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(54) Title: OUTER COVER ASSEMBLY AND DISPOSABLE ABSORBENT ARTICLE

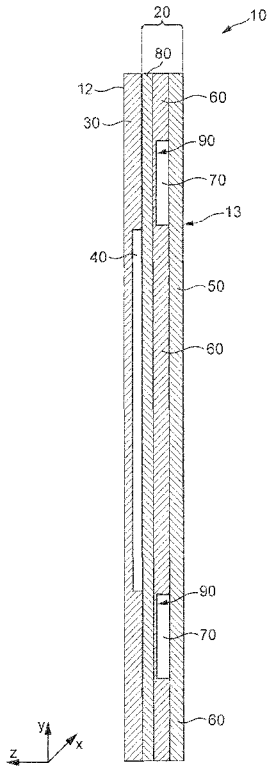

FIG. 1c

(57) Abstract: The present application relates to an outer cover assembly (20) for a disposable absorbent article. The outer cover assembly (20) extends in a longitudinal direction (Y) and a transverse direction (X) and has a thickness direction (Z) extending perpendicular to the longitudinal direction (X) and the transverse direction (Y). The outer cover assembly (20) comprises at least a first, nonwoven layer (50), a second, intermediate layer (60) and an inner, liquid-impermeable film layer (80) layered in this order in the thickness direction (Z), the inner, liquid-impermeable film layer (80) being provided on its side facing the second, intermediate layer (60) with at least one graphic (90), which has an extension in the longitudinal direction (Y) and the transverse direction (X). Either the first, nonwoven. layer (50) or the second, intermediate layer (60) is provided, with at least one opening (70) extending in the area of the graphic (90) in the longitudinal direction (Y) and the transverse direction (X) and over at least a part of the graphic (90). The other layer of the first, nonwoven layer and the second, intermediate layer without the opening has an, optical transmittance at least in the area covering the at least part of the graphic such that the at least part of the graphic is visible through the other layer. The present application also relates to a disposable absorbent article (10), such as a diaper, incontinence pant or sanitary napkin, comprising an outer cover assembly (20) as disclosed.

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OUTER COVER ASSEMBLY AND DISPOSABLE ABSORBENT ARTICLE

Technical Field

The present invention pertains to an outer cover assembly for a disposable absorbent article which is provided with a graphic. Additionally, the present invention pertains to a disposable absorbent article, such as a diaper, incontinence pants or sanitary napkin, having an outer cover assembly which is provided with a graphic.

Technical Background

Such disposable absorbent articles are articles which are worn adjacent the body, and used for the containment and absorption of bodily exudates, such as urine, blood, faeces and sweat. A typical disposable absorbent article comprises an absorbent core disposed between an inner topsheet, adapted to face and typically to contact the user's skin, and an outer cover layer for inhibiting liquid waste absorbed by the absorbent core from leaking out of the article. The inner topsheet of the absorbent article is typically liquid permeable to permit body waste to pass through for absorption by the absorbent core.

Over time, disposable absorbent articles have continuously been further developed and are now commonly provided with multi-component outer covers having various different materials and layers. Multi-component outer covers are also commonly termed backsheets or outer cover assemblies. By using a certain combination of materials and layers, an outer cover assembly can be provided that is highly functional with respect to softness, textile-likeness, liquid-impermeability and breathability etc. Accordingly, disposable absorbent articles of this kind are nowadays highly complex products and are made up of a large number of components that have to be handled and assembled at high speeds in a production process.

For these multi-component outer covers, it has often been an aim to include printed graphics, such as letters, character images, and/or numbers or the like, which are visible from outside the article. By

using printed graphics, the diapers become more aesthetically pleasing for the user and also more underwear-like. The graphics may also provide visual assistance to the user or to a caregiver securing the article on the user. Unfortunately, the presence of various materials and layers in multi-component outer covers makes it difficult to display printed graphics in a clear and vibrant manner, so that they may be easily visually discerned.

Several attempts to achieve this have been carried out. In GB 2 293 573, for example, a backsheet is disclosed having a film layer and an outer layer. The film layer is provided with a different colour from the outer layer of the backsheet, and the outer layer is further rendered transparent in certain areas. This allows the colour of the film to be visible through the transparent areas of the outer layer. The transparent areas of the outer layer are obtained by subjecting corresponding areas of an opaque nonwoven layer to heat and pressure so that the fibres in these areas melt and form a film-like structure.

EP 1 738 729 discloses an outer cover laminate having a first film layer with indicia, a second layer, preferably being a non-woven layer, and a third layer, preferably also being a non-woven layer. The third layer acts as a landing zone and is smaller than the second layer. In this example, both nonwoven layers are adapted to enhance the visibility of the indicia on the film material by being sufficiently translucent in combination.

It is also known in the art to provide an outer nonwoven layer of a backsheet with printed graphics. However, the quality of printing on a nonwoven of the type used on absorbent articles is less distinct and does not allow printing of figures and drawings in which distinct lines or fully coloured areas are required in order to obtain the desired aesthetic effect. Thus, the advantage of using the inner film layer for printing is that pictures or drawings with very distinct lines can be printed thereon. On the outer nonwoven layer, printed drawings or pictures will have blurred lines and indistinct areas due to the structure of the layer. If there is a

need for sharp lines, such as a text line, the outer nonwoven layer can therefore not be used.

EP 1 078 620 and US 7 214 849 disclose alternative solutions on how to enhance the visibility of the graphics. These documents disclose absorbent articles which have an additional printed sheet sandwiched between two layers. The additional printed sheet is preferably smaller than the outer layer, which makes it possible to form the printed sheet at low cost.

As regards other known arrangements, JP-A-2002-272783 discloses a diaper having an outer assembly with two nonwoven layers and elastic members disposed therebetween. Further, a pattern or graphic can be provided on a backsheet arranged on the inner side of the outer assembly and this graphic is intended to be seen through the two nonwoven layers. However, in such arrangements the visibility of the graphic tends to be impaired.

US 2005/0131366 A1 discloses an absorbent article having a decorative element or graphic. In this document, there is disclosed a liquid barrier sheet provided on its outer surface with a decorative element and an outer sheet covering the liquid barrier sheet. The outer sheet is provided with an optical transmittance that permits the decorative element to be seen through the outer sheet. In alternative embodiments, two outer sheets can be provided, and the liquid barrier sheet is provided either beneath both or between the two outer sheets. However, in each case, the entire outer sheet must be formed to have the appropriate optical transmittance, which may materially impact on other required properties of the layers.

EP 1 179 330 A2 discloses a laminate for a disposable diaper comprising two outer sheets and elastic members provided therebetween. A graphical design can be provided, possibly on a label or the like, and the area on which the combined, laminated web is provided with the graphical design can be made non-elastic to avoid wrinkling in that area.

Finally, EP 1 452 157 A1 discloses an exterior laminate that forms the outer surface of an absorbent article. The exterior laminate comprises an outer sheet, an inner sheet and a plurality of elastic members arranged between these two sheets. A portion of the elastic members is made inelastic and a pattern sheet with a pattern or graphic is inserted between the outer sheet and the inner sheet to cover the region of the elastic members which has been made inelastic. The outer sheet is such that the pattern sheet can be seen through it from the outside, or alternatively the backsheet of the absorbent body is omitted and the pattern sheet is made liquid impermeable and extends along the entire longitudinal axis of the diaper to act as a backsheet. However, in this document, either the pattern sheet must be on the outside, or the entire outer sheet must be sufficiently translucent to permit the graphic to be visible. In either case, a compromise must be made with visibility of the graphic and the other required properties of the backsheet.

Despite the activity in the field, exemplified by the above-cited disclosures, there remains a need for an outer cover assembly which combines high performance and functionality with an appealing finish. In particular, it is desirable that a balance is kept between the number of components making up the product structure and the location of the graphics on the outer cover such that the graphics appear aesthetically pleasing to the user and the manufacturing costs are minimised in view of the mass-production of said articles.

Summary of the Invention

Starting from the prior art, it is an object of the present invention to improve an outer cover assembly for a disposable absorbent article which is provided with a graphic.

Thus, in a first aspect the present invention relates to an outer cover assembly for a disposable absorbent article. The outer cover assembly extends in a longitudinal direction Y, a transverse direction X and a thickness direction Z extending perpendicular to the longitudinal direction Y and the transverse direction X. The outer cover assembly comprises at least a first nonwoven layer, a second intermediate layer and an inner liquid-impermeable film layer

layered in this order in the thickness direction. In use, the inner liquid-impermeable film layer will be located closer to the user in the thickness direction Z than the at least first nonwoven layer and second intermediate layer. The inner liquid-impermeable film layer is provided on its side facing the second intermediate layer with a graphic, and the graphic has an extension in the longitudinal direction Y and the transverse direction X. Furthermore, either the first nonwoven layer or second intermediate layer is provided with an opening in the area of the graphic, the opening extending in the longitudinal direction Y and the transverse direction Xand over at least a part of the graphic, i.e. such that the at least part of the graphic is not covered at that location by the layer provided with the opening. The other layer of the first nonwoven layer and the second intermediate layer without the opening has an optical transmittance at least in the area covering the at least part of the graphic such that the at least part of the graphic is visible through the other layer.

The term "opening" refers to an open area circumscribed by either the first nonwoven layer or the second intermediate layer. The extension of the opening is essentially in the longitudinal direction Y and the transverse direction X. The thickness of the layer can therefore be ignored in terms of the extension of the opening area, since inevitably all materials have a thickness, which is ultimately dependent on the material itself. The shape of the opening may be in any suitable form. Preferably, the shape takes the form of a square, rectangular, circle or triangle.

The term "layer" or "web" as used herein is a generally two-dimensional structure that may comprise one or more plies and may be in the form of a laminate made from plies of the same material or different materials. Hence, a nonwoven web or nonwoven layer or nonwoven laminate layer may comprise a multitude of plies or nonwoven plies.

For securing clear see-through visibility of the pattern from the outside and user-attractive appearance, it is preferred for the outer sheet 21 to have an optical transmittance of 55% or higher,

more preferably 65% or higher, most preferably 75% or higher. The see-through visibility of the pattern reduces with a decrease in optical transmittance.

Here, optical transmittance is defined to be the total luminous transmittance as measured according to ASTM Standard D 1003, Procedure A ("Hazemeter"), employing CIE Standard Illuminant A in the measurement, which standard is well-known to those skilled in the art. Measurement is made on arbitrarily selected 10 points of a sample sheet to obtain an average. The total transmittance of nonwoven fabric hardly varies depending on the process of fabrication and is rather governed by the basis weight.

A preferred basis weight for obtaining high total transmittance is 40 g/m^2 or less, more preferably 30 g/m^2 or less. Taking softness, touch, and cost into consideration as well as sufficient strength, a preferred basis weight of nonwoven fabric used as an outer sheet is 5 to 40 g/m^2 and preferably 8 to 30 g/m^2.

The term "graphic" may refer, but is not limited, to an image, a design, a pattern, symbology, indicia, or the like. "Graphic" also includes one or more single coloured patterns and/or multicoloured patterns which occupy a certain area of the outer cover assembly. The term "coloured" may refer to a status of non-white.

By leaving at least a part of the graphic uncovered, as mentioned above, it is meant that the opening allows the part of the graphic to be exposed. The result of this technical feature is that the graphic becomes easier to see from the outside of the outer cover assembly. Hence, by means of the provision of any of the first nonwoven layer and second intermediate layer with an opening in the area of the graphic in the longitudinal direction Y and the transverse direction X, which leaves at least a part of the graphic uncovered, it becomes possible to provide a highly functional and aesthetically pleasing outer cover assembly. This is achieved since at least the first nonwoven layer or the intermediate layer has an opening in the area of the graphic in order to reduce the amount of layers over at least a part of the graphic. That part of the graphic

is consequently covered by fewer material layers than, for instance, other parts of the film material, and the graphic becomes more vivid and vibrant. In other words, the opening allows the graphic to be exposed such that the graphic becomes more visible from the outside of the outer cover assembly. As a result, the outer cover assembly can be provided with more accurately defined graphics, whose qualities are less dependent on the complex product structure. By the principles of the invention, it is thus possible to meet the desire for using as few layers as possible over the graphic, preferably only one layer, while at the same time being able to provide a highly functional outer cover assembly using several material layers.

An additional advantage is that the graphic on the liquid-impermeable film layer may now appear more similar to graphics on other parts of the absorbent article. The article can therefore communicate overall a more harmonized set of graphics, which is less dependent on the complex product structure.

Furthermore, when making disposable absorbent articles, manufacturers are highly concerned to keep the use of raw materials to a minimum in order to reduce the carbon footprint of the disposable absorbent article. For instance, the use of a supplementary printed sheet may add unwanted costs to the absorbent article and is also negative for environmental reasons. Embodiments of the present invention therefore provide a less expensive and more environmentally responsible technical solution as compared with prior art solutions using an additional printed sheet, since embodiments of the invention make use of the existing layers of the outer cover assembly rather than requiring a supplementary sheet.

Preferably, any of the layers which do not form the opening covers at least a part of the graphic. In this manner, the graphic is provided with a protective layer and is less exposed to physical impacts, such as dust, unintentional contact with other articles when the articles are packaged face to face, contact with underwear during use, or other physical tearing that may destroy the quality

of the graphic. Thus, the vivid and vibrant aspects of the graphic are maintained for a longer time.

Preferably, any of the layers which does not form the opening covers at least a part of the opening. In this manner, the edges defining the opening are covered by an additional layer so as to ensure that the edges are not damaged or do not come apart.

In one aspect of the invention, the second intermediate layer may comprise a nonwoven material. By means of using a nonwoven material layer, the outer cover assembly becomes even softer. In addition, the cloth-like feel of the article is enhanced.

The first nonwoven layer or the second intermediate layer, when it is the other layer without the opening, may have a basis weight of 5 to 40 g/m^2, preferably 8 to 30 g/m^2. Without being bound by any theory, it is well-known that the opacity or optical transmittance levels for nonwovens are sensitive to material basis weight. For example, a high degree of nonwoven layer opacity indicates a high degree of obscuring a graphic behind it. Naturally, it is also likely that other properties of the material may affect the opacity, such as material density, thickness and the degree and type of pigmentation used (e.g. titanium dioxide, TiO2). A nonwoven layer with a basis weight in the range of 5 to 40 g/m^2 will have a satisfactory opacity in terms of providing visibility of the graphic and good layer strength. However, the advantage of selecting a nonwoven layer having a basis weight within the above preferred range of 8 to 30 g/m^2 is that an even better balance is kept between the opacity and the strength of the material. An acceptable degree of strength is critical since a thin material has a tendency to tear apart if it is used in an outer cover assembly. This is due to the fact that the outer cover assembly may be subjected to pulling forces when the user is putting the article on. This is particularly relevant if the outer cover assembly is used in a pull-on diaper or a pant-type disposable absorbent article.

In one aspect of the invention, the opening extends in the longitudinal direction Y and the transverse direction X over the entirety of the graphic. This allows the complete graphic to be as

vivid and vibrant as possible. This aspect of the invention may be important when the graphic(s) should be harmonized, e.g. when the assembly is provided with a large graphic or several minor graphics that together communicate a message to the user or the caregiver.

For reasons of improved fit and comfort, the outer cover assembly may further comprise body elastic. The body elastic is applied between the first nonwoven layer and the second intermediate layer, such that the outer cover assembly is elasticated. In such embodiments, the body elastic) may be configured in the region of the opening so as not to cause the region of the inner layer provided with the graphic to become wrinkled

Alternatively, the inner liquid-impermeable film layer may comprise an elastic film material, such that the outer cover assembly is elasticated.

In another aspect of the invention, the first and second layers are continuous layers. Continuous layers, here, are layers which are formed as a continuous web. Furthermore, the opening is obtained by a removal of an opening material portion of any of the first and second continuous layers. By means of having continuous layers, the outer cover assembly can be manufactured in an efficient manner. Further, by removal of a material portion from a continuous layer, it is possible to make the inventive outer cover assembly only by minor adaptations to an existing manufacturing process. Manufacturers can therefore utilize their existing processes without making extensive technical changes to the process sequence or sequences. The only additional requirement is the implementation of a manufacturing step which allows a portion of the layer to be removed. Hence, it is possible to avoid costly and/or complicated manufacturing solutions, and the outer cover assembly, as well as the article itself, can continue to be handled and assembled at high speeds.

Preferably, the opening material portion of any of the layers may be removed by cutting. By cutting out the opening material portion from any of the layers, an opening is achieved having smooth and uniform edges.

In yet another, alternative, aspect of the invention, the first nonwoven layer or the second intermediate layer, when provided with the opening, may comprise at least a first piece of material and a second piece of material. In this aspect, the first piece of material may be arranged relative to the second piece of material such as to define at least a portion of the opening therebetween. In this manner, it becomes possible to make full use of the available material since less or no material may be removed when forming the opening area as compared with the first aspect of the invention. The manufacturing process therefore becomes more environmentally friendly in terms of material savings. This aspect of the invention is particularly beneficial when the opening is shaped as a square or a rectangle. The square- or rectangle-shaped opening is simply formed by arranging two rectangular shaped pieces of material with a distance therebetween.

The second intermediate layer is arranged closer to the inner liquid-impermeable film layer than the first nonwoven layer, in the thickness direction Z. In one aspect of the invention, the opening may be formed in the second intermediate layer. The technical advantage of the above is that the opening and the graphic is covered by the first nonwoven layer. Moreover, when laminating the outer cover assembly, it makes it possible to more accurately synchronize the position of the opening with the graphic as the film layer and the layer with the opening are close to each other. The first nonwoven layer is arranged externally of the second intermediate layer, in the thickness direction Z. In an alternative aspect of the invention, the opening may be formed in the first exterior nonwoven layer. By means of having the opening in the first exterior nonwoven layer, the overall outer surface of the outer cover assembly is provided with different surface structures that may itself enhance the attractiveness of the outer cover assembly or the article. In addition, by having the opening on the exterior layer, the opening may define a window around the graphic which can have a positive impact on the communication of the graphic to the user, e.g. it may be easier for the user to find the graphic since it is surrounded by a distinct window, i.e. the edges of the opening.

The present inventions also relates to a disposable absorbent article, such as a diaper, incontinence pant or sanitary napkin. The disposable absorbent article comprises an outer cover assembly according to any one of the aspects as mentioned above. The article may have an inner surface facing the user during use and an outer surface facing away from the user during use. Further, the article may comprise a topsheet, which may form the inner surface, the outer cover assembly forming the outer surface, and optionally an absorbent core disposed between the topsheet and the outer cover assembly.

Preferably, the inner liquid-impermeable film layer of the outer cover assembly is arranged closer to the absorbent core in the thickness direction Z than the at least first nonwoven layer and the second intermediate layer.

The disposable absorbent article may further comprise, as seen in the longitudinal direction Y, a front portion, a rear portion and an intermediate crotch portion provided with two leg openings. The crotch portion extends between the front portion and the rear portion in the longitudinal direction Y of the article and is joined to the front and rear portions. Moreover, the outer longitudinal edge portions of the front portion may be connected by longitudinal side seams to the outer longitudinal edge portions of the rear portion.

In some embodiments, either the first, nonwoven layer or the second, intermediate layer is further provided with a further graphic and a further opening extending in the area of the further graphic in the longitudinal direction (Y) and the transverse direction (X) and over at least a part of the further graphic and that the other layer of the first, nonwoven layer and the second, intermediate layer without the further opening has an optical transmittance at least in the area covering the at least part of the further graphic such that the at least part of the further graphic is visible through the other layer.

In one embodiment, the further graphic and the further opening are positioned so as to be on the same one of a front surface or a rear surface of the article, when worn.

In another embodiment, the further graphic and the further opening are positioned so as to be on different ones of a front surface or a rear surface of the article, when worn.

In some embodiments, a further nonwoven layer is positioned between the second, intermediate layer and the first, nonwoven layer to cover the at least part of the graphic; and at least one of the first, nonwoven layer and the further nonwoven layer does not extend to cover the intermediate crotch portion of the article.

Brief Description of the Drawings

In the following, embodiments of the outer cover assembly and disposable absorbent article will be described, by way of example only, with reference to the accompanying Drawings, in which:

Figures 1a and 1b show a disposable absorbent article being an embodiment of the present invention;

Figures 2a, 2b, 2c and 2d show a sequence of laminated layers building up an outer cover assembly being an embodiment of the present invention;

Figures 3a, 3b and 3c show a sequence of laminated layers building up an outer cover assembly being another embodiment of the present invention;

Figures 4a, 4b and 4c show a sequence of laminated layers building up an outer cover assembly being a further embodiment of the present invention;

Figure 5 shows a continuous manufacturing process suitable for the production of embodiments of the present invention.

Detailed Description of the preferred Embodiments

In the following, embodiments of the outer cover assembly and the disposable absorbent article of the present disclosure will be described by reference to the attached Figures. Identical or similar features will be denoted by the same reference numerals and repeated description thereof may be omitted in order to avoid redundancies.

Although the following description has been made on a conventional pants diaper, the present invention may as well be implemented in an open diaper, i.e. a diaper to be closed by means of a fastening means. In addition, the present invention may as well be incorporated in incontinence guards and sanitary napkins. As used herein, "absorbent article" therefore means any article that can absorb body fluids and is suitable to be placed in close proximity to the genitals and/or anus of the user.

Figure 1a of the drawings shows an embodiment of a disposable absorbent article in the form of a diaper for an infant or an incontinent adult. The diaper is intended to be worn around the waist of the wearer like a pair of pants.

The absorbent article 10 comprises an outer cover assembly 20 having a front portion 150 which in the embodiment shown in the drawings in use is intended to extend over the stomach of the wearer. The outer cover assembly also comprises a rear portion 160, which in the shown embodiment is the part of the outer cover assembly that in use is intended to extend over the back of the wearer. The article has a longitudinal direction y and a lateral transverse direction x. The absorbent article as shown in Figure 1a may further be symmetric about a longitudinal center axis L. The article may be formed by the folding of a laminar structure, for example as shown in Figures 1b and 1c.

Longitudinal side seams 180 and 180' are formed along the laterally outermost margins of the front and rear portions 150 and 160 to thereby create a closed pants-type diaper, i.e. a unitary article having a waist opening and a pair of leg openings. The side seams can be formed in a variety of ways known in the art, such as ultrasonic welding, adhesive or a combination thereof. One or both side seams may further be openable and refastenable, wherein they

are formed by mechanical fasteners or adhesive tape. In a further embodiment the front and rear portions may be joined via a pair of elastic side panels.

An intermediate crotch portion 170, which is normally a part of the other cover assembly, is the part of the article that in use is intended to extend through the wearer's crotch area between the legs. An absorbent core is optionally disposed in the crotch portion 170 and extends into the front and rear portions 150 and 160.

The article 10 further comprises an inner topsheet (not shown in Figure 1a) and an outer cover assembly 20. The outer cover assembly 20 and the topsheet 30 will be further explained below. However, the topsheet is that sheet which in use of the diaper is in contact with the skin of the wearer or at least facing the skin.

The article may also be provided with a waist containment pocket and elasticised leg openings, i.e. leg opening 220, leg opening 230, leg elastics 240 and leg elastic 250. Since such constructional features are, however, well known in the art, they will not be described in further detail.

The article may also be provided by a so-called raised barrier cuffs (not shown) in order to provide an improved security against leakage. These raised barrier cuffs may in some instance replace leg elastics.

In an alternative embodiment, shown in Figure 1b, the absorbent article is a so-called open diaper, which has no side seams between the front and rear portions 150 and 160. Fastening means in the form of mechanical fasteners or adhesive tape are provided at the side edges of the rear portions and are intended to be fastened along the external surface of the front portion.

In another alternative embodiment of an open diaper structure, side panels, normally of an elasticized material, may join the front and rear portions to form a continuous waist opening. Each side panel is made up of a first side panel portion adjacent the front portion and a second side panel portion adjacent the rear portion. Each side panel may have a fastening means, for example a mechanical fastening

means, in the form of a hook or loop member, intended to cooperate with a complementary mechanical fastening means on the outside of the front portion, the so-called landing zone. The entire external surface of the outer cover assembly of the front panel may comprise a non-woven material, which functions as a loop material or a separate strip of loop material may be attached to the external surface of the front panel forming the landing zone. Further examples of mechanical fasteners are button and holes or button loops, snap fasteners and the like. The buttons can either be fastened to the side panels or to the absorbent article. Alternatively, adhesive fastening means may be used such as a tape tab, wherein at least part of the external surface of the outer cover assembly of the front portion is of a material to which the tape can adhere.

In a still further embodiment the absorbent article is a so-called belted diaper or incontinence garment comprising a pair of opposed laterally extending belt members usually attached to the rear portion at the waist portion thereof. These belt portions are adapted to be wrapped around the waist of the wearer of the garment and fastened together by means of first fastening means, such as an adhesive tape or mechanical fastening means, for example a hook-and-loop fastener. The front portion may then be passed between the legs of the wearer and fastened to the outside of the belt members by means of second fastening means provided at the waist portion of the front portion.

The materials making up the diaper 10 may be selected from any of the materials commonly used for such products and may include environmentally friendly materials from renewable sources and/or biodegradable material.

Thus, the topsheet, i.e. the liquid permeable layer may suitably be made of a non-woven material. Another conceivable material is perforated plastic. In particular, the material of the top sheet is preferably selected from a material that exhibits characteristics such as dryness and softness when the diaper is being worn. It is also desirable for the top sheet to be non-irritating to the skin

and to have a soft and textile-like surface which remains dry even in the event of repeated wetting. The topsheet could consist of a non-woven material, and could also consist of a perforated, hydrophobic nonwoven material in order to keep the surface which is closest to the user's body dry, the holes of said nonwoven material being able to impart a textile-like and comfortable feel to the topsheet. Such topsheets are conventionally known in the art, and those which are known to the skilled person may b e used without particular limitation, as circumstances dictate.

The absorbent core 40 is normally enclosed between the liquid permeable topsheet and a liquid impermeable outer cover assembly. The absorbent core 40 may extend between the front portion 150 and the rear portion 160 in the longitudinal direction X of the disposable absorbent article 10 and be joined to the front and rear portions 150, 160, as illustrated in Figure 1c, which shows the laminar structure of the absorbent article along line II in Figure 1b. However, the absorbent core 40 may only be joined to one of the front and rear portions 150, 160, or solely to the crotch portion 170, as desired. Suitably, at least the crotch portion 170 extends between the front portion 150 and the rear portion 160. However, if no crotch portion 170 is present, the absorbent core must extend between the front portion 150 and the rear portion 160 and be joined thereto.

The absorbent core 40 can be of any conventional kind. Examples of commonly occurring absorbent materials are cellulosic fluff pulp, tissue layers, highly absorbent polymers (so-called superabsorbent polymers, or SAP), absorbent foam materials, absorbent nonwoven materials or the like, and mixtures and/or laminates thereof, compressed or uncompressed, as requirements dictate. It is within the capacity of the skilled person to select an appropriate core for any particular application.

The size and absorbent capacity of the absorbent core may be varied to be suited for different uses such as for infants or for incontinent adults. For example, the absorbent core material could comprise an upper absorbent core and a lower absorbent core. The

term "upper" as used herein relates to the portion of the product intended to be positioned closer to the user when in use, whereas the term "lower" as used herein relates to the portion of the product closer to the garment-facing surface thereof. Furthermore, SAP in the lower absorbent core has the main function of increasing the liquid storing capacity of this layer whereas the main function of SAP in the upper absorbent core is to prevent rewetting of liquid absorbed in this layer if the article is compressed by external forces during use. The SAP in the upper absorbent core could be of a different type than the SAP used in the lower absorbent core or be present in a lower percentage than in the lower absorbent core. The SAP may be applied in localised areas of an absorbent core, e.g. in intake regions, liquid distribution regions and/or liquid retention regions. The person skilled in the art will understand how the concentration of SAP in an absorbent core may be adjusted depending on the absorbent properties and the type of absorbent article which is to be produced, e.g. a high amount of SAP may be used in order to achieve a thin absorbent article, while lower amounts may be used in some hygiene articles intended for light incontinence products.

One preferable example of a suitable material for the absorbent core is pulp mixed with approximately 30 % of SAP from BASF, Ludwigshafen, Germany available under the trade name Hysorb M7125. The mixture of cellulose fluff and SAP has preferably a density of 0.08 - 0.13 g/cm3. The absorbent core may also be made from a chlorine-free fluff pulp such as Totally Chlorine Free fluff pulp which is commercially available from Stora Enso.

Beside the absorbent core, the diaper may also comprise other layers such as a fluid acquisition layer for a quick transport of body fluids. The fluid acquisition layer has an open porous structure and should be able to quickly receive and temporarily store a certain amount of fluid and transfer it further to the underlying absorbent core. This is important, especially for the thin, compressed absorbent articles of today, which often have a high content of SAP. Absorbent articles of today certainly have high absorption capacity, but on the other hand they sometimes have a receiving speed which is too low to instantaneously cope with receiving large amounts of

liquid which could be released upon urination within a few seconds time interval. The fluid acquisition layer is usually a so-called high loft material produced by carding and through-air bonding or needling synthetic fibres, such as polyester, polypropylene or mixtures thereof. A suitable material for the acquisition layer is a hydrophobic wadding of through air nonwoven available from LIBELTEX, having the trade name DRY WEB T 23W.

Outer cover assembly

The outer cover assembly 20 as shown in Figure 1c extends in the longitudinal direction Y and the transverse direction X, and has a thickness direction Z extending perpendicular to the longitudinal direction X and the transverse direction Y. The outer cover assembly 20 comprises at least a first nonwoven layer 50, a second intermediate layer 60, and an inner liquid-impermeable film layer 80.

In other words, the second intermediate layer 60 is superposed on the inner liquid-impermeable film layer 80, and the first nonwoven layer 50 is superposed on the second intermediate layer 60 as an outer surface of the outer cover assembly and/or the absorbent article.

The outer cover assembly 20 may also be referred to as a multi-component outer cover, chassis or backsheet. The outer cover assembly, in use, covers the absorbent core 40 on the garment-facing side thereof. The topsheet 30 and outer cover assembly 20 generally have a similar extension in the plane, while the absorbent core 40 has an extension which is somewhat smaller. The topsheet 30 and outer cover assembly 20 are joined to one another around the periphery of the absorbent core, so that the absorbent core is enclosed within the envelope formed by the topsheet 30 and outer cover assembly 20. The topsheet 30 and outer cover assembly 20 may be joined to one another by any means common in the art, e.g. ultrasonic welding, thermal welding or gluing.

The outer cover assembly material may be breathable so as to allow vapour to escape from the absorbent core while still preventing

liquids from passing therethrough. Examples of breathable materials are microporous polymeric films, nonwoven laminates from spunbond and meltblown layers, laminates from microporous polymeric films and nonwoven materials. The areas of the outer cover assembly 20 outside of the absorbent core 40 may be formed of the topsheet and the outer cover assembly joined together to form a laminate structure. Alternatively at least part of the outer cover assembly outside the absorbent core area is made of another web material, which provides comfort and breathability.

Liquid impervious film layer

As mentioned above, the outer cover assembly 20 comprises a liquid impervious film layer 80, such as a thin plastic film, e.g. a polyethylene or polypropylene film. The liquid impervious film layer should at least cover the absorbent core on the garment-facing side thereof.

The liquid impervious film layer may also be breathable. This allows a higher degree of comfort for the wearer, as moisture/humidity build-up is reduced or completely avoided. The breathability of the liquid impervious film layer may be obtained by incorporating calcium carbonate ($CaCO_3$) filler material into a microporous polyethylene film. The breathability of the liquid impervious film layer may be quantified by the Water Vapour Transmission Rate (WVTR) according to ASTM E96-00 Procedure D. According to one embodiment, the liquid impervious film layer has a Water Vapour Transmission Rate of at least 500 g/m 2 24h, preferably at least 1500 g/m 2 24h, or most preferably at least 3000 g/m 2 24h as measured by the above ASTM procedure.

First nonwoven layer

The outer cover assembly 20 further comprises a first nonwoven layer 50. As the outer cover assembly 20 is exposed to the outside of the pant diaper in the crotch portion 170 and may come into contact with a wearer's skin when the diaper is worn, the first nonwoven layer 50 preferably has a textile or textile-like outer surface in order to avoid the stickiness that may be felt in contact with a plastic film

surface. A textile or textile-like outer surface is also preferred for the reason that it enhances the likeness of the pant diaper or other pant garments to regular underwear.

The first nonwoven layer 50 is preferably a spunbond, meltblown, spunlaced, hydroentagled, wetlaid or carded bonded nonwoven. The fibres of the nonwoven material may be natural (e.g. rayon or cellulose fibres) or artificial (e.g. polymeric fibres such as polyolefin fibres, e.g. polyethylene or polypropylene fibres). The first nonwoven layer 50 may be elastic or inelastic and will preferably comprise or consist of at least one nonwoven ply. The first nonwoven layer 50 may even comprise a laminate of two or more nonwoven plies, such as a SMS (Spunbond-Meltblown-Spunbond)-composite material. The first nonwoven layer 50 according to the invention will form part of a chassis for a disposable pant-type garment. Suitably, the first nonwoven layer 50 has a basis weight of between 5-40 g/m^2, preferably 8-30 g/m^2. The first nonwoven layer 50 should suitably be air-permeable.

Second intermediate layer

The outer cover assembly 20 also comprises a second intermediate layer 60. The second intermediate layer 60 can consist of any flexible web material as commonly used in the art, such as a layer of nonwoven material, a plastic film or a laminate of two or more sheets of the same or different materials.

The second intermediate layer 60 is preferably a spunbond, meltblown, spunlaced, hydroentagled, wetlaid or carded bonded nonwoven. The fibres of the nonwoven material may be natural (e.g. rayon or cellulose fibres) or artificial (e.g. polymeric fibres such as polyolefin fibres, e.g. polyethylene or polypropylene fibres). The second intermediate layer 60 may be elastic or inelastic and will preferably comprise or consist of at least one nonwoven ply. The second intermediate layer 60 may even comprise a laminate of two or more nonwoven plies, such as a SMS (Spunbond-Meltblown-Spunbond) composite material. The second intermediate layer 60 will form part of a chassis for a disposable pant-type garment. Suitably, the second intermediate layer 60 has a basis weight of between 5-40 g/m^2,

preferably 8-30 g/m^2. The second intermediate layer 60 should suitably be air-permeable.

The second intermediate layer 60 may alternatively comprise a plastic film, e.g. a polyolefin film such as polyethylene or polypropylene. The second intermediate layer 60 may even comprise a laminate of one or more nonwoven layers with one or more plastic films.

The nonwoven layer 50 and the intermediate layer 60 may be of the same material, or may be different. The dimensions of the intermediate layer 60 are essentially independent of the dimensions of the nonwoven layer 50. The intermediate layer 60 may have the same dimensions as the nonwoven layer 50, as shown in Figure 1b. However, it may be possible that the intermediate layer 60 has an extension in the longitudinal and transverse direction which is greater than or less than that of the nonwoven layer 50. The amount with which the intermediate layer 60 overlaps the nonwoven layer 50 may be selected appropriately by the skilled person. Preferably, the dimensions of the intermediate layer 60, and the amount of overlap between the nonwoven layer 50 and the intermediate layer 60, are such that the intermediate layer 60 overlaps the nonwoven layer 50 in the entire region of the nonwoven layer 50 in which the body elastic threads 190 are located. The nonwoven layer 50 and the intermediate layer 60 may be fixed together by any suitable means, e.g. thermal welding, ultrasonic welding or adhesion. Adhesion is most preferred. The nonwoven layer 50 and the intermediate layer 60 are suitably fixed to one another across substantially their entire area of overlap.

The nonwoven layer 50 and the intermediate layer 60 are laminated with the liquid impervious film layer 80. Lamination may take place in a number of ways, such as e.g. thermal welding, ultrasonic welding or adhesion.

Graphic

The inner liquid-impermeable film layer 80 is further provided with at least one graphic 90. The graphic 90 has an extension in the

longitudinal direction Y and the transverse direction X. The graphic 90 can either be located on the rear portion 160, the front portion 150, the intermediate crotch portion 170, or on a combination of any of the portions 150, 160 and 170. In one aspect of the invention, the graphic may extend from one of the portions to another portion. The graphic 90 may coomprise any desirable design, and can combine one or more representations such as letters, figures, symbols or combinations thereof. The graphic is provided, and preferably printed, on the exterior side of the inner liquid-impermeable film layer 80 on which the second intermediate layer 60 is to be superposed. Presently contemplated embodiments include those involving the use of a pre-printed polyethylene film, a pre-printed nonwoven fabric. Alternatively, the graphic may be provided by means of a label or patch, presently preferred to be made of polyethylene, a nonwoven fabric, or a tissue material, on which the graphic is pre-printed. However, the graphic may be provided on the layer, the label or the patch with any image-forming process which might occur to the skilled person in this art, and should be taken to include graphics which are, for example, embossed or embroidered, as well as printed.

In Figures 2a and 3a, a portion of a film layer 80 of a liquid impermeable material, e.g. polyethylene, is schematically disclosed. In the example of these Figures, a set of printed areas 90 or pictures is printed on this layer by suitable printing technique. Multicolour printing on the liquid-impermeable film layer 80 can be carried out by, for example, flexographic printing or gravure printing. Any other printing techniques, if appropriate, can be utilized. Flexographic printing is a technique in which an object to be printed is clinging to an impression drum while running on a plate cylinder and therefore undergoes little stretching. Therefore, it is suited for multicolour printing on a thin and stretchy material like the liquid-impermeable film layer 80. In the Figures 2a and 3a, the graphic 90 is represented as a grid of dots, but as mentioned above, other objects or figures can of course be used instead of dots, without limitation.

Configuration of the film layer, nonwoven layer and intermediate layer

In order that the graphic 90 may be clearly discerned by the user, one of the nonwoven layer 50 and the intermediate layer 60 is provided with an opening in the area of the graphic 90.

Figures 2a, 2b, 2c and 2d show a first exemplary layer configuration relating to the present invention.

In Figure 2a, the film layer 80 is shown with two graphics 90, one on a portion which will form the front of the garment when worn, the other on a portion which will form the back of the garment when worn. The number and arrangement of the graphics 90 is purely exemplary; only a single graphic may be provided, on the front, on the back or elsewhere. Alternatively, two or more than two graphics may be provided, for example, two graphics on the front, one on the back, or two on the back, two on the front, depending on the information to be conveyed.

In Figure 2b, an intermediate layer 60 is shown, with openings 70 which correspond to the positions of the graphics 90 on the film layer 80. In various embodiments, the graphics may be larger or smaller than the openings; here, each opening 70 is sized so as to expose the entire respective graphic 90 when the layers 60 and 80 are overlaid. Of course, the opening may be exactly sized to expose the graphic; or the opening may be slightly larger than or slightly smaller than the graphic, depending on whether the edges of the graphic are intended to be clearly visible, and on the positional accuracy of the lamination processes available.

Here, intermediate layer 60 is of approximately the same height as the film layer 80 but has an hourglass shape, defining two wider regions, suitable for forming a waistband, and a narrower region, of approximately the same width as the film layer 80, between the wider region, being suitable for forming a portion to fit between the legs of the user. Thus, the narrower portion and the two wider regions, when folded about a horizontal axis to form a diaper or similar article, define holes for legs.

In Figure 2c, the layers 60 and 80 are overlaid, so as to expose the graphics 90 through the respective openings 70.

In Figure 2d, a nonwoven layer 50 is positioned over the intermediate layer 60, the nonwoven layer 50 having optical transmittance sufficiently high so that the graphic may be discerned through the layer when observed from the outside, i.e. looking through nonwoven layer 50 through the opening in intermediate layer 60 towards film layer 80.

In Figures 2a to 2d, opening 70 is approximately square, but this is considered exemplary only. The opening may be made of any shape, dependent on the shape of the graphic and the structural requirements of the produced article.

Alternatively, the opening or openings may be formed by arrangement of discrete pieces of material, as exemplified in Figures 3a, 3b, and 3c.

In Figure 3a, a film layer 80 is shown similar to that of Figure 2a.

In Figure 3b, two pieces of material 110 and 120 are positioned overlapping with the film layer 80 so as to define an opening 70 through which the graphic 90 is exposed. A further two pieces of material are positioned similarly with respect to the other, optional, graphic visible in Figure 3b. Together, the four pieces of material constitute an intermediate layer 60. Here, the pieces are square, but rectangular shapes, or other irregular shapes, may also be contemplated depending on design requirements.

In Figure 3c, a piece of material 100 is overlaid on pieces of material 110 and 120, and a similar piece is overlaid on the other two pieces of material which constitute, together with pieces of material 110 and 120, the intermediate layer 60. In being so overlaid, the pieces of material cover the opening 70 and the graphic 90. The overlaid pieces of material, of which piece of material 100 is one, together constitute nonwoven layer 50.

In the embodiment of Figures 3a to 3c, the pieces of material 110 and 120 are approximately square and do not extend the full length

of film layer 80, while the piece of material 100 is rectangular, of height comparable to that of pieces of material 110 and 120 and of width sufficient to cover both pieces of material 110 and 120. This configuration allows, when folded along a horizontal axis, leg holes easily to be defined without the cutting the vertical edge curve seen in Figure 2d. This is advantageous in terms of material use, and in terms of producing articles of larger sizes. However, other shapes are contemplated, and indeed a curved edge to the leg holes may be provided by appropriately shaping the pieces prior to or during assembly 100, 110 and 120.

Alternatively, nonwoven layer 50 can also be a single piece of material partly overlapping, or completely covering, the graphic or graphics and the pieces of material making up intermediate layer 60.

In Figures 2a to 2d and 3a to 3c, the opening 70 is defined in the intermediate layer 60, whether by forming in a continuous layer or by arrangement of pieces of material 110, 120. However, also contemplated is the arrangement wherein the opening is equivalently formed in the nonwoven layer 50; the intermediate layer 60 then being a continuous layer in the region of the graphic, having optical transmittance sufficiently high so that the graphic may be discerned through the layer when observed from the outside. Presently preferred, however, is to form the opening or openings in the intermediate layer 60, since then the edges of the opening or openings are protected from handling damage by the nonwoven layer 50.

A further embodiment, shown in Figures 4a to 4c, is also presently contemplated.

Figure 4a shows film layer 80, similar to that shown in Figure 3a, although having (in this example) only one graphic 90 provided to it, here, for example, to be provided on a front portion of the article.

Figure 4b shows an intermediate layer 60 laminated with the film layer 80, the intermediate layer 90 having similar width and length dimensions as the film layer 80, and having an opening 70 to

correspond in position and dimensions to the graphic 90 when the layers 80 and 60 are overlaid.

Figure 4c shows the structure of Figure 4b further provided with a nonwoven layer 55 formed in two pieces of material, each rectangular in form and of similar dimensions, one provided to cover the opening 70, the other provided at a symmetrical position with respect to a horizontal axis, with space between. The pieces of material forming layer 55 are wider than film layer 80, such that by folding the arrangement of Figure 4c about the horizontal axis, similar to Figures 3a to 3c, and bringing the vertical edges of the pieces of material forming layer 55 together, a waistband and leg holes are defined.

However, Figure 4c also shows a further nonwoven layer 50, made of pieces of material of similar dimensions and arrangement as the pieces constituting layer 55 and overlaid thereon. In this arrangement, the further nonwoven layer 50 forms the backsheet of the garment and is able to isolate any elastics and/or glue used in the construction from the surface of the garment. In this embodiment, a reduced amount of nonwoven material is needed to produce the garment since is no particular need to cut out sections for forming holes for the user's legs. Tooling costs can thus also be reduced in this embodiment. The combination of layer 50 with layer 55 should preferably have a comparable light transmittance to layer 50 of the embodiments of Figures 2a to 2d and 3a to 3c, to enable the graphic to be most clearly displayed.

Of course, the features of the forgeoing embodiments can be combined and, for example, layer 55 of Figure 4c can be formed in the same manner as e.g layer 50 of Figure 2d.

In some arrangements, the opening or openings may be formed wholly within the borders of the layer defining the opening or openings; in other arrangements, the opening or openings are provided at an edge portion of the layer. The former is preferable in terms of structural integrity; the latter, in terms of simplicity of manufacturing.

Light Transmittance

In order to secure clarity of the graphic 90 even when seen through either of the layers 50 and 60, it is necessary not only for the graphic 90 itself to be clear enough but for the layers 50 and 60 to have sufficiently high light transmittance. A light transmittance is represented by a ratio of the intensity of light incident on an object to that of transmitted light.

The transmittance of the layers 50 and 60 can be increased by decreasing their basis weight, but too small a basis weight tends to fail to provide the outer cover assembly 20 with a satisfactory texture or feel. For securing clarity of the graphic 90 in good balance with texture, strength and feel of the outer cover assembly 20, it is preferred for the layer(s) superposed on the inner liquid-impervious film layer 80 to have a total basis weight of 5 to 40 g/m^2, preferably 8 to 30 g/m^2 . Thus, advantageous optical transmittances of 55% or higher, more preferably 65% or higher, most preferably 75% or higher may be achieved, in practice, without compromising texture or feel.

While the layers 50 and 60 are preferably white or very lightly tinged, each or both layers may be colored as long as the clearness of the graphic 90 or the appearance of the disposable absorbent article 10 is not impaired.

Waist elastics

In order to ensure a high degree of leakage security, the absorbent articles are preferably designed to closely fit the body of the user in such a way that the absorbent articles do not become loose or slip off the body of the user. The outer cover assembly 20 can for instance be provided with a number of elastic threads 195 arranged parallel from the waist opening. The elastic threads are preferably also arranged towards the leg openings 240 and 250, as previously explained. In this manner, the absorbent article is provided with a more comfortable fit allowing good leakage security.

Accordingly, in the outer cover assembly 20, the first nonwoven layer 50 and the second intermediate layer 60 can extend outward from the front and rear edges of the inner liquid-impermeable film layer 80, and the extended parts can be folded back on the topsheet 30 side. The folded parts of the layers 50 and 60 in the front and rear waist opening portions can overlap, partially or wholly, the absorbent core 4. With particular reference to Figure 1a, a plurality of elastic members 195, together forming the so-called waist elastic, are fixedly disposed between the folded parts of the layers 50 and 60 over the width of the outer cover assembly 20 in their tensioned state such that they can contract and thus gather the nonwoven material in the waist band when they are allowed to relax. The elastic members 195 are disposed such that their ends may meet with an overlap when the side ends of the front portion 150 and the side ends of the rear portion 160 are respectively joined together. In this manner there is formed substantially a continuous loop of gathers encircling near the waist opening of the diaper 10.

The waist elastic 195 may be in the form of a waist band formed from plies of substantially non-elastic nonwoven material that is elasticized by one or more elongated elastic members, such as elastic threads or bands that are arranged between the plies. The plies can be formed from a single layer of material such as an edge portion of the first nonwoven layer 50 that is folded over onto itself or can be made from separate materials such as a portion of the first nonwoven layer 50 and a layer of another material.

An embodiment of a disposable pant diaper according to the invention need not have waist elastic with the configuration shown in Figure 1a. The waist elastic may be entirely absent or may be arranged on only one of the front portion 150 and the rear portion 160. The waist elastic may extend along only a part of the waist opening such as along a central section of the front waist edge and/or the rear waist edge.

The outer cover assembly 20 is preferably inelastic in the crotch area.

Body elastic

The outer cover assembly may further comprise body elastic 190. The body elastic is applied between the first nonwoven layer 50 and the second intermediate layer 60, or integrated with one of the first, nonwoven layer and the second, intermediate layer, for example as elastic elements extending through the layer, such that the outer cover assembly 20 is elasticated.

As seen in Figure 1a, the body elastic 190 is shown as multiple elongated elastic members extending between the side edges 180 and 180' across the front portion 150 and the rear portion 160. The elastic members may be elastic strings or bands that may be uniformly or non-uniformly spaced over the portions 150 and 160 and that may have been applied with the same or different tensioning.

The body elastic is not essential, however, and may be omitted or designed in other ways as found suitable for a specific purpose. Accordingly, body elastic may be applied to only one of the front and rear body portion 150 and 160 and may include or consist of curved elastic elements. The body elastic may extend over part of the absorbent core. However, in order to prevent the absorbent core from being puckered when the outer cover assembly of the absorbent article is elasticated, it is common to allow the elastic threads, or the elastic material, to extend only over the upper portions of the absorbent article. Hence the elastic threads typically only extend from the waist opening to the absorbent core, but not over the absorbent core.

In general, the action of body elastic on an underlying layer will be to compress the layer laterally, which in turn tends to cause the layer to become deformed, for example by wrinkling. However, if the region of liquid-impermeable film layer 80 on which graphic 90 is printed becomes wrinkled, the graphic will itself become wrinkled, and the visibility and clarity of the graphic 90 will become decreased. Therefore, in embodiments having body elastic, it is preferable that the body elastic is configured, in a region of the opening 70 at least, so as not to cause at least that region of the liquid-impermeable film layer 80, visible through the opening and on which graphic 90 is printed, to become wrinkled.

This may be achieved by simply cutting the material of the elastic, for example the elastic threads, in order to provide an area of the laminate that is no longer elastic so that it does not become wrinkled in use, using one of several techniques known in the art. For example, it is possible to use a technique similar to that disclosed in JP-A-2002-253605. Alternatively, the elasticity of the elastic material may be deactivated, for example by decreasing the tension in the elastic threads in the region of the opening to similar effect.

When employing body elastic in an embodiment of the invention, it is preferable, especially if the elastic is not cut, to select an elastic material, such as elastane threads (obtainable under the trade name Lycra), which is sufficiently thin and transparent in use as not to obscure the graphic, at least in the region of the opening.

Elastic film material

In an alternative example, the outer cover assembly 20 is provided with an elastic film material (not shown) such that the outer cover assembly is elasticated. Accordingly, the outer cover assembly 20 comprises an elastic film material layer 80, a first nonwoven material 50 and a second nonwoven material 60. The elastic film material is liquid-impermeable, and is arranged closer to the absorbent core 40 in the thickness direction Z than the at least first and second nonwoven layers 50, 60. The inner liquid-impermeable elastic film layer 80 is then further provided with a graphic 90. The graphic 90 has an extension in the longitudinal direction Y and the transverse direction X. Any of the nonwoven layers 50, 60 forms an opening 70 in the longitudinal direction Y and the transverse direction X such that said opening 70 extends over at least a part of the graphic 90.

Alternatively at least part of the outer cover assembly outside the absorbent core area is made of another web material, which provides

comfort and breathability. One example of a pant absorbent article of this type is shown in WO2005/122984, in which a part of the outer cover assembly covering the front and back portions comprises an elastic web material in the form of an elastic laminate.

As mentioned above, a major part of the front and back portions 150 and 160 may alternatively be made of an inelastic material and elasticized side panels may be provided in the sides of the absorbent article in the area bridging the front and back portions.

In connection with the above, it should be noted that the body elastic and one or more elastic layers as disclosed above may be provided together. In such cases, where the body elastic is configured to be under tension once the tension has been released from the elastic layer or elastic layers, the elastic layer will tend to wrinkle as the tension is further released from the body elastic. If the film on which the graphic or graphics is provided, even if elastic, would otherwise tend to suffer from this phenomenon, the body elastic should preferably be deactivated in the manner described above in the region of the graphic, in order to avoid the wrinkling degrading the clarity of the graphic.

The same is true with regard to the presence of body elastic threads integrated with nonwoven layer 50 or intermediate layer 60, or when either or both of these layers themselves are elastic.

Exemplary mode of manufacture

Figure 5 shows an exemplary mode of manufacture of an embodiment of the present invention.

In Figure 5, a web of film 80 having graphics 90 previously provided to it travels from left to right. Simultenously, a web of intermediate material 60 is directed from above the web of film 80, via a cutter C which forms openings 70 by cutting out blanks 75, to overlay web of film 80 such that the graphics 90 are aligned with openings 70. Webs of film 80 and intermediate material 60 then travel in synchrony further to the right, where a further web of nonwoven material 50 is directed from above the laminated layers 80

and 60 to overlay the laminate. The three webs, respectively of film 80, intermediate material 60 and nonwoven material 50 then travel in synchrony further to the right, where portions 220 and 230 of the laminate are removed to define waistband and crotch regions, and thereby eventually leg holes.

The above process can be adapted, as will be evident to one skilled in the art, to provide any of the foregoing embodiments of the invention. Of course, the foregoing embodiments are provided as being purely exemplary, and it will be within the capability of those skilled in the art to put the teaching of the present disclosure into practice with suitable adaptions, having regard to specific product requirements, availability of materials, and local preferred practices. All such modifications, provided within scope of the appended claims, are considered to form part of the present invention.

Claims

1. An outer cover assembly (20) for a disposable absorbent article, said outer cover assembly (20) extending in a longitudinal direction (Y) and a transverse direction (X) and having a thickness direction (Z) extending perpendicular to the longitudinal direction (X) and the transverse direction (Y), said outer cover assembly (20) comprising at least a first, nonwoven layer (50), a second, intermediate layer (60) and an inner, liquid-impermeable film layer (80) layered in this order in the thickness direction (Z), said inner, liquid-impermeable film layer (80) being provided on its side facing the second, intermediate layer (60) with at least one graphic (90), said graphic (90) having an extension in the longitudinal direction (Y) and the transverse direction (X), characterized in that either the first, nonwoven layer (50) or the second, intermediate layer (60) is provided with at least one opening (70) extending in the area of the graphic (90) in the longitudinal direction (Y) and the transverse direction (X) and over at least a part of the graphic (90) and that the other layer of the first, nonwoven layer and the second, intermediate layer without the opening has an optical transmittance at least in the area covering the at least part of the graphic such that the at least part of the graphic is visible through the other layer.

2. An outer cover assembly (20) according to claim 1, characterized in that the second, intermediate layer (60) comprises a nonwoven material.

3. An outer cover assembly (20) according to claim 1 or 2, characterized in that the first, nonwoven layer or the second, intermediate layer, when it is the other layer without the opening (70), has a basis weight of 5 to 40 g/m2, preferably 8 to 30 g/m2.

4. An outer cover assembly (20) according to any one of the preceding claims, characterized in that the opening (70) extends in the longitudinal direction (Y) and the transverse direction (X) over the entirety of the graphic (90).

5. An outer cover assembly (20) according to any one of the

preceding claims, characterized in that: said outer cover assembly (20) further comprises a body elastic (190), said body elastic (190) being applied between the first, nonwoven layer (50) and the second, intermediate layer (60), or being integrated into one of the first, nonwoven layer (50) and the second, intermediate layer, such that the outer cover assembly (20) is elasticated; and said body elastic (190) is configured in the region of the opening (70) so as not to cause the region of the inner layer (80) provided with the graphic (90) to become wrinkled.

6. An outer cover assembly (20) according to any one of the preceding claims 1 to 4, characterized in that the inner, liquid-impermeable film layer (80) comprises an elastic film material (82), such that the outer cover assembly (20) is elasticated.

7. An outer cover assembly (20) according to any one of the preceding claims, characterized in that the first, nonwoven layer and the second, intermediate layer (50, 60) are continuous layers and the opening (70) is formed by a removed portion of material (75) of the layer provided with the opening (70).

8. An outer cover assembly (20) according to any one of the preceding claims 1 to 6, characterized in that the first, nonwoven layer or the second, intermediate layer, when provided with the opening (70), comprises at least a first piece of material (110) and a second piece of material (120), wherein the first piece of material (110) is arranged relative to the second piece of material (120) such as to define at least a portion of the opening (70) therebetween.

9. A disposable absorbent article (10), such as a diaper, incontinence pant or sanitary napkin, comprising an outer cover assembly (20) according to any one of the preceding claims, characterized in that said article (10) has an inner surface (12) facing the user during use, an outer surface (13) facing away from the user during use, said article (10) further comprising a topsheet (30), which may form the inner surface, the outer cover assembly forming the outer surface, and optionally an absorbent core (40) disposed between the topsheet and the outer cover assembly.

10. A disposable absorbent article (10), according to claim 9, characterized in that the inner, liquid-impermeable film layer (80) is arranged closer to the absorbent core (40) in the thickness direction (Z) than the at least first, nonwoven layer (50) and second, intermediate layer (60).

11. A disposable absorbent article (10) according to claim 9 or 10, characterized in that the article (10) further comprises, as seen in the longitudinal direction (Y), a front portion (150), a rear portion (160) and an intermediate crotch portion (170) provided with two leg openings (220, 230), the crotch portion (170) extending between the front portion (150) and the rear portion (160) in the longitudinal direction (Y) of the article (10) and being joined to the front portion and the rear portion, wherein the outer longitudinal edge portions of the front portion (150) are connected by longitudinal side seams (180, 180') to the outer longitudinal edge portions of the rear portion (160).

12. A disposable absorbent article according to any one of claims 9, 10 or 11, or an outer cover assembly according to any one of claims 1 to 8, characterized in that either the first, nonwoven layer (50) or the second, intermediate layer (60) is further provided with a further graphic and a further opening extending in the area of the further graphic in the longitudinal direction (Y) and the transverse direction (X) and over at least a part of the further graphic and that the other layer of the first, nonwoven layer and the second, intermediate layer without the further opening has an optical transmittance at least in the area covering the at least part of the further graphic such that the at least part of the further graphic is visible through the other layer.

13. A disposable absorbent article according to claim 12, characterized in that the further graphic and the further opening are positioned so as to be on the same one of a front surface or a rear surface of the article, when worn.

14. A disposable absorbent article according to claim 12, characterized in that the further graphic and the further opening are positioned so as to be on different ones of a front surface or a

rear surface of the article, when worn.

15. A disposable absorbent article according to any one of claims 9 to 14, characterized in that: a further nonwoven layer (55) is positioned between the second, intermediate layer (60) and the first, nonwoven layer (50) to cover the at least part of the graphic; and at least one of the first, nonwoven layer (50) and the further nonwoven layer (55) does not extend to cover the intermediate crotch portion (170) of the article.

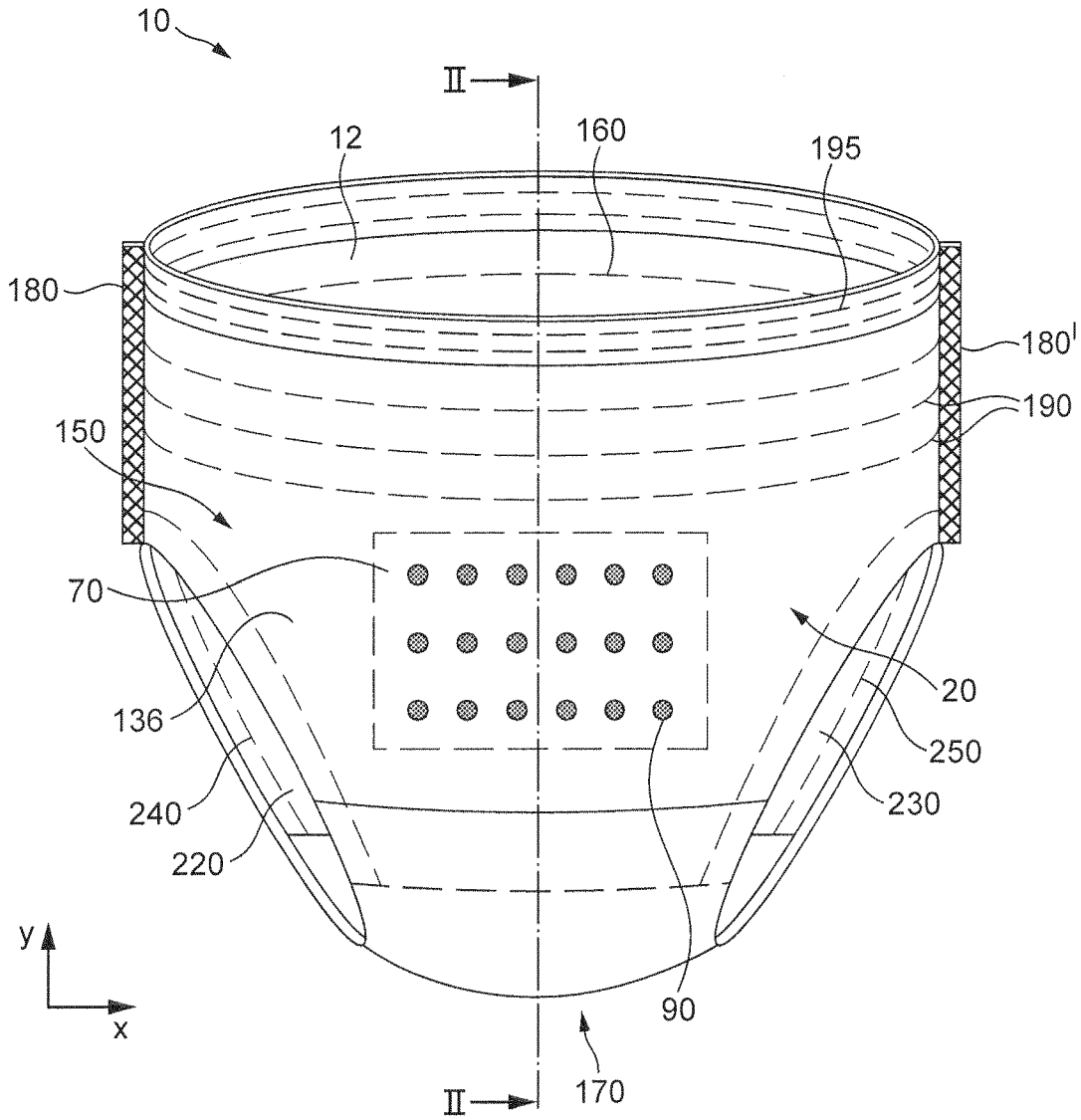
10
II
12
160
195
180
180'
190
150
70
20
136
250
240
230
220
y
x
90
170
II

FIG. 1a

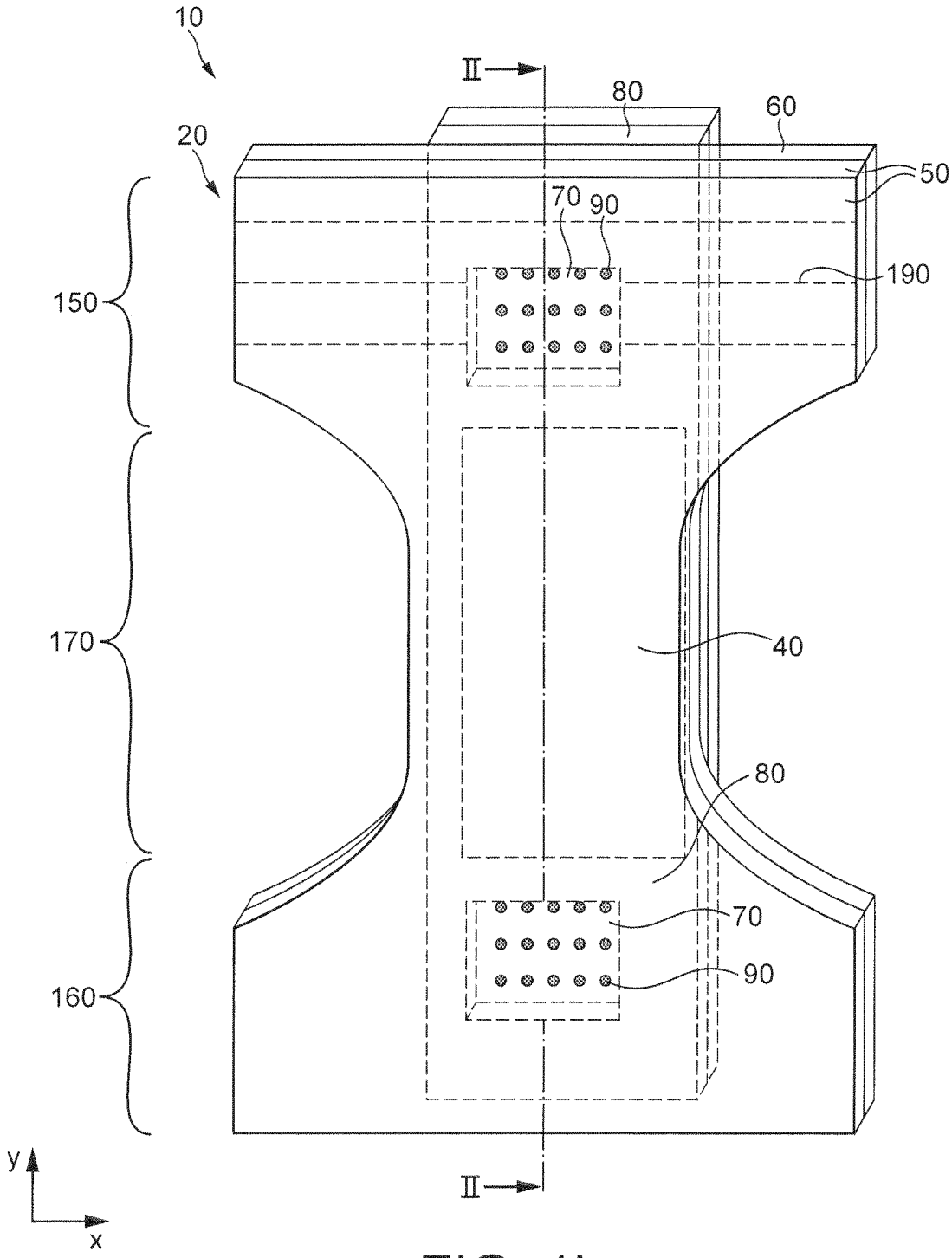

FIG. 1b

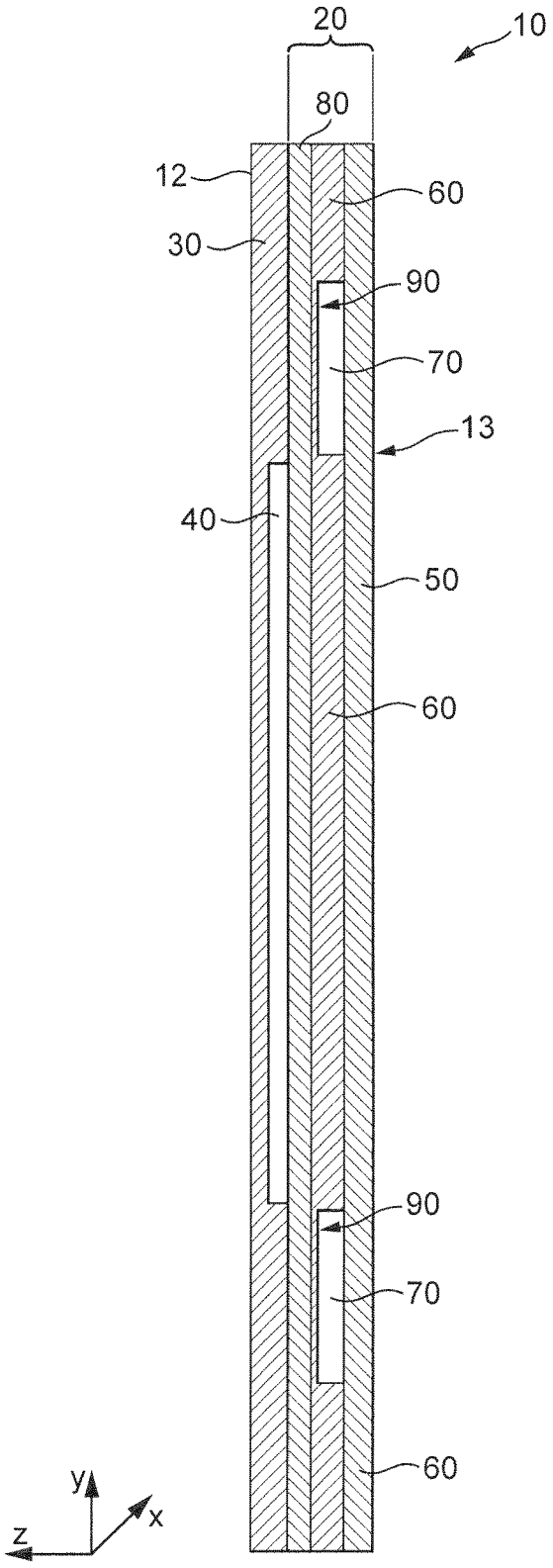

FIG. 1c

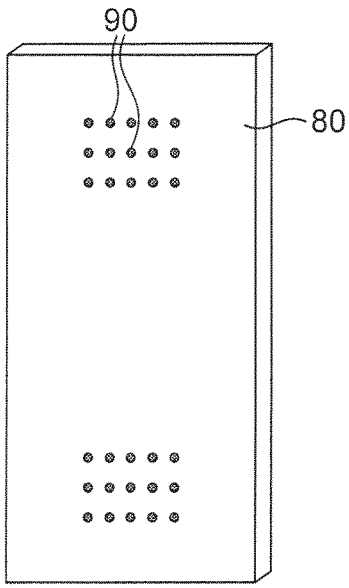

FIG. 2a

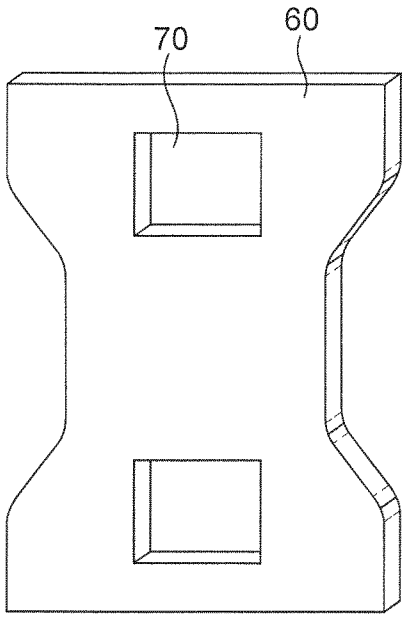

FIG. 2b

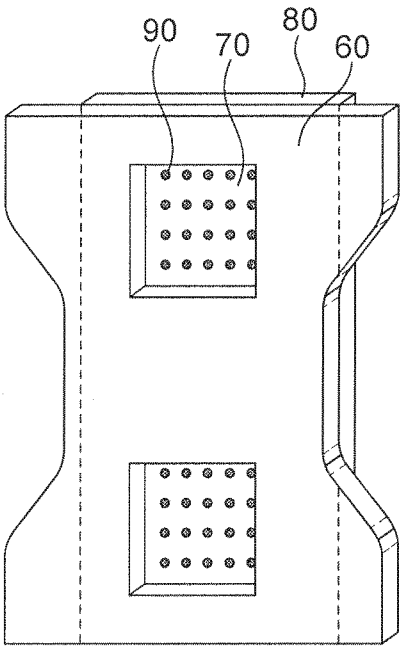

FIG. 2c

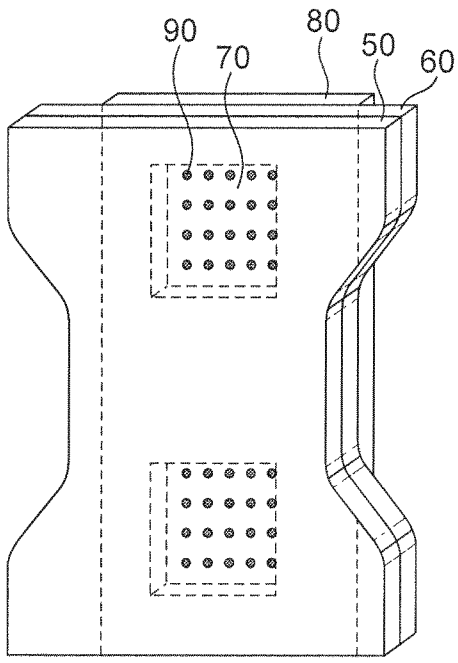

FIG. 2d

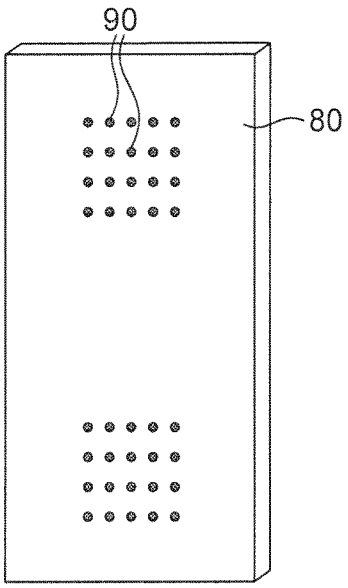

FIG. 3a

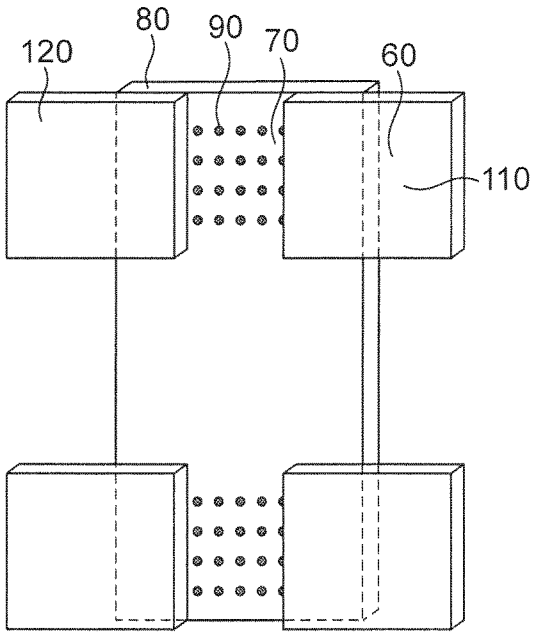

FIG. 3b

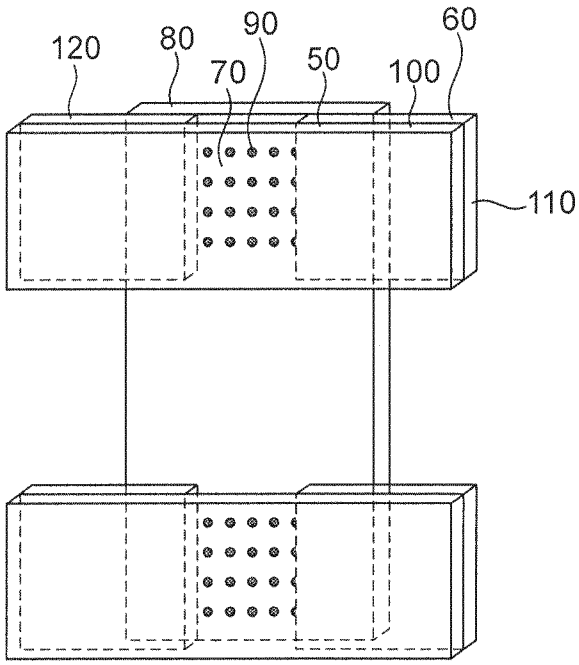

FIG. 3c

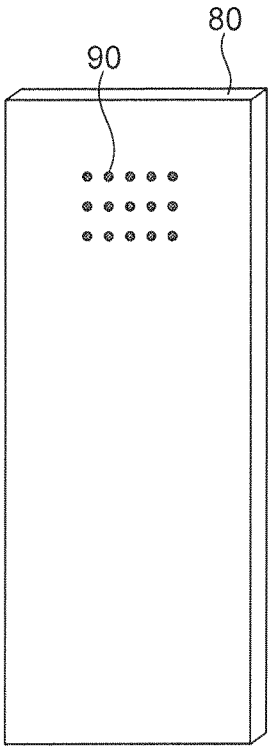

FIG. 4a

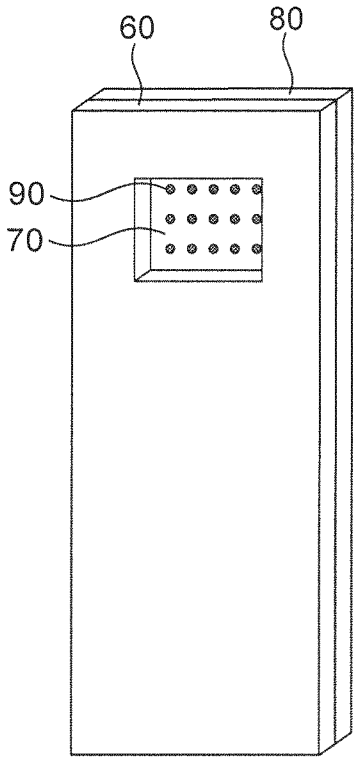

FIG. 4b

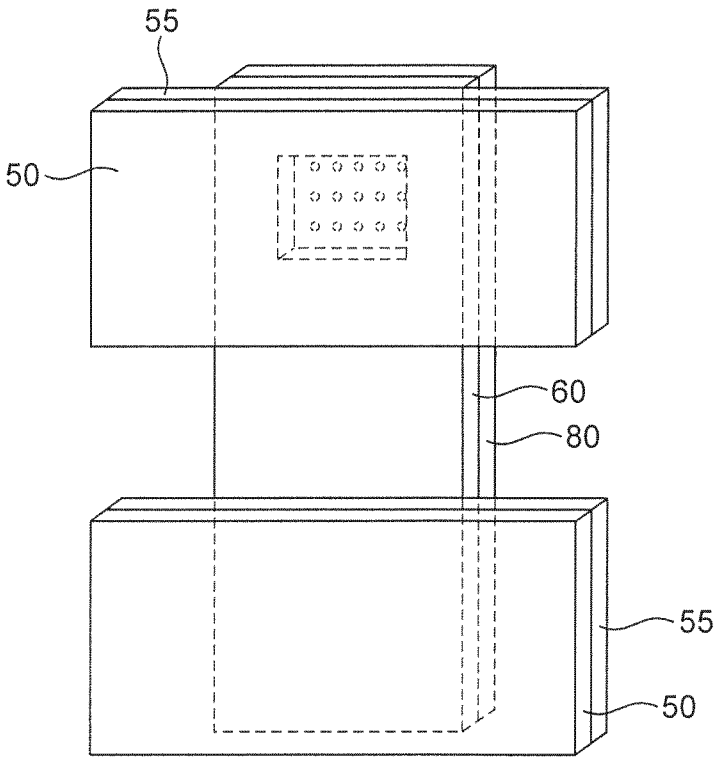

FIG. 4c

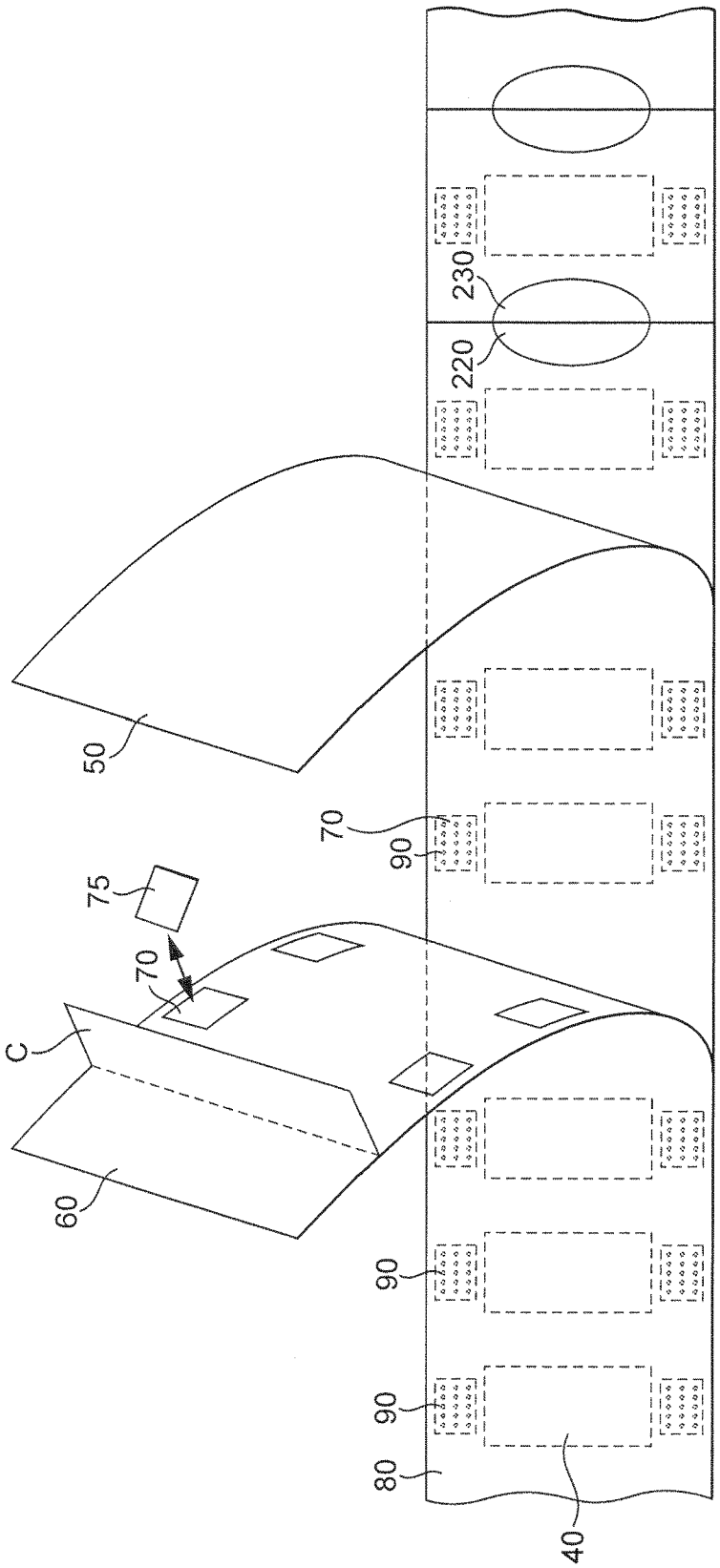

FIG. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2012/058526

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61F13/514
ADD.

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)
A61F

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1 287 799 A2 (UNI CHARM CORP [JP]) 5 March 2003 (2003-03-05) paragraphs [0016] - [0023]; figures -----	1-15
A	EP 1 738 729 A1 (PROCTER & GAMBLE [US]) 3 January 2007 (2007-01-03) claims; figures -----	1-15
A	EP 0 900 571 A2 (MCNEIL PPC INC [US]) 10 March 1999 (1999-03-10) paragraph [0013] - paragraph [0035]; figures -----	1-15

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"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
25 July 2012	13/08/2012

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Boccignone, Magda

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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