein the pattern units (3) are ellipsis, or circle, or square, or rectangle, or triangle. 35
15. The absorbent sheet products strip (1) according to any one of the claims 7 to 14, wherein all the zones (C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12) have the same zone size. 40
16. The absorbent sheet products strip (1) according to any one of the claims 7 to 14, wherein the zones (C1, C2, C3, C4, C5, C6, C7, C8, C9, C10) have variable zone size. 45
17. A roll (2) made of a wound absorbent sheet products strip (1) according to any one of the claims 1 to 16. 50
18. A stack (12) made of a folded absorbent sheet products strip (1) according to any one of the claims 1 to 16.
19. Use of the absorbent sheet products strip (1) according to any one of the claims 1 to 16 as towels, kitchen towels, hand towels, toilet papers, wipes and facial tissues. 55

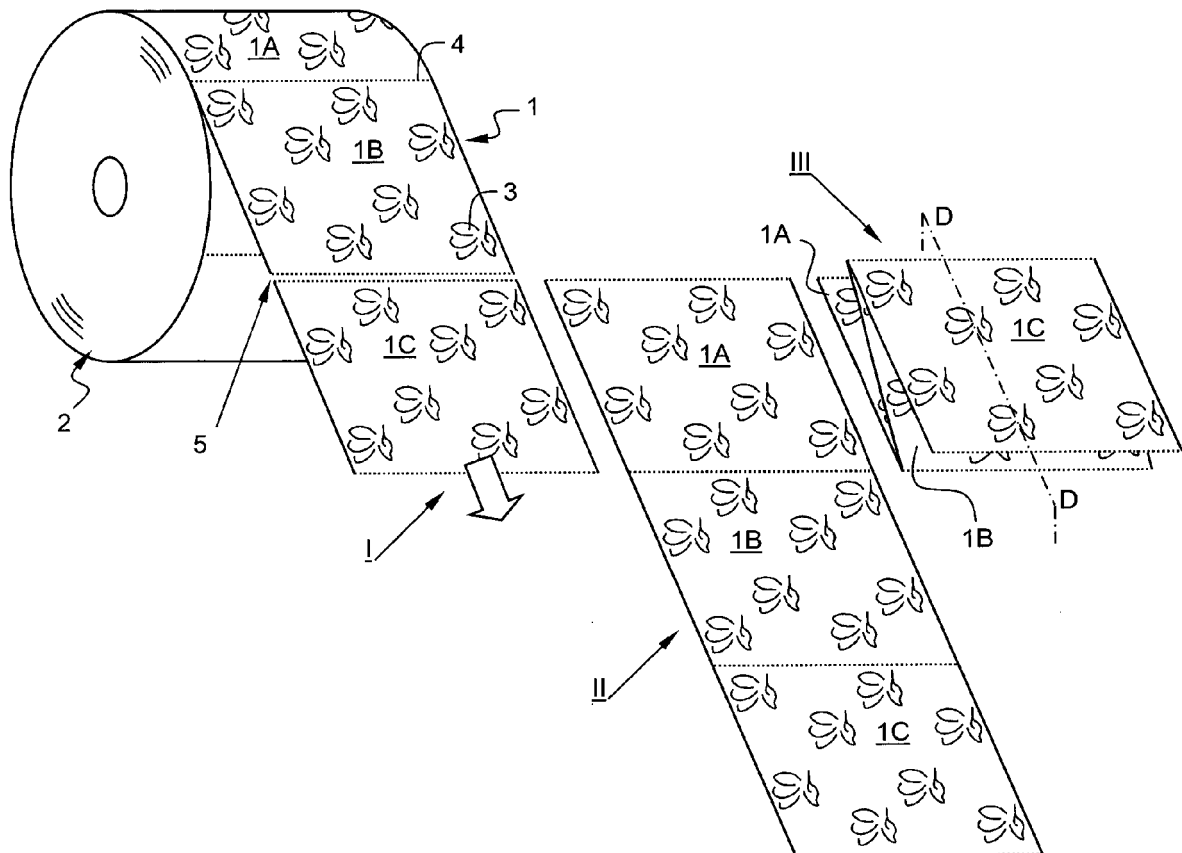


FIG. 1

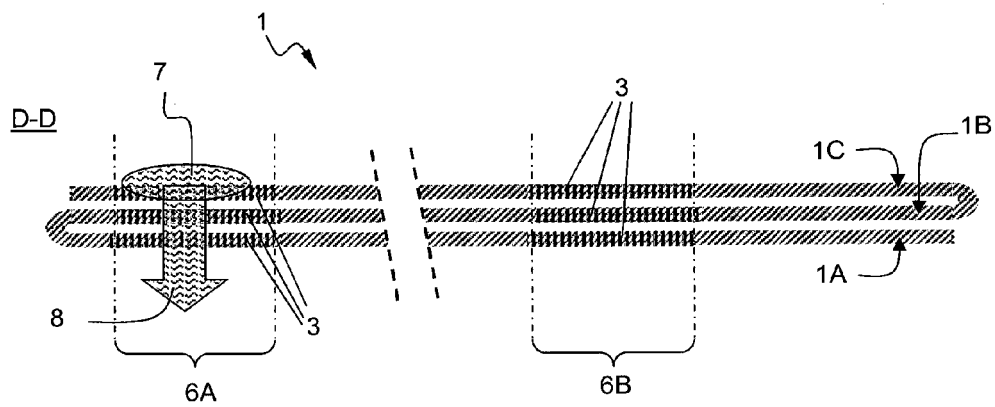


FIG. 2

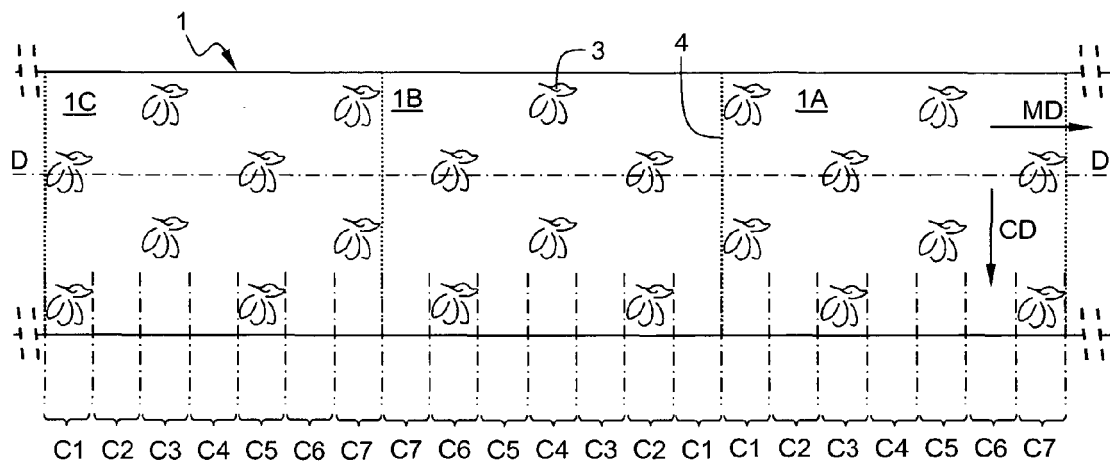


FIG. 3

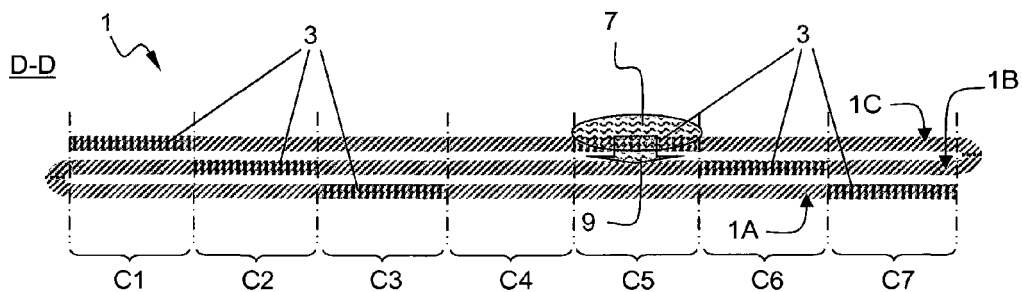


FIG. 4

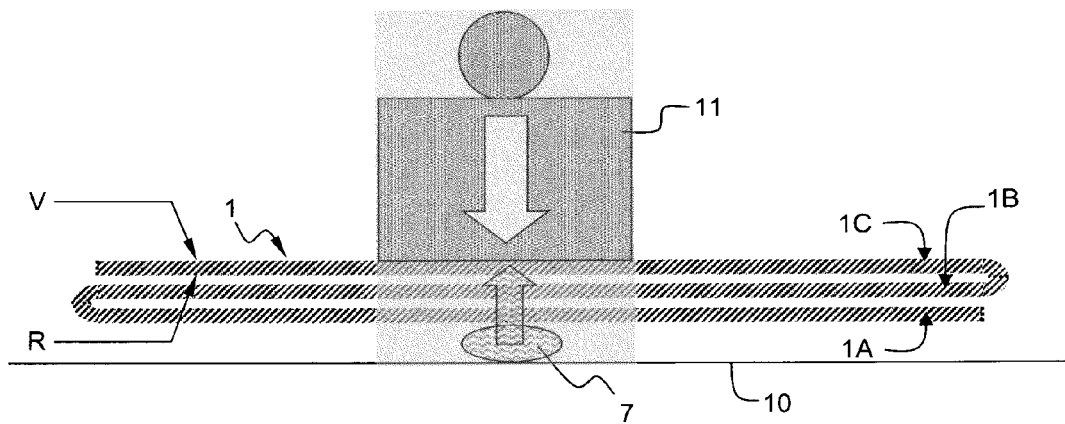


FIG. 5

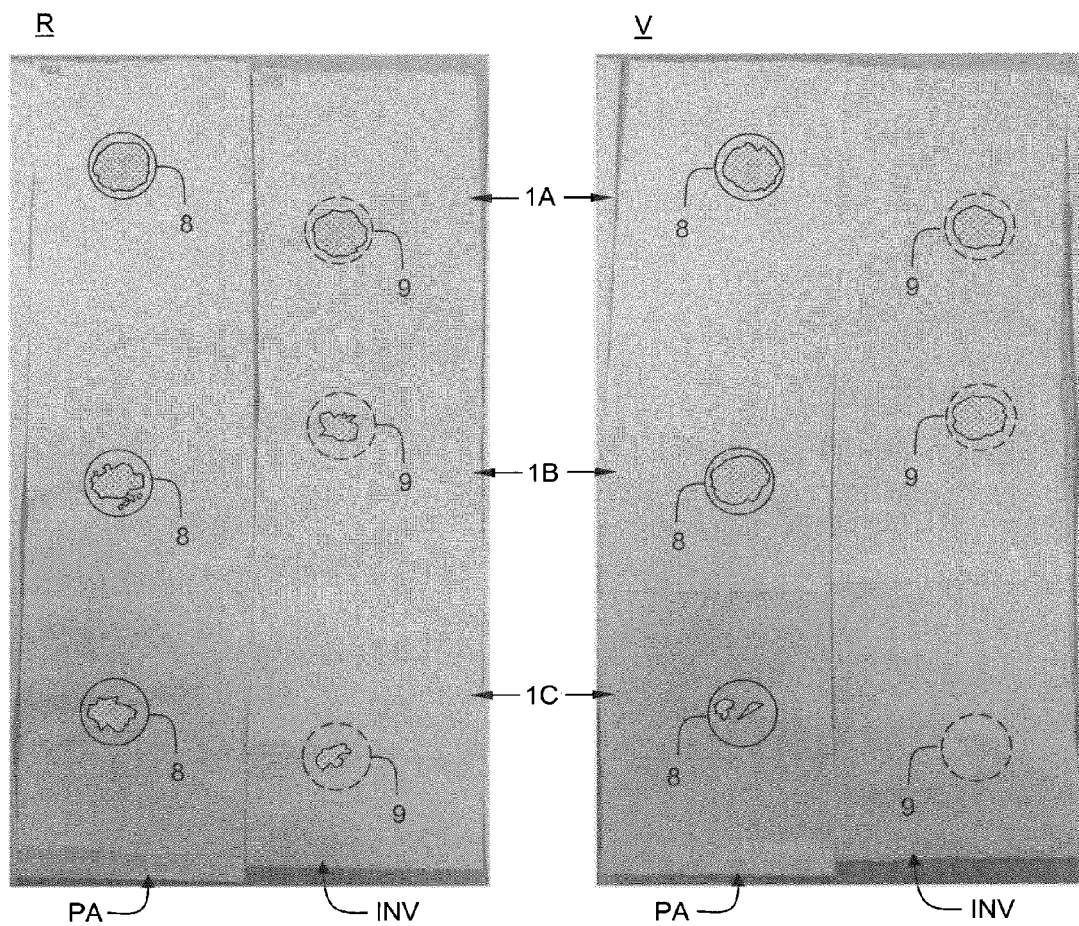


FIG. 6

FIG. 7

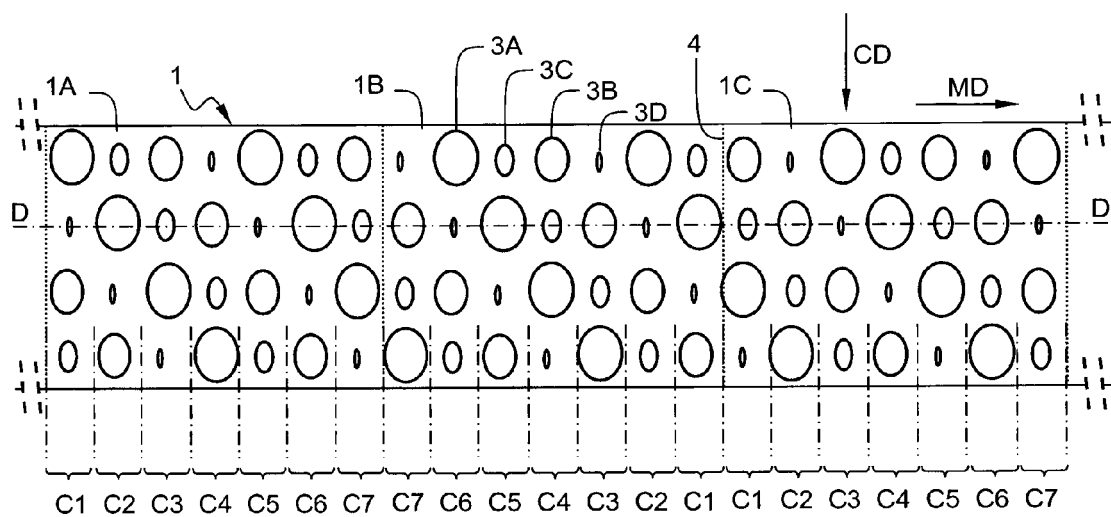


FIG. 8

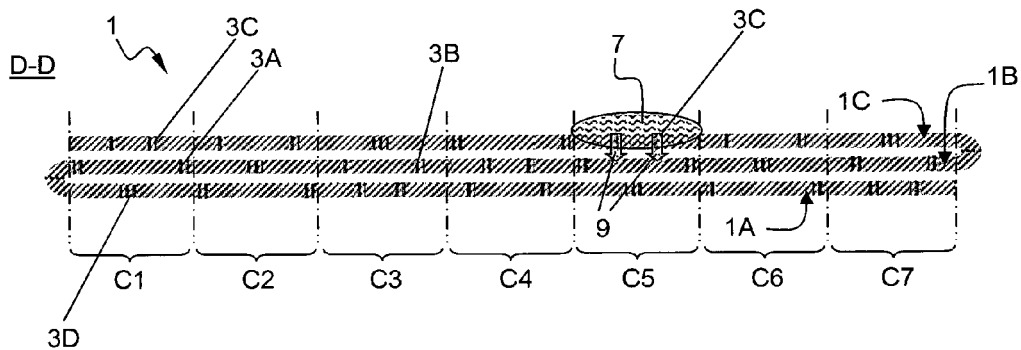


FIG. 9

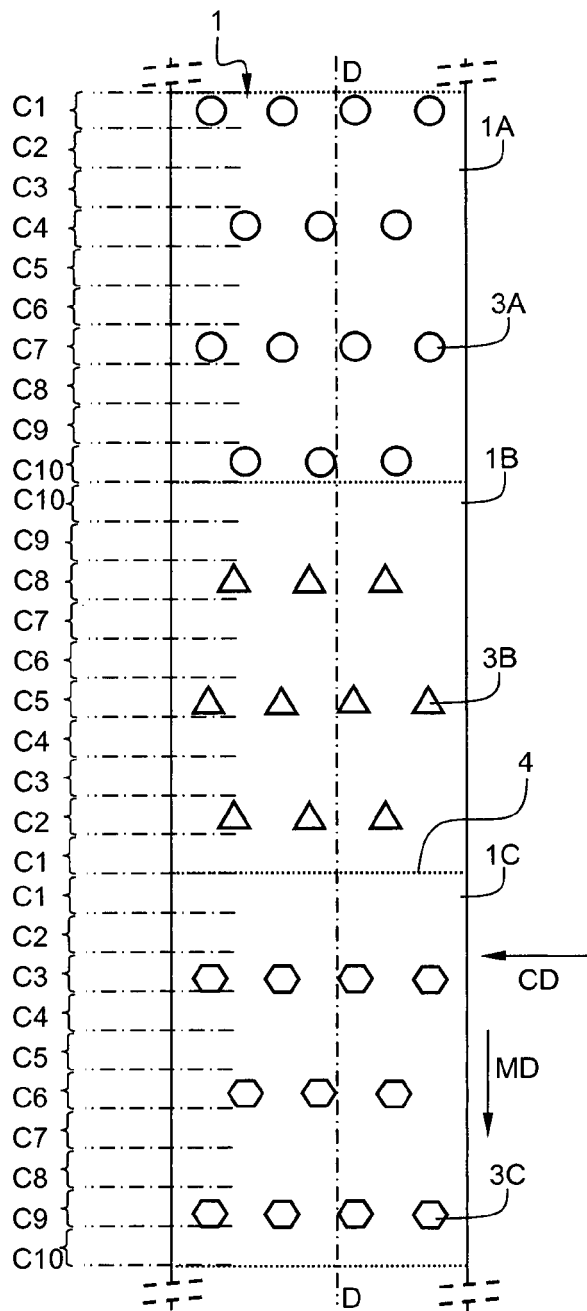


FIG. 10

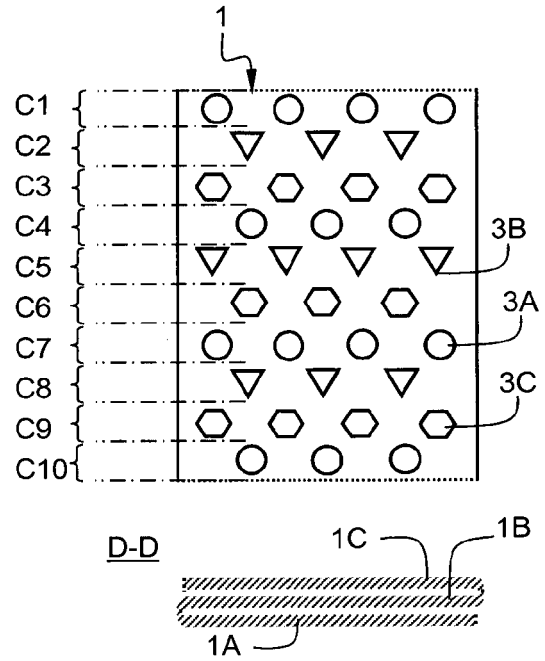


FIG. 11

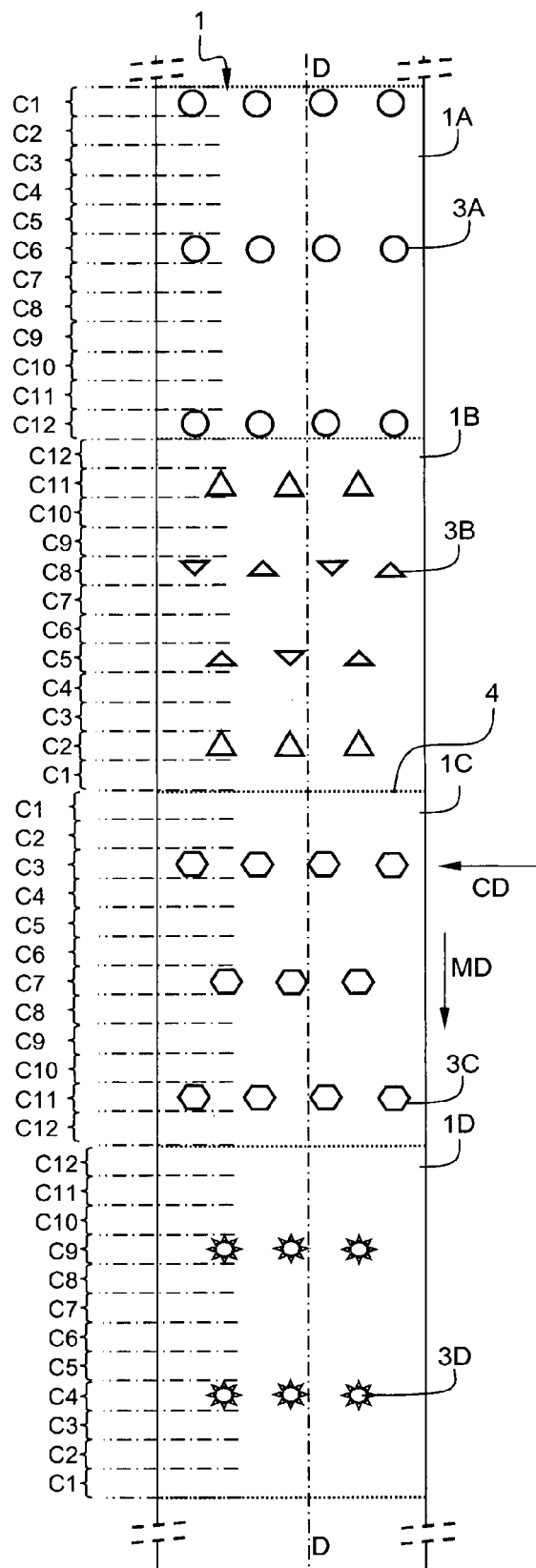


FIG. 12

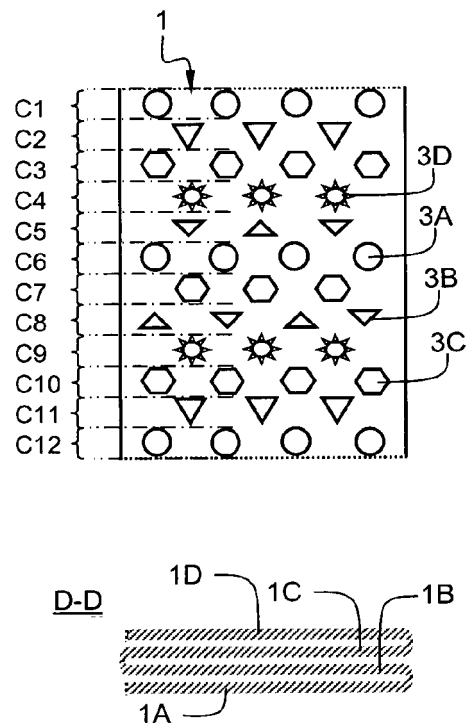


FIG. 13

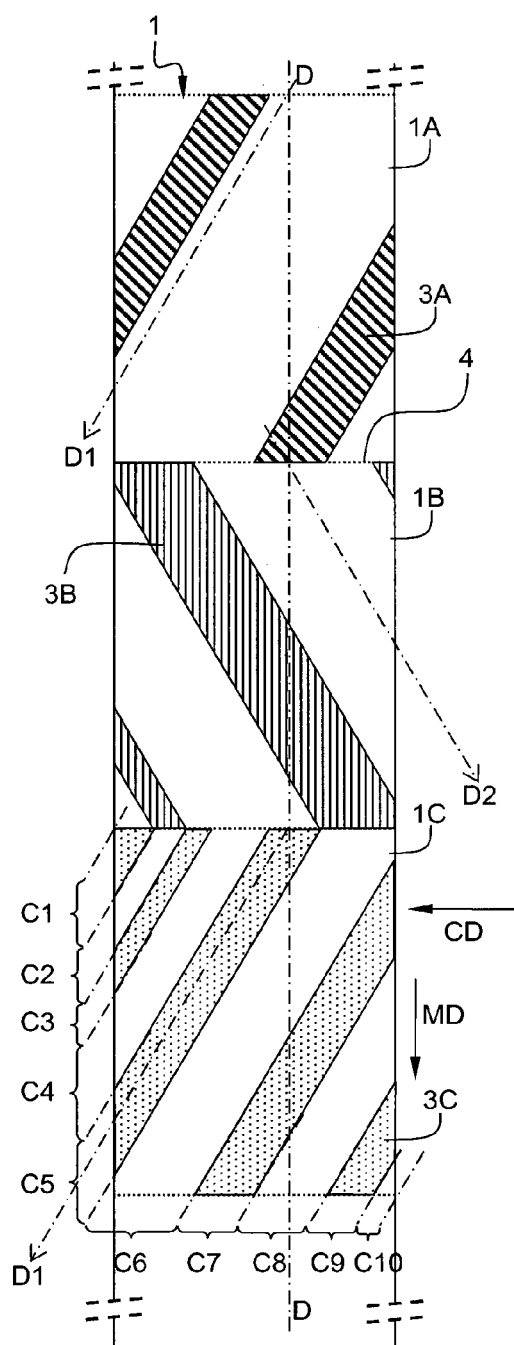


FIG. 14

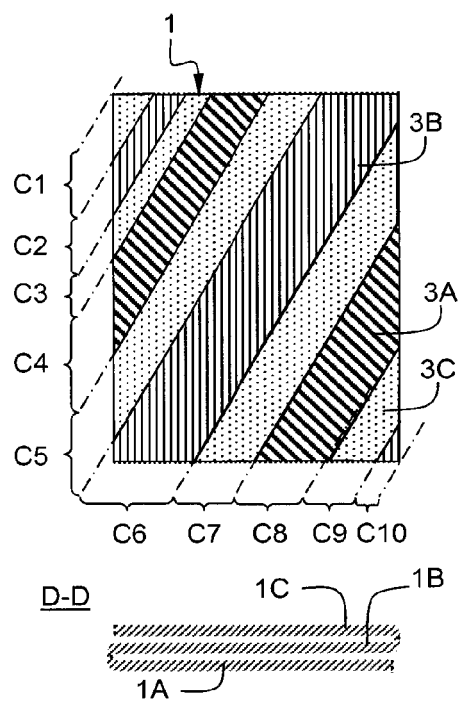


FIG. 15

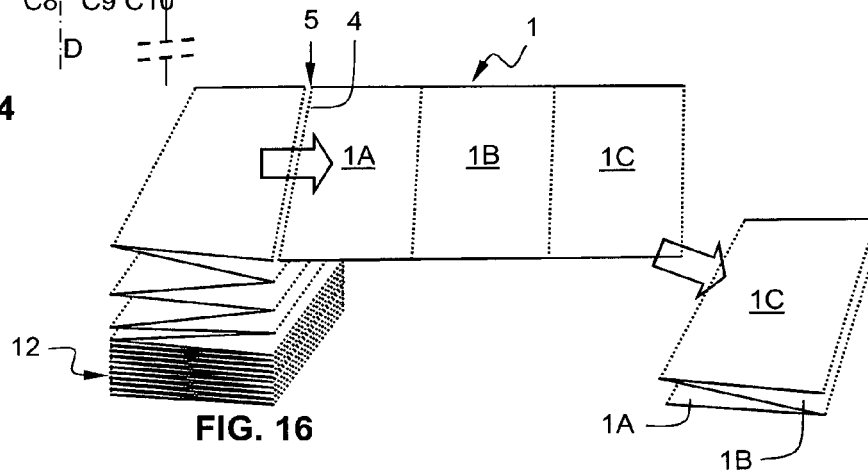


FIG. 16



EUROPEAN SEARCH REPORT

 Application Number
EP 14 00 2485

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2006/092817 A1 (PERINI FABIO SPA [IT]; GELLI MAURO [IT]) 8 September 2006 (2006-09-08) * claims 1-35; figures 4,5 *	1-4,6, 17-19	INV. D21H27/00 D21H27/02
X	US 2007/044928 A1 (SHANNON THOMAS G [US] ET AL) 1 March 2007 (2007-03-01) * claims 1-40 *	1-3, 17-19	
X	US 2007/084099 A1 (SARBO BENJAMIN C [US] ET AL) 19 April 2007 (2007-04-19) * claims 1-19; figures 1-8 *	1,17-19	
A,D	US 8 383 223 B2 (BARREDO DONALD [FR]) 26 February 2013 (2013-02-26) * the whole document *	1-19	
A	EP 1 527 898 A1 (SCA HYGIENE PROD GMBH [DE]) 4 May 2005 (2005-05-04) * the whole document *	1-19	
A	US 2010/297378 A1 (MELLIN ANDRE [US] ET AL) 25 November 2010 (2010-11-25) * the whole document *	1-19	TECHNICAL FIELDS SEARCHED (IPC) D21H A47K
A	US 2012/034430 A1 (NELSON NAOMI RUTH [US] ET AL) 9 February 2012 (2012-02-09) * the whole document *	1-19	
A	WO 2013/184909 A1 (PROCTER & GAMBLE [US]) 12 December 2013 (2013-12-12) * the whole document *	1-19	
A	US 2012/088076 A1 (GLAKPE ESINAM DENIECE [US] ET AL) 12 April 2012 (2012-04-12) * the whole document *	1-19	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 23 January 2015	Examiner Karlsson, Lennart
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 00 2485

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The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

23-01-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2006092817 A1	08-09-2006	AT 544590 T BR P10609374 A2 EP 1855876 A1 ES 2380788 T3 US 2008199660 A1 WO 2006092817 A1	15-02-2012 30-03-2010 21-11-2007 18-05-2012 21-08-2008 08-09-2006
US 2007044928 A1	01-03-2007	AU 2006285338 A1 CA 2614749 A1 CR 9639 A EC SP088095 A EP 1919340 A1 JP 2009505780 A KR 20080038126 A US 2007044928 A1 WO 2007027262 A1	08-03-2007 08-03-2007 13-02-2008 20-02-2008 14-05-2008 12-02-2009 02-05-2008 01-03-2007 08-03-2007
US 2007084099 A1	19-04-2007	AU 2006299877 A1 BR P10612608 A2 CA 2614296 A1 CR 9640 A EC SP088093 A EP 1933683 A1 JP 5422786 B2 JP 2009511167 A KR 20080056710 A US 2007084099 A1 WO 2007044157 A1	19-04-2007 07-12-2010 19-04-2007 03-03-2008 20-02-2008 25-06-2008 19-02-2014 19-03-2009 23-06-2008 19-04-2007 19-04-2007
US 8383223 B2	26-02-2013	CA 2682218 A1 EA 200901306 A1 EP 2142060 A1 FR 2914170 A1 US 2010112264 A1 WO 2008135690 A1	13-11-2008 30-04-2010 13-01-2010 03-10-2008 06-05-2010 13-11-2008
EP 1527898 A1	04-05-2005	AU 2004291216 A1 BR P10415656 A CN 1845825 A EP 1527898 A1 EP 1677988 A1 MX PA05012971 A RU 2350473 C2 WO 2005049326 A1	02-06-2005 19-12-2006 11-10-2006 04-05-2005 12-07-2006 16-03-2006 27-03-2009 02-06-2005
US 2010297378 A1	25-11-2010	CA 2762557 A1	25-11-2010

EPO FORM P0459

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 00 2485

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The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

23-01-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		US 2010297378 A1	25-11-2010
		WO 2010135387 A1	25-11-2010

US 2012034430 A1	09-02-2012	CA 2748114 A1	09-02-2012
		US 2012034430 A1	09-02-2012

WO 2013184909 A1	12-12-2013	CA 2876117 A1	12-12-2013
		US 2013327487 A1	12-12-2013
		WO 2013184909 A1	12-12-2013

US 2012088076 A1	12-04-2012	CA 2814093 A1	12-04-2012
		EP 2624797 A1	14-08-2013
		FR 2974494 A1	02-11-2012
		US 2012088076 A1	12-04-2012
		WO 2012047992 A1	12-04-2012

EPO FORM P0459

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Patent documents cited in the description

- US 8383223 B [0006] [0025]