Novel process for preparing an absorbent article

The present invention is directed to a novel process for preparing an absorbent article, wherein the process comprises providing a first sheet layer (2); conforming said first layer on a first roll C2, whereby longitudinal corrugations are formed on the layer; conforming said corrugated layer (2) on a second roll C3, whereby a pattern of pockets (4, 4a) is obtained; providing a pre-metered amount of SAP particulate material (6) into said pockets; providing a second sheet layer (7) material and affixing it for sandwiching with the first sheet layer; and finishing the absorbent article.
The present invention is directed to a novel process for preparing an absorbent article. More specifically, the present invention is directed to a process for filling super absorbent polymer into recesses formed on a supporting, travelling layer.

BACKGROUND OF THE INVENTION

Absorbent articles are known and commonly used in personal care absorbent products such as diapers, training pants, sanitary napkins, incontinence garments, bandages and the like. The invention also relates to a process for making said article.

Nowadays, the absorbing element in the article is comprised of high absorbency materials such as superabsorbents (Super Absorbent Polymers --SAP--), which form the diaper's absorbent core.

While the SAP has many advantages, it is also difficult to dose, given the fact that SAP is available as a powder. The problem is not acute for uniform layers dispensing devices, but becomes very relevant when SAP patterns are required.

EP-A-1621166 discloses a process for producing absorbent core structures, comprising the steps of:

- providing a carrier material;
- providing a support for said carrier material, the support having a support pattern;
- providing a carrier material holding means (especially vacuum applying means);
- positioning said carrier over said support means, whereby said carrier contacts said support;
- providing a pre-metered amount of SAP particulate material;
- providing a cover material for sandwiching with the carrier; and wherein
- said carrier material is supported only in the region of the support pattern of the support means;
- said carrier material is deformed by said carrier holding means such that indentations are formed in the unsupported regions;
- said SAP particulate material being transferred to said carrier material into said indentations thereby forming a primary pattern of particulate material.

EP-A-1621167, a companion application of the above EP-A-1621166, discloses a process for producing absorbent core structures, comprising substantially the same steps, and wherein the process comprises the steps of:

- providing a SAP particulate material;
- providing a transfer device for receiving said SAP particulate material in a receiving region and transferring it to an discharging region;
- said transfer device comprising a first pattern forming means.

In the above processes, the pattern is formed by the indentations formed in the unsupported regions. This provides for a poor uniformity, and the depth of the clusters formed by the indentations is rather limited. Also, the entire pattern is formed during one operation. The dispensing of the SAP particulate material makes use of a feeding hopper, this being derived from the helio-cylindrical printing system. The volume of the delivered SAP cannot be changed, while the SAP particulate material can vary because of different suppliers. Any change requires a change in the engraving of the dispensing roll. Further, high speeds are not possible with such systems. Last, in order to have a dosing that is reliable, it is necessary to compact the SAP in the discharging regions, which does not facilitate the complete release into the clusters and provides for attrition and shearing forces applied by the hopper to the SAP, which is a fragile material and subject then to degradation.

The above techniques thus still do not completely solve the problems of the distribution of SAP in cavities formed in the absorbent article.

Consequently, there is a need for an improved process for forming liquid-absorbing article containing SAP where the SAP is distributed according to a given pattern, and where the SAP is delivered in a fast and reliable manner.

SUMMARY OF THE INVENTION

The invention thus provides a process for manufacturing an absorbent article (1), said article comprising:

- a first sheet layer (2) presenting an array of absorbent receiving pockets (4, 4a);
- masses (6) of superabsorbent material, which masses are placed in said absorbent receiving pockets (4, 4a);
- a second sheet layer (7) placed on top of the first layer; said process comprising the steps of
  - providing a first sheet layer (2);
  - conforming said first layer on a first roll C2, whereby longitudinal corrugations are formed on the layer;
  - conforming said corrugated layer (2) on a second roll C3, whereby a pattern of pockets (4, 4a) is obtained;
  - providing a pre-metered amount of SAP particulate material (6);
  - providing a second sheet layer (7) material and affixing it for sandwiching with the first sheet layer;
  - finishing the absorbent article.

According to one embodiment, the step of con-
forming on a first roll C2 is obtained by friction of the sheet layer (2) on the corresponding corrugated surface of said roll C2.

[0012] According to one embodiment, the process further comprises the step of unstrressing the sheet between rolls C2 and C3.

[0013] According to one embodiment, the process further comprises the step of pinching the sheet between roll C2 and counter roll CC2, where the roll C2 and counter roll CC2 have grooves (71 a, 71 b, 71 c, 71 d) and ribs (81 a, 81 b, 81 c, 81 d) cooperating with each other.

[0014] According to one embodiment, the step of forming the pockets comprises holding the layer (2) and/or (7) into the second roll C3 by applying vacuum.

[0015] According to one embodiment, the second roll C3 comprises recesses (91 a, 91 b, 91 c) corresponding to the array of absorbent receiving pockets (4, 4a).

[0016] According to one embodiment, said pre-metered amount of SAP material is delivered from a delivering unit placed above roll C3, whereby the pre-metered amount of SAP is filled in a pattern of pockets.

[0017] According to one embodiment, the process further comprises the step of:

- providing bonding beads (5), preferably adhesive beads, between the pockets.

[0018] According to one embodiment, the process further comprises the step of:

- providing adhesive layers (3) and/or (8) between the first and second layers, whereby said layers are bonded.

[0019] According to one embodiment, the process further comprises the step of:

- calendering into the absorbent article (1).

[0020] According to one embodiment, the sheet layer (2) and/or (7) is/are non-woven.

[0021] According to one embodiment, the sheet layer (2) is impervious to liquids and the sheet layer (7) allows penetration of liquids into the masses of superabsorbent material.

[0022] The process is especially suited for manufacturing a diaper, training pant, sanitary napkin, incontinence garment or bandage comprising manufacturing an absorbent article according to any one of the preceding claims, and converting said article into said diaper, training pant, sanitary napkin, incontinence garment or bandage.

[0023] The invention thus allows the formation of arrays of pockets at two distinct locations in the process. Unlike the prior art recited above, the respective walls of the pockets are formed in two separate steps in the process. This allows a better shaping of the pockets, and control of their geometry. Also, pockets of large dimensions, including pockets with large depths can be easily manufactured.

**BRIEF DESCRIPTION OF THE FIGURES**

[0024]

Figure 1 represents the formation of the absorbent article of the invention. Figure 2 represents a schematic illustration of the top view of an absorbent article according to the invention. Figure 3 represents an overall view of the process of the invention for the manufacture of the article. Figure 4 represents the bottom layer supply step. Figure 5 represents the adhesive layer (3) distribution step. Figure 6 represents the forming of the sheet layer (2) onto roll C2. Figure 7 represents an enlarged view of roll C2. Figure 8 represents the beads deposition step. Figures 9a and 9b represent the roll C3 for two different embodiments of the invention. Figures 9c and 9 represent the respective discs, corresponding to fig.9a and 9b. Figure 10 represents the SAP distribution step and the calendering step, as well as the optional ADL deposition step. Figure 11 represents the finishing step. Figure 12 represents a perspective view of roll C2 and counter roll CC2.

**DESCRIPTION OF EMBODIMENTS OF THE INVENTION**

[0025] The invention is now disclosed in more details below, in a non-limiting manner.

[0026] Reference is made to figure 1 which discloses the formation of the absorbent article of the invention according to one embodiment.

[0027] In an initial step, a first sheet layer (2) is provided. This first layer will serve as the bottom layer. It may be impervious to liquids, but this is not necessary in case of the presence of an impervious backsheet in the diaper for example.

[0028] This layer then receives a layer of adhesive (3). This adhesive is typically a hot-melt, as will be disclosed in more details below. The adhesive may be present on the entire surface or only at the vicinity of the sealed area. It is preferred that the adhesive be present on the entire surface (in a continuous or discontinuous manner). With this embodiment, the adhesive will receive the SAP and will adhere to it so that most of the SAP will be caused to adhere to the surface of the sheet layer. This will improve the SAP position and further prevent SAP from slipping within the disposable diaper.

[0029] The sheet layer (2) with the adhesive layer (3) is then formed into the desired shape. Different tech-
Adhesive beads (5) (also known as adhesive ropes) are then applied at a location between the pockets (4, 4a) previously formed, as illustrated in Fig. 2, which is a top view of an absorbent core with pockets in rectangular shape and beads in the machine direction (MD) and transverse direction (TD). Standard techniques are used.

The steps for manufacturing the article of the invention and the various elements thereof are disclosed in more details below.

Thus a longitudinal pocket is possible; in this case the pocket will be elongated, e.g. from 10-80mmx100-400mm.

The SAP is then placed in the thus-formed pockets, using an appropriate dosing device, as will be disclosed in more details below.

The second sheet layer (7) receives first an adhesive layer (8). The second sheet layer is typically water-permeable so as to allow the fluids to penetrate through and reach the SAP. This second sheet will typically serve as the top layer. The adhesive layer will not be complete or will be porous, so as to allow transfer of fluid through the sheet layer. The adhesive layer (8) is optional and may be omitted.

The second sheet layer (7) with the adhesive layer (8) is then affixed onto the first sheet layer (2) with the pockets (4, 4a) containing the SAP (6) and bearing the beads (5). This is done in an area (9) in the vicinity of the beads (5).

Calendering is then performed on the sandwich thus formed, ensuring the bonding of the two sheet layers.
The adhesives used in the invention are known in forming the pockets and filling in the SAP, as will have a porosity to air that will be controlled. This will assist migration within the thickness of the sheet layer esp. the beads also ensure a draining function. The liquid can ensure geometrical stability of the absorbent article. The liquid can be present in the machine direction (MD), transverse direction (TD) or both. The beads ensure a porosity to air that will be controlled. This will assist migration within the thickness of the sheet layer esp. the beads also ensure a draining function. The liquid can provide a paving function to air that will be controlled. This will assist migration within the thickness of the sheet layer esp. the beads also ensure a draining function. The liquid can ensure geometrical stability of the absorbent article. The liquid can be present in the machine direction (MD), transverse direction (TD) or both. 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An hot-melt may have the following composition: 15 to 40% thermoplastic polymer, 30 to 60% tackifying resin, 30% or lower of other constituents: plasticizing oil, anti-oxidation agents, additives etc.

(c). Paraffins and waxes, which can make up from 0 to 20% of the formulation. They play a role in providing barrier, rigidity and hot melt hardness properties.

(d). Plasticizers such as oils which can make up some 0 to 30% of the formulation. They control hot melt flexibility and viscosity.

(e). Anti-oxidants which may make up from 0.2 to 2% of the formulation. They stabilize the components when hot and when cold.

(f). Fillers which may make up part of the formulation when particular properties are desired such as UV-resistance (oxidation resistance), flame proofing, anti-allergy properties, rheology modification, etc.

An hot-melt may have the following composition: 15 to 40% thermoplastic polymer, 30 to 60% tackifying resin, 30% or lower of other constituents: plasticizing oil, anti-oxidation agents, additives etc.

An adhesive may also be used with the SAP. This may assist in reducing the SAP movements. This can be, as disclosed above an HMA, HMPSA. It may also be water based (WB), and for example it can be a WBPSA. The adhesive used together with the SAP can be hydrosoluble. This adhesive can be deposited at the same time the SAP is placed in the formed pockets. This embodiment will allow a tighter holding of the particles or grains of SAP, which is beneficial for the process and/or design.

With reference to figure 3, an overall view of the process is provided. In figure 3 are represented the rolls C1, C2, C3, C4, C5 and C6, and associated slider rolls for rolls C1, C3 and C6. Nip points A, B, C D and E, corresponding respectively to the nip between rolls C1 and slider roll, C3 and C4, C3 and slider roll, C3 and C5, and C6 and slider roll are also shown in figure 2. Are also represented sheets (2) and (7) when supplied from appropriate sources. Each sub-step of figure 1 can also be found in a corresponding manner in figure 3. Each step will then be disclosed in a more detailed manner below. One will understand that the optional steps in figure 1 are similarly optional in figure 3.

With reference to figure 4, the initial bottom layer supply step is disclosed. Sheet layer (2) is unrolled under mild tension up to a nip point #A between roll C1 and associated slider roll. Roll C1 is preferably smooth and comprises for example a rubber sheath (or sleeve).

With reference to figure 5, the sheet layer (2) (bottom layer) will receive an adhesive layer (3). This adhesive can be HMPSA and is represented by the deposition of glue G1. This takes place while the bottom layer is on roll C1, after nip point A. This adhesive will serve the purpose of retaining as much as possible the SAP that will be distributed in the pockets at point #B (see below). The adhesive coating is performed using standard techniques, as indicated above. The surface weight of the adhesive layer (3) is standard in the art. In one embodiment, the adhesive is deposited as a foamed product. A foamed product will offer, for a given thickness, savings in adhesive amount, a higher tackiness, a lower cohesion (entrapping of SAP), and a lower flow (SAP particles coating should be avoided since their specific surface is one driving factor for the liquid absorption).

With reference to figure 6, the sheet layer (2) (bottom layer) is formed onto a roll C2 so as to impart the lengthwise profile of the pockets. Roll C1 has a rotating speed which is higher than the rotating speed of roll C3. The difference in rotating speed allows material to be present for forming the vertical walls of the pockets. Roll C2 will have a rotating speed slightly above the speed of roll C1 so as to generate a tension necessary for the forming. The friction being higher in the upper part of roll C2 will also ensure tensioning the bottom layer during deposition of the adhesive beads (below). Roll C2 can receive a non-skid coating.

In figure 7, the roll C2 has grooves 71 a, 71 b, 71 c, 71 d. Each groove has a valley, represented here with a square shape, but tapered valleys are possible, and the angles can be smoothed if desired. Is represented valley 72a corresponding to groove 71 a. A corresponding peak 73a is represented, between two adjacent valleys. The web that is obtained after roll C2 hence exhibits ribs or corrugations. The web will match the groove due to the difference in friction between the top and the bottom of the grooves and the difference in winding speeds. The difference in winding speeds between the different rolls allows material to match the inner of the grooves. Roll C3 has the lowest winding speed, then roll C1 has an intermediate winding speed and finally roll C2 is the roll having the greatest winding speed among the three. The width of the web is reduced due to the formation of ribs/corrugations in the grooves; the difference in rotating speeds provides for a relaxation of the web tension and allows for such formation. The sheet layer (2) (with the adhesives (3) and/or (5)) is unstressed between rolls C2 and C3, where roll C3 has a rotating speed below the one of roll C2, as previously indicated. The difference in rotating speeds between rolls C2 and C3 is dictated by the amount (or length) of sheet layer that is necessary to form the other part of the vertical walls of the pockets. The two nip points #A and #D (calendering, see below, nip point #D is not represented on fig.6) will act as fixed
points to impart the geometry to the sheet between the two nip points.

[0071] Roll C2 can be obtained by stacking discs of varying thicknesses and diameters (corresponding to width and depth of the pockets). This allows changing rapidly the geometry of the article without the need to revert to a complete change of set of rolls.

[0072] With reference to figure 8, the beads deposition is disclosed. Lenghwise beads are deposited using standard techniques. Because roll C2 has an adapted speed, the tension on the outer surface is suited for receiving the adhesive beads. The beads may not need to be necessarily linear, or continuous. They can be in the form of zigzags, and can be as dots. Beads deposition takes place on the sheet at locations corresponding to, or close to, the peaks 73a.

[0073] An alternative embodiment is one where the adhesive beads are replaced by another bonding process. As bonding process, one can use the heat-sealing, the adhesive beads are replaced by another bonding process. Because roll C2 has an adapted speed, the tension on the outer surface is suited for receiving the adhesive beads. The beads may not need to be necessarily linear, or continuous. They can be in the form of zigzags, and can be as dots. Beads deposition takes place on the sheet at locations corresponding to, or close to, the peaks 73a.

[0074] With reference to figure 6 (see above), the pockets formation is disclosed, where the pockets are formed mainly by roll C3. In a manner similar to the forming according to MD (Machine Direction), the forming of the pockets in the TD (Transverse Direction) is carried out using a roll C3 formed from stacking discs with selected geometry, forming a matrix.

[0075] With reference to figure 9a, a roll C3 is disclosed which is a matrix. The bottom part of the recesses (91 a, 91 b, 91 c) in the roll C3 is equipped with holes, allowing applying a vacuum. Applying a vacuum will serve attracting the sheet layer so as to conform it to the shape of the matrix, to define the pockets. The air porosity (Gurley porosity) of the bottom layer non-woven will be adapted such that the vacuum applied in the central part of the roll C3 is sufficient to press the sheet against the roll by suction. The applied vacuum will also serve when the SAP is distributed into the pockets thus formed (see below). The applied vacuum can be obtained with an inner drum or mandrel inserted into the roll, which can be segmented so as to apply vacuum only to those part of the roll in need thereof. The sector with the vacuum can thus represent between 30° and 180°, preferably between 60° and 120°.

[0076] A vacuum sector can be of the type disclosed in the prior art documents mentioned above, see EP-A-1621166 and EP-A-1621167. Roll C3 can be varied in dependence on the desired shape or geometry of the pockets.

[0077] Fig 9b represents a roll C3 with elongated shapes, rather than matrix shapes.

[0078] The roll C3 can be obtained in a manner similar to roll C2, i.e. by using discs that are stacked on an axis. Fig. 9c and 9d represent the respective discs, corresponding to fig. 9a and 9b.

[0079] With reference to figure 10, is disclosed the distribution of the SAP. SAP is distributed from roll C4, which is counter-rotating with respect to roll C3. Rotating speeds of rolls C3 and C4 are adapted one to the other. The two rolls are usually not in contact, a small gap existing between the two, so as to adapt for varying thicknesses for the bottom layer (2). One possible technique for dispensing SAP is the one disclosed in document US7744713, incorporated herein by reference. Vacuum being applied in the forming roll, this will also assist the SAP to be kept in place (with the Gurley porosity of the bottom layer being adapted to let the vacuum have an effect on holding in place the SAP).

[0080] With reference to figure 10 is also disclosed the bringing into contact of the top layer (sheet layer (7)). The top layer is displayed facing the bottom layer at a nip point #C, before calendering. Point #C is preferably as close as possible to nip point #B, so as to avoid poluting adhesive parts (if any) with the powdery SAP. The top layer (7) is brought under tension on the top of the pockets formed before and is tensioned by passing over a slender roll (which may have a banana shape). Tension is preferably applied to as to minimize the effect of the vacuum on the top layer to be applied (tension will avoid waves that could otherwise form due to the vacuum). The slender roll may also comprise rigs, so as to form a top layer with pleats within the thickness (to provide for further expansion).

[0081] With reference to figure 10, is also disclosed the calendering step. A pressure is applied between rolls C3 and C5 to proceed with the fixing of the top layer onto the bottom layer, whereby closed pockets (4a) are formed.

[0082] Is also represented as a further, optional, embodiment, the providing of the acquisition distribution layer ADL (11). This layer is supplied at nip point #C so as to be formed into a sandwich at that point. This ADL will preferably receive adhesives on both faces, but can also be fixed using any of the bonding system discussed above.

[0083] With reference to figure 11, is disclosed the finishing step. The compacting is carried out during winding under tension of the finished product. A pressing roll C6 is used to impart pressure at point #E during winding.

[0084] Two optional steps can be present (not shown).

[0085] The first optional step is the coating of the top layer (7) with an adhesive layer (8). Coating is an open coat, spiral-spray coating, multi lines, pattern coating, and the like. Coating methods are well known to the skilled man.

[0086] The second optional step is the spraying of adhesive for holding and/or agglomerating the particles of SAP. This spraying can be performed with an airless technique (low pressure) or air-mix. This would be applied onto the SAP particles once deposited into the pockets, substantially immediately after the SAP has been distributed from roll C4 (and before the top layer is af-
While the above disclosure has been given with the bottom layer receiving the SAP, it is possible, albeit less preferred, to invert the two sheet layers in the apparatus described above.

When beads are present in both the MD and TD, the process disclosed above can be amended as follows. A high-speed nozzle can be arranged at the vicinity of roll C5, where the nozzle is able to deposit a band of adhesive of small width, according to the sequence of the manufacturing, usually driven by the forming roll C3. A plurality of nozzles may be needed.

Alternatively, a process known as offline process can be used. In such a situation, the bottom part of the cores are manufactured off-line (i.e. until roll C3 and C4, but before roll C5 (calendering), and then brought onto the final manufacturing line in a perpendicular manner (the final manufacturing line being the line where the absorbent article or core is inserted into a diaper for example). Beads are applied and then the top layer is applied. Calendering and cutting is then performed.

The process can be reversed, where the top layer and the bottom layers are swapped. It is also possible that pockets be formed in both layers; in such a case there will be two forming devices on the line.

A further embodiment is disclosed below, where the respective sheets are inverted. As mentioned above, the process can be reversed, where the top layer and the bottom layers are swapped.

In this embodiment depicted at figure 12, the forming of the corrugations is assisted with a counter-roll placed on top of roll C2. The counter roll CC2 and the roll C2 can be matched through a proper driving device. Said device can be gears, or a belt (notched or not). Alternatively, the matching can be simply obtained by friction, roll CC2 being free on its axis.

This embodiment is used to further form the corrugations, by pinching the sheet between two facing, corresponding, surfaces of cooperating rolls. This is represented on figure 12, where C2 and CC2 are represented according to a cross-section (along the longitudinal axis). As can be seen, roll CC2 comprises ribs 81 a, 81 b, 81 c, 81 d cooperating with the grooves 71 a, 71 b, 71 c, 71 d (only valley 72a and peak 73a are represented) of roll C2.

For this embodiment, the sheet 7 is the one that is formed on rolls C2 and CC2. Sheet 7 does not receive any adhesive coat in this situation, which enables the two rolls C2 and CC2 to interact and pinch the sheet 7. The pockets will then be formed on this sheet 7 rather on the sheet 2 as in the previous embodiment. For this, the sheet 2 will receive the adhesive layer (3) and the beads (5), notably at the stage of roll C5 for example.

Apart from the inversion (and associated steps for the adhesive deposition) and the additional steps for the counter roll CC2, the process is performed in substantially the same way.

The absorbent article or absorbent core of the invention can be used in a variety of products. It may be associated with a layer of fluff or cellulose layer, an acquisition/distribution layer, or both; it can also be used stacked one over the other in 2 or more layers, where the patterns of pockets may be aligned or offset, and the like, creating 3D draining network. The absorbent article or core of the invention can generally speaking be used as part of personal care products, especially diapers.

Claims

1. A process for manufacturing an absorbent article (1), said article comprising:
   - a first sheet layer (2) presenting an array of absorbent receiving pockets (4, 4a);
   - masses (6) of superabsorbent material, which masses are placed in said absorbent receiving pockets (4, 4a);
   - a second sheet layer (7) placed on top of the first layer; said process comprising the steps of
     - providing a first sheet layer (2);
     - conforming said first layer on a first roll C2, whereby longitudinal corrugations are formed on the layer;
     - conforming said corrugated layer (2) on a second roll C3, whereby a pattern of pockets (4, 4a) is obtained;
     - providing a pre-metered amount of SAP particulate material (6);
     - providing a second sheet layer (7) material and affixing it for sandwiching with the first sheet layer;
     - finishing the absorbent article.

2. The process of claim 1, wherein the step of conforming on a first roll C2 is obtained by friction of the sheet layer (2) on the corresponding corrugated surface of said roll C2.

3. The process of claim 1 or 2, further comprising the step of unstressing the sheet between rolls C2 and C3.

4. The process of any one of claims 1 to 3 or 2, further comprising the step of pinching the sheet between roll C2 and counter roll CC2, where the roll C2 and counter roll CC2 have grooves (71 a, 71 b, 71 c, 71 d) and ribs (81 a, 81 b, 81 c, 81 d) cooperating with each other.

5. The process of any one of claims 1 to 4, wherein the step of forming the pockets comprises holding the layer (2) and/or (7) into the second roll C3 by applying vacuum.

6. The process of any one of claims 1 to 5, wherein the
second roll C3 comprises recesses (91 a, 91 b, 91 c) corresponding to the array of absorbent receiving pockets (4, 4a).

7. The process of any one of claims 1 to 6, wherein said pre-metered amount of SAP material is delivered from a delivering unit placed above roll C3, whereby the pre-metered amount of SAP is filled in a pattern of pockets.

8. The process of any one of the preceding claims, further comprising the step of:

   - providing bonding beads (5), preferably adhesive beads, between the pockets.

9. The process of any one of the preceding claims, further comprising the step of:

   - providing adhesive layers (3) and/or (8) between the first and second layers, whereby said layers are bonded.

10. The process of any one of the preceding claims, further comprising the step of:

     - calendering into the absorbent article (1).

11. The process of any one of the preceding claims, wherein the sheet layer (2) and/or (7) is/are non-woven.

12. The process of any one of the preceding claims, wherein the sheet layer (2) is impervious to liquids and the sheet layer (7) allows penetration of liquids into the masses of superabsorbent material.

13. A process for manufacturing a diaper, training pant, sanitary napkin, incontinence garment or bandage comprising manufacturing an absorbent article according to any one of the preceding claims, and converting said article into said diaper, training pant, sanitary napkin, incontinence garment or bandage.
Fig. 1
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