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(54) **Title**: METHOD OF MAKING AN ABSORBENT COMPOSITE AND ABSORBENT ARTICLES EMPLOYING THE SAME

(57) **Abstract**: Disclosed is an absorbent core composite for a disposable absorbent article. The absorbent composite has a first fabric, a body side second fabric, and a plurality of aggregates of superabsorbent particles (SAP) situated between the first fabric second fabric. About each of a plurality of the SAP aggregates, an arrangement of spaced apart bond sites secure the second fabric to the first fabric and form a pocket in which the SAP aggregate is secured between the first fabric and the second fabric. The body side second fabric is a bulky nonwoven including fibers that entangle at least some particles in the SAP aggregate.

METHOD OF MAKING AN ABSORBENT COMPOSITE AND ABSORBENT ARTICLES EMPLOYING THE SAME

BACKGROUND

[001] The present application claims the benefit of United States Provisional Application Serial No. 61/801,620, filed on March 15, 2013 (pending), which disclosure is hereby incorporated by reference for all purposes and made a part of the present disclosure.

[002] The present disclosure relates generally to an absorbent composite (or absorbent core laminate) and a method of making an absorbent composite. The present invention also relates generally to disposable absorbent articles employing absorbent composites and methods of making same. Such disposable absorbent articles include diapers, training pants, adult incontinence products, bodily exudates absorbing products, feminine hygiene products, and other absorbent products (collectively "disposable absorbent articles" or "disposable absorbent products").

[003] Disposable absorbent articles typically employ three basic structural elements: a topsheet that forms the inner surface, a backsheet that forms the outer surface, and an absorbent core that is interposed between the topsheet and the backsheet. The topsheet is designed to allow liquid to pass from outside the absorbent article through the topsheet and into the absorbent core. The topsheet may be made out of a range of liquid and vapor permeable hydrophilic or hydrophobic materials. The permeability of the topsheet can be increased by using surface activation agents ("surfactants"). Surfactants lower the surface energy or the contact angle of the liquid-solid interface and facilitate the liquid's passage through the topsheet.

[004] The backsheet is designed to prevent fluid from passing from the absorbent core through the backsheet and out of the absorbent article. The backsheet may be made out of an impermeable film that extends the full width of the article or a combination of cloth-like material and impermeable film. The backsheet may also have vapor transmission properties ("breathability") that allow vapor to pass through the backsheet without releasing fluid stored in the absorbent core. The backsheet may also be made from a liquid impermeable but vapor transmitable non-woven material such as spunbond, melt-blow, spun-bond ("SMS"); spun-bond, melt-blown, melt-blown, spun-bond ("SMMS"); micro, nano, or splitable fibers; spun melt or spun laced; carded; and the like.

[005] The absorbent core is designed to contain and distribute fluid that passes through the topsheet. A typical absorbent core is made out of a high or super absorbent polymer (SAP) stabilized by an absorbent matrix. SAP is commonly made out of materials such as polyvinyl alcohol, polyacrylates, various grafted starches, and cross-linked sodium polyacrylate. SAP can be in the form of particles, fibers, foams, web, spheres, agglomerates of regular or irregular shapes, and film. The absorbent matrix is typically a de-fiberized wood pulp or similar material. The absorbent matrix is very bulky relative to the topsheet, backsheet, and SAP. Most of a diaper's thickness comes from the absorbent core.

[006] Increasingly, consumers of absorbent articles are demanding thinner absorbent articles. To meet these demands, manufactures are decreasing the thickness of absorbent articles by decreasing the amount of absorbent matrix used in absorbent cores. Although the resulting absorbent cores are thinner, they suffer in performance. As the amount of absorbent matrix is reduced, it is less effective in stabilizing the SAP - preventing the SAP from migrating within the absorbent core. As SAP migrates within the core, the absorbent core loses its effectiveness and no longer has uniform absorbency. For example, SAP that is not contained tends to bunch up in wetted areas and is inefficient for handling subsequent discharges.

[007] Manufacturers have attempted to solve this problem by creating small, individual SAP pockets or by gluing the SAP. These solutions, however, have been largely unsuccessful. The SAP pockets merely limit the migration to movement within the pockets. However, because there is still a movement of the particles, the absorbent core does not exhibit uniform absorbency. Gluing the SAP stabilizes the SAP, but results in an uncomfortably stiff absorbent core and a loss in the SAP's swelling capacity. Applicants have also discovered that may of the methods to contain the SAP can negatively impact SAP and the absorbent core's capacity to receive and distribute intake.

[008] Accordingly, there exists a need for an improved absorbent product that continues the trend of decreasing product thickness, while minimizing product stiffness and otherwise exhibiting excellent absorbency and fluid handling properties. The specification of U.S. Pat. No. 8,148,598, which is commonly assigned and designates at least one common inventor as the present application, describes a prior improvement to the state of the art and serves as background to the present disclosure. The '598 patent document is hereby incorporated by reference, in its entirety, for all purposes and made a part of the present disclosure. The present disclosure may, in one respect, be regarded as continuing and furthering the effort to provide improved absorbent products and methods of manufacturing.

BRIEF SUMMARY

[009] In one aspect, the disclosure provides improved absorbent composites and methods of making the composite. Embodiments are disclosed that focus on the composition or arrangement of components of the absorbent composite. In one embodiment, an absorbent core composite for a disposable absorbent article has a first fabric, a body side second fabric, and a plurality of aggregates of superabsorbent particles (SAP) situated between the first fabric second fabric. About each of a plurality of the SAP aggregates, an arrangement of spaced apart bond sites secure the second fabric to the first fabric and form a pocket in which the SAP aggregate is secured between the first fabric and the second fabric. The body side second fabric is a bulky nonwoven including fibers that entangle at least some particles in the SAP aggregate. In preferred embodiments, a pattern of adhesive may be preapplied on the first fabric (*e.g.*, a pattern having a plurality of intersecting loops defining open regions free of adhesive).

[0010] In another aspect, a method is disclosed for manufacturing an absorbent composite laminate for a disposable absorbent article. The method entails conveying a first fabric into position to receive superabsorbent particles (SAP) and depositing SAP on the first fabric to provide discrete aggregates of SAP. A second fabric of a bulky nonwoven is then conveyed and positioning relative the first fabric such that fibers of the bulky nonwoven entangle particles in a top layer of particles of the SAP aggregate. This secures, at least partly, the SAP aggregate therebetween. The first and second fabric are then bonded at a network of bond sites to form an elongated laminate having a plurality of pockets of SAP aggregate, whereby each pocket is defined by bond sites positioned about a SAP aggregate and securing the second fabric to the first fabric; and conveying the elongated laminate, whereby the bulky nonwoven and pockets inhibit SAP particle migration from said pockets. In preferred embodiments, the bond sites are bond points and/or the bond sites form diamond shaped pockets and a corresponding grid without any direct straight line paths to the side margins.

[0011] A disposable absorbent article is also disclosed having a chassis body defined by a first end margin and a second end margin longitudinally spaced from the first end margin, the end margins partially defining front and back waist regions that are fastenable about a waist of a user. The article further includes a topsheet, a backsheet, and an absorbent composite disposed between the topsheet and backsheet. The absorbent composite includes a first fabric, a second fabric bonded to said first fabric, absorbent particles secured between the first and second fabric. The first fabric is intermittently attached to the second fabric to define

a plurality of pockets situated between the first fabric and the second fabric and containing an aggregate of superabsorbent particles (SAP), wherein discontinuous and spaced apart bond sites secure the first fabric with the second fabric. The second fabric is a bulky nonwoven material positioned on a bodyside of the absorbent composite and over the SAP aggregate such that fibers of the bulky nonwoven entangle superabsorbent particles, wherein the SAP aggregate is free of an absorbent matrix in a middle portion extending from beneath the bulky nonwoven material.

[0012] In another aspect, an absorbent composite is disclosed having a bulky nonwoven substrate, a top fabric bonded with the bulky nonwoven substrate, and a layer of superabsorbent particles (SAP) secured therebetween. Furthermore, hot melt adhesive is interspersed with the SAP to mutually secure the SAP with the bulky nonwoven substrate and top fabric. The top fabric may be tissue material in preferred embodiments.

[0013] In yet another aspect, a method is disclosed for manufacturing an absorbent composite. The method entails conveying a first substrate of a nonwoven material, delivering a mixture of superabsorbent particles (SAP) with hot melt adhesive particles onto the conveyed first substrate, and, as the first substrate with the mixture is conveyed, applying heat to the first substrate, thereby activating the hot melt adhesive particles and bonding the SAP with the hot melt particles and the first substrate. A second substrate is then applied atop the first substrate and SAP layer bonded therewith.

[0014] Various embodiments are disclosed in which aggregates of absorbent particles are strategically located and/or constituted between a top layer and a bottom layer, and across the expanse of the composite or core. By varying the position of the aggregates or the restrictions on the aggregates, the performance and capabilities of the absorbent composite may be managed or influenced. In certain embodiments, the aggregates of absorbent particles are situated in containers or pockets. In further embodiments, the size, spacing, arrangement, and\or geometry or shape of the containers or pockets are specifically provided to achieve certain core fluid handling properties.

[0015] In one embodiment, a disposable absorbent article includes a chassis body defined by a first end margin and a second end margin longitudinally spaced from the first end margin, the end margins partially defining front and back waist regions that are fastenable about a waist of a user. The article further includes a topsheet, a backsheet, and an absorbent composite disposed between the topsheet and backsheet. The topsheet and backsheet define longitudinal and lateral margins of the chassis body. The absorbent composite includes a first fabric and a second fabric bonded to the first fabric. Furthermore, absorbent particles are

adhered between the first and second fabric, wherein the first fabric is intermittently attached to the second fabric to define a plurality of containers situated between the first fabric and the second fabric and containing an aggregate of absorbent particles. The absorbent composite includes regions of containers of absorbent particles aggregates including a primary region having containers of a first size and a secondary region having a plurality of containers of a second size different from the first size.

[0016] The present disclosure is of an absorbent composite that, in some embodiments, does not require an absorbent matrix and a novel method of making the absorbent composite. The present document also discloses an absorbent article that incorporates the absorbent composite. The absorbent composite provides for an absorbent article that can be made very thin and pliable, while at the same time retaining enough SAP to provide sufficient absorbency and dry and wet integrity (uniform absorbency). Although using the absorbent composite in a diaper is described, one skilled in the art would readily understand that an absorbent composite made according to the inventive process may be used in a wide variety of absorbent products.

[0017] The present disclosure is also directed to an improved absorbent article incorporating the absorbent composite.

[0018] In one example, a method is described for manufacturing a composite sheet, comprising the steps of positioning a first fabric to receive particles, depositing particles on the first fabric, applying adhesive to a second fabric, positioning the second fabric relative to the first fabric, and forming bond sites that extend between the first and second fabric. The method may further include an article in which the particles comprise SAP particles, skin care particles, odor absorbing particles, binder particles, ion exchange particles, and combinations thereof. Still further, the method may include the step of coating the particles with a hydrophobic material.

[0019] The method may include conforming the first fabric to a surface. The surface may include recesses that form pockets or containers in the first fabric when it is conformed to the surface. The SAP particles may be guided into the pockets formed in the first fabric. Suction may be used to conform the first fabric to the surface. The adhesive applied to the second fabric may be applied in a concentration sufficient to secure an effective amount of dry particles. That concentration is generally between 1 to 100 grams per square meter. More specifically, the adhesive may be applied in a concentration of between 5 and 75 grams per square meter, or even more optimally, between 12 and 50 grams per square meter. The adhesive may be applied in a manner such that the total amount of adhesive engaging

particles is between 1 and 100 grams per square meter. The inventive method may further includes a step of applying adhesive to the first fabric before particles are deposited on the first fabric.

[0020] The bond sites suitable for the method may be bond lines, which may be continuous or discontinuous and may define pockets or other shapes and designs. Alternatively, the bond sites may be bond points. The bond sites may be positioned relative to particles and/or arranged to prevent straight line particle migration of more than 2 inches.

[0021] Alternatively, the method entails positioning a first fabric to receive particles, positioning particles on the first fabric, securing the particles relative to the first fabric, positioning a second fabric over the particles, and forming bond sites that join the first fabric to the second fabric. The bond sites may be discrete points spaced to inhibit the migration of particles. The bond sites may also be bond lines spaced to inhibit the migration of particles, or bond lines that are connected to form a single bond line. The bond lines may be arranged to form pockets within which some particles are positioned. The particles may be SAP particles, skin care particles, odor absorbing particles, binder particles, ion exchange particles, and combinations thereof. The particles may be secured to the first fabric with adhesive, thermal plastic, or combinations thereof. In addition to or in the alternative, the particles may be secured to the second fabric with adhesive, thermal plastic, or combinations thereof. Furthermore, shapes may be formed in the first fabric for receiving particles.

[0022] A disposable absorbent article according to the disclosure may comprise a topsheet, a backsheet, and an absorbent core disposed therebetween, wherein at least a portion of one of the backsheet, topsheet, and absorbent core. The absorbent core is an absorbent composite comprising a first fabric, a second fabric bonded to the first fabric, and particles adhered between the first and second fabric. The particles may be SAP particles, skin care particles, odor absorbing particles, binder particles, ion exchange particles, and combinations thereof.

[0023] Alternatively, an absorbent layer may be provided that is supported on the backsheet, such that a section of the backsheet provides the second fabric of the absorbent composite. The backsheet may further comprises a first backsheet layer, a second backsheet layer and SAP particles in a concentration of about 20 gsm positioned there between and the second back sheet layer is an *SMS* having a basis weight in the range of about 10 gsm to 60 gsm. The absorbent layer may be adhered between the first and second fabric with an adhesive concentration of between 1 and 100 grams per square meter. The first fabric may be bonded to the second fabric at discrete points, which discrete points may define pockets. Further, the

first fabric may be bonded to the second fabric along a plurality of bond lines, which bond lines may define pockets.

[0024] The absorbent core may also comprise a first fabric, a second fabric, bond sites at which the first fabric is connected to the second fabric; and an absorbent layer of particles adhered between the first and second fabric. The particles may be SAP particles and/or other beneficial particles. The absorbent layer may be supported underneath a section of the topsheet, such that the section of topsheet provides the second fabric of the absorbent composite. The absorbent layer may be supported on a section of the backsheet, such that the backsheet section provides the first fabric of the absorbent composite.

[0025] In some embodiments, the disposable absorbent article may include a concentration of SAP particles in the absorbent layer of between about 50 and 650 grams per square meter. The SAP particles may also be coated with a hydrophobic material to retard the initial receipt of liquid by the SAP particles in the absorbent layer. The bond sites may define a plurality of continuous lines that inhibit the movement of the SAP particles of the absorbent layer. The continuous lines may be shaped to form pockets between the first and second fabrics. The bond sites may define a plurality of discontinuous lines that inhibit the movement of the SAP particles of the absorbent layer. The discontinuous lines may be shaped to form pockets between the first and second fabric.

[0026] In the yet another embodiment, the bonds may be positioned along periphery of pockets of particles. The bonds may form a pattern such as herringbone, bricklayer, circles, triangles, dots, dashes, rectangles, and combinations thereof. The yet another embodiment may also include loose particles positioned between the first and second sheets.

[0027] The foregoing has outlined rather broadly the features and technical advantages of the present disclosure in order that the detailed description that follows may be better understood. Additional features and advantages will be described hereinafter. It should be appreciated that the specific embodiments disclosed may be readily utilized as a basis for modifying or designing other structures for carrying out the same purposes. It should also be realized that such equivalent constructions do not depart from the disclosure as set forth in the appended claims. The features which are believed to be characteristic of the disclosure, both as to its organization and method of operation, together with further objects and advantages will be better understood from the following description when considered in connection with the accompanying figures. It is to be expressly understood, however, that each of the figures is provided for the purpose of illustration and description only and is not intended as a definition of the limits of the present disclosure.A disposable absorbent article according to

the disclosure may comprise a topsheet, a backsheet, and an absorbent core disposed therebetween. The absorbent core is an absorbent composite comprising a first fabric, a second fabric bonded to the first fabric, and particles secured between the first and second fabric. The particles may be SAP particles, skin care particles, odor absorbing particles, binder particles, ion exchange particles, combinations thereof, or in preferred embodiments consist of SAP.

[0028] Alternatively, an absorbent layer may be provided that is supported on the backsheet, such that a section of the backsheet provides the second fabric of the absorbent composite. The backsheet may further comprise a first backsheet layer, a second backsheet layer and SAP particles in a concentration of about 20 gsm positioned there between and the second back sheet layer is an *SMS* having a basis weight in the range of about 10 gsm to 60 gsm. The absorbent layer may be adhered between the first and second fabric with an adhesive concentration of between 1 and 100 grams per square meter. The first fabric may be bonded to the second fabric at discrete points, which discrete points may define pockets. Further, the first fabric may be bonded to the second fabric along a plurality of bond lines, which bond lines may define pockets.

[0029] The absorbent core may also comprise a first fabric, a second fabric, bond sites at which the first fabric is connected to the second fabric; and an absorbent layer of particles adhered between the first and second fabric. The particles may be SAP particles and/or other beneficial particles. The absorbent layer may be supported underneath a section of the topsheet, such that the section of topsheet provides the second fabric of the absorbent composite. The absorbent layer may be supported on a section of the backsheet, such that the backsheet section provides the first fabric of the absorbent composite.

[0030] In some embodiments, the disposable absorbent article may include a concentration of SAP particles in the absorbent layer of between about 50 and 650 grams per square meter. The SAP particles may also be coated with a hydrophobic material to retard the initial receipt of liquid by the SAP particles in the absorbent layer. The bond sites may define a plurality of continuous lines that inhibit the movement of the SAP particles of the absorbent layer. The continuous lines may be shaped to form pockets between the first and second fabrics. The bond sites may define a plurality of discontinuous lines that inhibit the movement of the SAP particles of the absorbent layer. The discontinuous lines may be shaped to form pockets between the first and second fabric.

[0031] In the yet another embodiment, the bonds may be positioned along periphery of pockets of particles. The bonds may form a pattern such as herringbone, bricklayer, circles,

triangles, dots, dashes, rectangles, and combinations thereof. The yet another embodiment may also include loose particles positioned between the first and second sheets.

[0032] The foregoing has outlined rather broadly the features and technical advantages of the present disclosure in order that the detailed description that follows may be better understood. Additional features and advantages will be described hereinafter. It should be appreciated that the specific embodiments disclosed may be readily utilized as a basis for modifying or designing other structures for carrying out the same purposes. It should also be realized that such equivalent constructions do not depart from the disclosure as set forth in the appended claims. The features which are believed to be characteristic of the disclosure, both as to its organization and method of operation, together with further objects and advantages will be better understood from the following description when considered in connection with the accompanying figures. It is to be expressly understood, however, that each of the figures is provided for the purpose of illustration and description only and is not intended as a definition of the limits of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033] For a more complete understanding of the present disclosure, reference is now made to the following descriptions taken in conjunction with the accompanying drawing, in which:

[0034] FIG. 1 is a schematic of one embodiment of a method of making an absorbent composite using calendar rolls;

[0035] FIG. 2 is a schematic of another embodiment of a method of making the inventive absorbent composite using calendar rolls;

[0036] FIG. 3 is a schematic of the method shown in FIG. 1 with an additional energy source;

[0037] FIG. 4 is a variation of the method shown in FIG. 1 that uses ultrasonic bonding techniques instead of calendar rolls;

[0038] FIG. 5 is a variation of the method shown in FIG. 2 that uses ultrasonic bonding techniques instead of calendar rolls;

[0039] FIG. 6 is an illustration of various potential bonding patterns that may be used in the method and absorbent article;

[0040] FIG. 7 is a cross sectional illustration of a pockets formed by the method and utilized in the absorbent article;

[0041] FIG. 8 is a perspective view of a disposable absorbent article embodying the absorbent composite;

[0042] FIG. 9 is a top plan view of the disposable absorbent article of FIG. 8 in a flat and extended condition;

[0043] FIG. 10 is an exploded view of the disposable article of FIG. 8;

[0044] FIG. 11 is a partial cross-sectional view of an absorbent core utilizing the absorbent composite and employed by an absorbent article;

[0045] FIG. 12 is partial cross-sectional view of an absorbent core utilizing an alternative embodiment of the inventive absorbent composite and employed by an alternative absorbent article;

[0046] FIG. 13 is a cross-sectional view of an absorbent article employing in the leg cuffs an absorbent composite;

[0047] FIG. 14 is a cross-sectional view of an absorbent article employing in the leg cuffs a saturated absorbent composite;

[0048] FIGS. 15A-15D are simplified illustrations of an absorbent composite according to the present disclosure, with particular attentions to an arrangement of aggregates of absorbent particles across the composite;

[0049] FIG. 16A is a simplified illustration of a prior art SAP sandwich;

[0050] FIG. 16B is a simplified illustration of an SAP structure (sandwich) in accordance with the present disclosure;

[0051] FIGS. 17A-17D are simplified illustrations in cross-sectional view of pockets and fluid properties characterizing the arrangement of pockets, in accordance with the disclosure;

[0052] FIG. 18A is a simplified schematic of a process of making an absorbent composite according to the disclosure;

[0053] FIGS. 18B-18C are illustrations or photographs of exemplary components of the process described in respect to FIG. 18A;

[0054] FIG. 19 is a simplified cross-sectional view representing an absorbent composite in accordance with the process of FIG. 18A;

[0055] FIGS. 20A is a simplified cross-sectional view across a lateral centerline of a disposable absorbent article employing an absorbent core laminate in accordance with a preferred embodiment of the disclosure;

[0056] FIGS. 20B is a simplified cross-sectional view across a longitudinal centerline of a disposable absorbent article employing an absorbent core laminate in accordance with a preferred embodiment of the disclosure;

[0057] FIG. 20C is a simplified cross-sectional view of an absorbent composite in the absorbent core laminate of FIGS. 20A and 20B;

[0058] FIG. 21 is an exploded view of an absorbent core laminate according to an embodiment of the disclosure;

[0059] FIGS. 22A-22C are exploded view of various stages of manufacturing the laminate in FIG. 21;

[0060] FIG. 23 is a top perspective view of an embossed absorbent core laminate according to an embodiment of the disclosure;

[0061] FIG. 24 is a plan view of an exemplary absorbent core laminate employing bond points, according to an embodiment of the disclosure;

[0062] FIG. 25 is a plan view of an absorbent core laminate according to an alternate embodiment of the disclosure;

[0063] FIG. 26 is an exploded view of an absorbent core laminate according to an alternate embodiment of the disclosure;

[0064] FIG. 27 is simplified illustration of a stage in the manufacture of an absorbent core laminate according to an embodiment of the disclosure;

[0065] FIG. 28 is a plan view of a disposable absorbent article employing an absorbent core laminate, according to a preferred embodiment of the disclosure;

[0066] FIG. 29 is a simplified illustration in cross-sectional view of an absorbent composite according to a preferred embodiment of the disclosure; and

[0067] FIG. 30 is a simplified illustration in partial cross sectional view of a bulky nonwoven layer point bonded in an absorbent composite according to the disclosure.

DETAILED DESCRIPTION

[0068] Upon review of the detailed description and the accompanying drawings provided herein, it will be apparent to one of ordinary skill in the art that an absorbent composite made according to the present disclosure may be used in disposable absorbent articles, and more particularly, in disposable absorbent articles, such as diapers, training pants or other incontinence products. Accordingly, the present disclosure shall not be limited to the structures and processes specifically described and illustrated herein, although the following description is particularly directed to an absorbent composite that is used in a disposable diaper. The term "absorbent article" or "absorbent garment" with which the present disclosure is associated, includes various types of disposable articles and garments which are placed against or in proximity to the body of the wearer so as to absorb and contain various bodily exudates, bodily fluid, or biofluid.

[0069] Perhaps to gain a better understanding and appreciation of the particular contributions and improvements which are introduced in the present disclosure, reference may be first made to the improvements earlier disclosed in U.S. Patent No. 8,148,598. These earlier improvements are described in respect to FIGS. 1-14. Some of the teachings and suggestions therein may, in addition to serving as background knowledge in the art, translate to certain specific embodiments of the present disclosure (which will become apparent to one skilled in the relevant art given the present disclosure).

[0070] In FIG. 1, a fabric 125 is shown as it is dispensed from roll 120 and carried along a production line on a conveyer belt 100. The fabric 125 may be thermal plastic material that may be a woven, nonwoven, film, or a combination thereof. The fabric 125 is secured to the conveyor belt 100 by a vacuum system 110. The vacuum system 110 serves to confirm the fabric 125 to the conveyor belt 100.

[0071] In one embodiment, the surface of the conveyor belt 100 has recessed portions that form cups in the fabric 125 as the fabric is pulled against the surface of the conveyor belt 100. The surface of the conveyor belt 100 is not limited to constructions that form cups in the fabric but, instead, may be configured with a number of different surface shapes and sizes. Examples include ridges, raised shapes, and holes. In addition, the surface shapes may be distributed uniformly or non-uniformly across the width and length of the conveyor belt. Alternatively, the conveyor belt 100 may be flat. In applications in which the conveyor belt 100 has holes or other similar constructions, the depth of the pockets formed in the fabric 125 may be varied by the force of the vacuum system 110, the elasticity of the fabric 125, or a combination thereof. Additionally, heat may be used to increase the elasticity of the fabric 125 as the fabric is pulled against the surface of the conveyor belt 100. Heat may be applied to the fabric by way of a heated conveyor belt or any other means known in the art. The vacuum 110 may be applied uniformly across the surface of the conveyor belt 100 or at selected locations. For example, in a configuration in which the surface of conveyor belt 100 has depressions, vacuum may be applied only at the depressions.

[0072] The SAP particles 135 are then deposited on the fabric 125 by SAP dispenser 130. The SAP dispenser 130 may be configured to position SAP particles in their desired position on the first fabric or may be configured merely to deposit SAP particles on the first fabric, wherein the SAP particles are position by another means. One skilled the art understands that multiple SAP dispensers 130 may be used. The SAP particles 135 may be deposited, positioned, or both on the fabric 125 by wind or other known methods. Alternatively, the conveyor belt shown in FIG. 1 may be inverted so that the vacuum system 110 applies

suction from above. In such a configuration, the fabric 125 is carried over a supply of SAP particles 135 and the SAP particles are held onto the surface of fabric 125 by vacuum system 110. In alternative embodiments, SAP dispenser 130 may include skin care particles such as ion exchange resins, deodorant, anti-microbial agents, binder particles, or other beneficial particles. Further, although the preferred embodiment is directed to SAP particles, the methods discloses herein can be used with any combination of the above referenced particles, including combinations that do not include SAP. Alternatively, separate dispensers advantageously positioned along the production line (not shown) may be used to deposit different types of particles such as, for example, skin care particles.

[0073] The SAP particles 135 are positioned and concentrated on the fabric 125 according to a number of alternative methods. In one embodiment, the vacuum system 110 and fabric 125 may be configured to allow the vacuum system 110 to pull the SAP particles 135 against the surface of the fabric 125 uniformly or in particular areas. In another embodiment, the shape of the fabric 125 guides the SAP particles 135 into position. For example, when the fabric 125 is shaped to form pockets, the SAP particles 135 roll into the pockets as a result of the vacuum system 110, the vibration of the conveyor belt, wind, the angle of the conveyor belt, or combinations thereof. Alternatively, the SAP dispenser(s) 130 may be positioned and controlled to dispense SAP particles 135 strategically across the surface of fabric 125, which strategic positioning includes but is not limited to alignment or nonalignment with the machine direction, offset, or randomly. Further, SAP may be positioned such that there are zones without SAP particles. Still further, SAP particles may be positioned using adhesive such as by applying adhesive to specific locations on a surface, depositing SAP particles on the surface. Still further, SAP particles may be positioned on both fabrics 125 and 155.

[0074] Once SAP particles have been deposited and positioned on fabric 125, a second fabric 155 is introduced into the production line from roll 150. The second fabric 155 may be selected from a variety of materials including spun-bonded thermoplastic or similar woven or nonwoven material, film, or combinations thereof.

[0075] The adhesive 145 is applied to the SAP particles 135 in a number of ways. FIG. 1 shows the adhesive 145 applied to the fabric 155. Alternatively, the adhesive 145 may be applied to the fabric 125 and SAP particles 135, fabric 125 before the SAP particles 135 are deposited on the fabric 125, or directly to the SAP particles before they are deposited on the fabric 125. In still another embodiment, the adhesive 145 is applied at the point where fabrics 125 and 155 are jointed together. In still another embodiment, multiple coats of adhesive are applied. For example, adhesive 145 may be applied to the fabric 125 before the SAP particles

135 are deposited, to the SAP particles 135 after they have been positioned, to the fabric 155, or a combination thereof. Alternatively or in addition to the above embodiments, binder particles may be mixed with the SAP particles 135. Additionally, the adhesive may be applied uniformly, randomly, or in a specific pattern, depending the desired absorbent properties of the finished composite.

[0076] The adhesive is applied according to a number of methods know to those skilled in the art. For example, the adhesive may be sprayed, rolled, or spun onto the surface of fabric 155. The adhesive may be hydrophobic, hydrophilic, biodegradable, bioderived, or combinations thereof. The preferred adhesive is hydrophobic. The concentration of adhesive in a coat varies between 1 and 100 grams per square meter ("GSM"). Optimally, the concentration is between 5 and 75 GSM. In a preferred embodiment, the concentration is between 12 and 50 GSM. Additionally, enough adhesive should be applied to cover at least 25% of the targeted area.

[0077] Fabrics 125 and 155 are then bonded together. FIG. 1 shows a thermal bonding system in which calendar rolls 160 and 170 are used. However, other bonding systems/methods may be used. For example, the ultrasonic bonding system of FIGS. 4 and 5 may be used. Adhesive 145 retains the SAP particles 135 in a relatively fixed position with respect to the fabrics during the bonding process and subsequent to the bonding process. The bond pattern may be aligned with the distribution of the SAP particles 135. Alternatively, the bond pattern may not be aligned with the distribution of the SAP particles 135. In such embodiments, the bonding equipment may be adapted to nudge the SAP particles 135 aside prior to bonding or to bond through the SAP particles 135. These embodiments eliminate the need to synchronize the bond points with the distribution of SAP particles.

[0078] Fabrics 155 and 125 are shown as two materials. However, one skilled in the art understands that the fabrics may actually be part of the same material. In such a configuration, the unitary fabric is folded to cover the SAP particles. Alternatively, the edges of fabric 125 may be folded prior to applying the second fabric 155. In embodiments in which fabrics 125 and 155 are separate, fabrics 125 and 155 may be the same or a different material. Additionally, fabric 155 may be sized to cover specific areas, such as the center section, of fabric 125.

[0079] Once the fabrics have been bonded together, the absorbent composite 195 is collected on rewinder 200.

[0080] In a method illustrated in FIG. 2, the fabric 125 is transported along the conveyer belt 100. As fabric 125 is transported along the conveyer belt 100, a thin coat of adhesive 145 is

applied to fabric 125. As with the method of FIG. 1, the adhesive may be applied uniformly, randomly, or in a specific pattern, depending the desired absorbent properties of the finished composite. Although the adhesive 145 is shown being applied before the SAP Particles 135 are deposited, alternate embodiments are envisioned. For example, the adhesive may be applied according to the embodiments described with respect to FIG. 1.

[0081] Following the application of the adhesive, SAP particles 135 are deposited and positioned on the fabric 125. The SAP particles 135 may be deposited directly on fabric 125, as shown in FIG. 2, or indirectly, such as by wind blowing SAP particles across fabric 125. The weight of the SAP particles aids in securing the fabric 125 to the conveyor belt 100. Additionally, the SAP particles may be positioned in a manner similar to that disclosed for FIG. 1.

[0082] A second fabric 155 is then fed into the production line from roll 150. The second fabric is positioned to cover the SAP particles 135. The adhesive 145 prevents the SAP particles from moving freely between the two fabrics. The resulting sandwiched construction is then transported to the calendar rolls for thermal bonding. As described with respect to FIG. 1, the bond pattern may be aligned or not aligned with the SAP particles 135. The absorbent composite 195 is then collected by rewinder 200. As described with respect to FIG. 1, fabrics 125 and 155 may be part of a single sheet. Additionally, the fabrics may be folded in the manner described for FIG. 1. In another embodiment, the fabric 125 may be coated with adhesive and pressed on a supply of SAP particles.

[0083] FIG. 3 is similar to FIGS. 1 and 2, except that an energy source 900 such as an oven or microwave generator is positioned along the assembly line. The energy source applies heat and or radiation 910 that can be used to melt thermal plastic binder. The amount of heat may also be regulated to melt specific types of particles or fibers, specific sections of the fabrics, or only the outer layers of particles/binder.

[0084] FIGS. 4 and 5 are similar to FIGS. 1 and 2, except that the fabrics are bonded together using ultrasonic bonds. FIGS. 4 and 5 show an ultrasonic bonding system (210a and 210b). It is readily understood that FIGS. 1-5 show different embodiments of the novel method and that aspects of the various methods may be advantageously combined depending on the need. Important to all combinations, however, is the amount of adhesive 145, binder particles, or combinations thereof applied to the SAP particles 135 and the strength of the bonds. As noted with respect to FIG. 1, the optimal concentration of adhesive is between 12 and 50 GSM, though other concentrations are acceptable. In all embodiments, it is important that the concentration of adhesive 145 be high enough to inhibit the migration of SAP particles 135.

The concentration should not be so high, however, that it coats the SAP particles 135 and reduces SAP swelling. The adhesive should only inhibits the migration of enough SAP particles 135 to assure uniform absorbency. Although not shown, one skilled in the art understands that the energy source 900 shown in FIG. 3 can also be applied in the configurations shown in FIGS. 2, 4 and 5.

[0085] FIG. 6 (a) through (q) show various bonding patterns contemplated by the method. The bonding patterns may completely enclose an area, partially enclose an area, or provide local bonding zones. The lines and points indicate the bond sites. The solid lines depict bond lines. The bond lines may form open shapes or enclosed shapes, such as can be found in examples (a) and (c), which depict continuous bond lines that completely enclose pockets of SAP particles 135 or, as in example (g), separate distinct regions of the absorbent composite. The dashed lines, such as can be found in examples (b) and (m), are discontinuous bond patters that do not completely enclose pockets of SAP particles 135. In these configurations, the migration of dry SAP particles is inhibited by the adhesive and continuous or discontinuous bond patters. Discontinuous pond patters may be substituted for continuous bond patterns and vise versa. Further, though the FIG. 6 shows either continuous or discontinuous bond patters, combinations of discontinuous and continuous bond patters may be used.

[0086] FIG. 7 shows a partial cross-section of an absorbent composite 195. FIG. 7 shows how bonds 192 may act to separate pockets of SAP particles 135. As noted with respect to the bonding pattern, SAP particles 135 may be entirely enclosed in pockets defined by the bonding pattern, partially enclosed in pockets defined by the bonding pattern or merely inhibited by the bonding pattern. Inhibited in this context means the SAP particles 135 cannot move directly from one area of the core to another area, but instead, must move around bond sites.

[0087] Notably, multiple functions or advantageous properties are obtained in the absorbent composite by varying the amount of SAP particles, the type and number of fabrics used, and construction variables such as, the ratio of SAP to adhesive, and applying the absorbent composite at various locations in the article. Such manufacturing and design techniques may be incorporated into structural designs and methods of the present disclosure.

[0088] Additionally, one skilled in the art understands that the process for constructing a single absorbent composite described above may be modified to produce a multiple, laminated absorbent composite. In structures comprising multiple layers, the layers may be sheets of absorbent composite 195 that are laminated together to form a single structure or

alternating layers of fabric and SAP particles 135 that form a single structure. One skilled in the art understands that alternating layers may be achieved by applying adhesive to the top of fabric 155 (FIG. 1), applying a second layer of SAP particles 135, and a third fabric (not shown). Similarly, additionally layers may be added, limited only by the maximum thickness suitable for the bonding process.

[0089] The SAP particles 135 may be coated with a miscible, hydrophobic material. The coating acts as a barrier or membrane that initially slows the liquid uptake, thereby saving SAP capacity for additional or secondary discharges. In this regard, the coating evens out the absorbency rates between discharges. In the processes shown in FIGS. 1 to 5, the coating may be applied prior to the adhesive 145 being applied, after the adhesive 145 is applied, or at the same time. Alternatively, the adhesive may be mixed with the coating material.

[0090] In one example, a light coating of mineral oil is applied over the SAP particles 135. The coating retards the initial uptake by the SAP particles and allows more time for the liquid to spread out in the article. Preferably, the mineral oil is applied at a concentration of about 0.00001 grams per gram of SAP to about 0.1 grams per gram of SAP (depending on the particular product design). Alternatively, the mineral oil may be applied in specific target zones. In this way, the received liquid is encouraged to initially spread to uncoated areas before the coated areas are activated and begin to swell.

[0091] An absorbent composite manufactured by the above-described process may be used for a disposable absorbent article or as one or more of the components of a disposable absorbent article. The components of an absorbent article include the backsheet, topsheet, absorbent core, containment walls or cuffs (including leg gathers), backsheet/absorbent core composite, topsheet/absorbent composite, and combinations thereof. Such constructions are described below in more detail.

[0092] FIG. 8 is a perspective view of a disposable absorbent article in the form of a diaper 10. Diaper 10 comprises a topsheet 50, a backsheet 60, and an absorbent core (not shown). The diaper further comprises upstanding barrier cuffs 34 which extend longitudinally along the diaper and are elasticized to conform to the buttocks of the wearer. Additionally, the diaper includes an elastic band 52 and fastening elements 26. Element 26, in use, extends to and engages the corresponding opposing end of the diaper to secure the diaper about the wearer.

[0093] FIG. 9 illustrates a composite web structure of the diaper 10 of FIG. 8 in a generally flat and unfolded configuration. As will be explained further below, the web structure may be subsequently trimmed, folded, sealed, welded and/or otherwise manipulated to form a

disposable diaper 10 in a finished or final form. To facilitate description of the diaper 10, the description refers to a longitudinally extending axis AA, a laterally extending central axis BB, a pair of longitudinally extending side edges 90, and a pair of end edges 92 which extend between side edges 90. Along the longitudinal axis AA, the diaper 10 includes a first end region or front waist region 12, a second end region or back waist region 14, and a crotch region 16 disposed therebetween. Each of the front and back waist regions 12, 14 is characterized by a pair of ear regions or ears 18, which are located on either side of a central body portion 20 and extend laterally from the side edges 90. A fastening structure 26 (*e.g.*, a conventional tape fastener) is affixed to each of the ears 18 along the back waist region 14 of diaper 10.

[0094] When the diaper 10 is worn about the waist, the front waist region 12 is fitted adjacent the front waist area of the wearer, the back waist region 14 is fitted adjacent the back waist area, and the crotch region 16 fits about and underneath the crotch area. To properly secure the diaper 10 to the wearer, the ears 18 of the back waist region 14 are brought around the waist of the wearer and toward the front and into alignment with the ears 18 of the front waist region 12. The securing surface may be located on or provided by the interior or exterior surface of the front waist region 12. Alternatively, the fasteners 26 may be located on the ears 18 of the front waist region 12 and made securable to the ears 18 of the back waist region 14.

[0095] FIG. 10 is an exploded view of the diaper of FIGS. 8 and 9. A suitable diaper structure typically employs at least three layers. These three layers include a backsheet 60, an absorbent core 46, and a topsheet 50. The diaper structure mayor may not contain a pair of containment walls or leg cuffs 34 disposed upwardly from the topsheet 50 and preferably equipped at least with one or more spaced apart, longitudinally elastic members 38. It will be shown below that any of these diaper elements or a combination of these elements may be constructed with or using the absorbent composite 195. Additionally, an acquisition layer 48 could be added to improve performance.

[0096] BACKSHEET

[0097] As mentioned above, the diaper 10 employs a backsheet 60 that covers the core 46 and preferably extends beyond the core 46 toward the side edges 90 and end edges 92 of the diaper 10. In one aspect of the invention, the backsheet 60 is constructed from a single-layered material sheet of absorbent composite 195. In such a configuration, fabric 125 is positioned as an outer surface of the backsheet 60.

[0098] Additionally, an alternative structure could be used for gel blocking. For an application using gel blocking, a backsheet of the inventive disposable absorbent article is

relatively thin and provides improved flexibility. When dry, the backsheet is soft and breathable, but upon wetting, a thin, gel blocked layer is formed (*i.e.*, on the inner surface of the backsheet) which renders the backsheet substantially liquid impervious. The gel blocked layer is formed by the swelling of the SAP particles 135.

[0099] TOPSHEET

[00100] Similarly, the absorbent composite 195 may be utilized with or as the topsheet of an absorbent garment. The topsheet 50 is preferably soft, compliant, exhibits good strikethrough and a reduced tendency to rewet from a liquid pervious material. The topsheet 50 is placed in close proximity to the skin of the wearer when the diaper 10 is worn. In this way, such a topsheet 50 permits bodily discharges to rapidly penetrate it so as to flow toward the core 46 more quickly, but not allowing such discharges to flow back through the topsheet 50. The topsheet 50 may be constructed from anyone of a wide range of liquid and vapor permeable hydrophilic materials. The surface(s) of the topsheet may be treated with a surfactant so as to facilitate liquid transfer therethrough, especially at a central zone or area of the topsheet located over the core and an inner surface of the core. The topsheet may also be coated with a substance having rash preventing or rash reducing properties (*e.g.*, aloe vera).

[00101] In one example, the topsheet 50 is formed from an absorbent composite 195 that covers substantially the entire area of the disposal absorbent article 10, including substantially all of the front waist region 12, back waist region 14, and crotch region 16. Further, the ear layer of the inner region 18 is formed from the same single topsheet material and, thus, may be referred to as being unitary with the topsheet 50 in forming lateral extensions of the topsheet material. Alternatively, the topsheet 50 may be formed from multiple different materials which vary across the width of the topsheet 50. Such a multiple piece design allows for creation of preferred properties and different zones of the topsheet.

[00102] ABSORBENT CORE

[00103] In addition to or as an alternative to the above examples, the absorbent core of the disposable absorbent article may be constructed from the absorbent composite 195, laminated layers of absorbent composite 195 (not shown) or multiple layers of SAP particles 135 and fabric. FIGS. 11 and 12 depict cross sectional views of alternating layers of SAP particles 135 and fabric that form a multi layered absorbent composite 700 and 900, respectively. As shown in these drawings, the core 46 may be comprised of distinct layers of SAP particles 135 (710 and 910). The layers may be uniform or non-uniform, depending on the intended application. In the non-uniform multi layered absorbent composite 900, the

concentration of SAP particles 135 may vary within a given layer, between layers, or combinations thereof.

[00104] FIG. 11 depicts a composite structure 700 in which SAP particle layers 710 and fabric layers 720 are alternated to form the completed composite structure 700. The layered design can also be constructed by bonding together sheets of absorbent composite, folding a unitary sheet of absorbent composite, or constructing absorbent composites with multiple layers during the manufacturing process. In folded applications, the composite fold may be a C-fold, Z-fold, V-fold, W-fold or combinations thereof. Further, the folds may be open, closed, or overlapping.

[00105] FIG. 12 depicts multi layers absorbent composite 900. As shown in FIG. 12, high concentrations areas of SAP particles 910 may be strategically positioned to provide additional absorbency in specific regions such as the crotch of an absorbent article. One skilled in the art understands that the high concentration areas may be offset to control the amount and direction of liquid penetration. Additionally, the layer with zones of high concentrations may be combined with layers of substantially uniform layers. Alternatively, the high SAP concentration areas can be formed by positioning multiple layers of absorbent core.

[00106] The core may be configured to extend substantially the full length and/or width of the disposable absorbent article. Preferably, however, the core is disposed or is otherwise concentrated at the crotch region of the article. In various embodiments, the core extends to the edges of the article and the SAP particles 135 are concentrated in the crotch region or another target zone of the article. In still another embodiment, the particles can be a combination of SAP particles, skin care particles such as ion exchange resins, deodorant, anti-microbial agents, binder particles, or other beneficial particles.

[00107] CONTAINMENT WALLS

[00108] Now turning to FIGS. 13 and 14, the disposable absorbent article 10 utilizes a pair of containment walls or cuffs 34 which employ the absorbent composite 195. Each containment wall 34 is a longitudinally extending wall structure preferably positioned on each side of the core 46 and spaced laterally from the longitudinal center. The longitudinal ends of the walls 34 may be attached, for example, to the topsheet 50 in the front and rear waist regions 12 and 14. Preferably, the ends of the containment wall 34 are tacked down inwardly and attached, for example, by adhesive to the web structure. Such a construction effectively biases the containment wall 34 inwardly and is generally considered to cause containment wall 34 to exhibit improved leakage prevention properties.

[00109] FIG. 13 provides a cross-sectional view of a diaper 10. The diaper 10 includes backsheet 60, absorbent core 46, acquisition layer 48, and topsheet 50. As shown in FIG. 13, the core is an absorbent composite 195. The diaper 10 also includes a pair of containment walls or cuffs 34 which are formed by folding the topsheet 50 and wrapping it about the ends of the absorbent composite 195. Alternatively, the absorbent composite 195 in the cuffs 34 may be distinct from the absorbent core 46.

[00110] Preferably, the containment walls 34 are equipped with elastic members 38, which extend along a substantial length of the containment walls 34. In a common application, the elastic members 38 are placed within the containment walls 34, preferably at the top of the containment walls 34 while in a stretched condition and the glued to the containment walls at least at their ends. When released or otherwise allowed relaxing, the elastic members 38 retract inwardly. When the article 10 is worn, the elastic members 38 function to contract the containment walls 34 about the buttocks and the thighs of the user in a manner, which effects a seal between the article 10, the buttocks and the thighs. The core 46 may be a single sheet of absorbent composite 195 or multilayered, as described above.

[00111] FIG. 13 depicts the configuration of the containment walls 34 when it is soft and dry. FIG. 14, on the other hand, depicts the containment walls after wetting, in which the absorbent composite 195 has swollen to dispose the containment walls 34 in a resiliently, erect position. Unlike traditional leg cuffs in the prior art, the resiliently erect containment walls 34 resists flattening (*e.g.*, when the wearer sits down) and, thereby, ensures leakage prevention, especially of explosive, liquefied bowel movements and rapid discharges of urine.

[00112] OPTIONAL LAYERS

[00113] The disposable absorbent article may employ additional layers including an acquisition layer or surge layer 48, preferably situated between the topsheet and the core (*e.g.*, FIG. 10). One function of such an acquisition layer is to spread out or disperse liquid flow so that liquid is distributed more evenly over the core surface. This serves to slow down the flow so that the liquid has adequate time to be absorbed by the core. The acquisition layer also serves to prevent the core from being saturated locally, while a substantial remainder of the core is not absorbing any liquid.

[00114] TAPE TABS

[00115] The disposable absorbent article must be secured to the wearer. This is most important with respect to diapers since diapers are not pulled up by the wearer, like training pants or incontinent briefs, but are fastened around the wearer. Securing elements

compliment the elastic members by effecting a quasi-seal between the wearer and the waistband and leg cuffs, so that liquid is contained within the article which is then absorbed; in other words, so that it does not leak through gaps between the wearer and the edge of the article. The securing elements may be adhesive, mechanical fasteners hook and loop features, or conceivably strings, *i.e.*, anything that will secure one end of the article to the longitudinally opposite end. The securing elements may also be co-adhesive such that they adhere to each other but not other materials.

[00116] In the examples shown in the Figures (see, *e.g.*, FIG. 10), the article 10 is affixed to the wearer by tape fasteners 26 which are permanently affixed to (*e.g.*, sewn directly into) the backsheet 60. Tape fasteners 26 are contacted with the transversely opposite ear 22 extending from the backsheet, where they remain affixed due to adhesive compound applied to the fasteners 26. Alternatively, the article 10 may be training pants, pull-on diapers, and the like. In this configuration, the article 10 mayor may not have tape fasteners 26.

[00117] WAISTBAND

[00118] Waistbands employing elastic members 52 are positioned along the transverse portion of the article 10 so that when worn, the waistbands are positioned along the waist of the wearer. Generally, the waistband preferably creates a quasi-seal against the waist (transverse elastic members 52) so that liquid waste does not leak from the regions between the waist elastic and the waist of the wearer. The quasi-seal is significant because, although the liquid may be eventually absorbed by filler material, the assault of liquid by the wearer may overwhelm the absorption rate capacity of the filler material. Hence, the waistbands contain the liquid while it is being absorbed. Secondly, the waistbands may have a capacity to absorb liquid (see, e.g., U.S. Patent No. 5,601,544, which is hereby incorporated by reference).

[00119] Aggregate (and Embossing) Patterns and Material Selection for Fluffless Absorbent Composites

[00120] The simplified illustrations of FIGS. 15A-15D present absorbent composites 510 with particularly advantageous arrangements of aggregates 512 of absorbent particles, according to the present disclosure (with like reference numerals used to indicate like elements). Referring first to FIG. 15A, each of the aggregates on the absorbent composite 510 is represented by the diamond-shaped enclosure 514 in the pattern. In preferred embodiments, SAP is employed as the absorbent particles in the aggregates. Furthermore, SAP aggregates in each of FIGS. 15A-15D are preferably maintained in place and stabilized

by physical entrapments or containers provided by the engagement of a first fabric disposed generally above the SAP aggregate with a second fabric disposed generally beneath the SAP aggregate. Thus, in an alternative view of FIG. 15A, the diamond units represent the outline of the containers or pockets, reflecting in particular embodiments, the engagement of the top fabric with the bottom fabric, as previously described herein.

[00121] As described previously, the absorbent performance of the SAP can be affected by the size and structure of the container. As SAP becomes more saturated, its permeability is reduced. Water cannot pass through the SAP particle due to the high level of water already contained within the SAP particle and eventually the SAP can completely halt the passage of further fluid through it. This is known as gel blocking. Also, as SAP becomes more saturated, it swells and its volume increases. By confining the SAP in a small container of fixed volume it is possible to restrict the swelling of the SAP and prevent it from reaching its highest saturation levels (and, by consequence, stop the SAP from reaching its lowest levels of permeability). The degree to which the SAP particle is restricted depends on a number of factors, including: the nature and size of the container, the size and frequency of any breaks in the container (*e.g.*, along the side walls), the amount of SAP disposed in the container, and the amount of fluid absorbed by the SAP. Further, the performance properties of SAP are affected by its degree of saturation. Specifically, absorbent composite properties such as permeability, absorption rate, capillary pressure (arising from the void space in the composite) will vary significantly as the SAP changes from dry to fully saturated. In accordance with a method of the present disclosure, target or optimal performance of the SAP may be achieved by changing the size of the container and/or the SAP concentration so as to physically constrain the swelling of the SAP and limit the maximum saturation point of the SAP. By incorporating these physical features, preferred levels of permeability or a preferred absorption property may be achieved in target regions of the absorbent core. Thus, by playing with the two variables of pocket size and the amount of SAP in the pocket, the minimum permeability of that container or pocket may be "set". Pockets in some regions of the diaper may be prevented from gel blocking and the permeability of that region of the core may be optimized. A gradient of pocket size may also be established to obtain maximum flow and utilization of the absorbent core. This gradient will be radiate from the target zone towards the ends or sides of the diaper.

[00122] The various arrangements of containers or pockets also promote SAP and core utilization and prevent fluid from bypassing the containers. Ideally, fluid should leak or flow from container to container as the SAP reaches the maximum level of saturation which is set

either by the properties of the SAP or the volume of the pocket into which it is expanding. Applicants contemplate that, in some of the previously described composites or arrangements of pockets (see FIG. 6), there may be a tendency for fluid to leak between the pockets. That is the fluid runs along the channels formed by embossing lines and does not enter the core. To mitigate this tendency, arrangements or patterns for the containers are preferably ones that minimize or eliminate short and direct routes (as may be established along embossing lines) of fluid flow from the core center to the side margins of the core (at end edges). To illustrate, containers or pockets shaped as diamonds are preferred to ones formed in squares or rectangles, because the diagonal lines or channels formed by the diamond containers are longer and more circuitous. Circles are also effective if packed in a way that does not present channels that flow quickly to the edge. In more preferred arrangements, fluid flow is forced to change directions one or more times before flowing through the side of the diaper.

[00123] An absorbent core for a baby diaper or adult incontinence product is required to absorb fluid quickly, in an anatomically aligned region of the core, absorb all the fluid without leaking at the sides or ends of the product and hold on to that fluid without wetting the user's skin particularly when under the pressure caused by the user's bodyweight. This present disclosure accomplishes that by providing regions of the core having different performance parameters defined by the size of the containers retaining the SAP, as well as the arrangement of the containers. Thus, a core may be designed to attain optimized performance characteristics by changing the size of the pocket and/or the concentration of SAP within that pocket.

[00124] In certain arrangements shown here, design features are combined to provide a core that is less likely to leak, absorbs wetness fast, and provides a dry, comfortable feeling for the user. At the crotch region of the core, the container size and SAP loading are optimized to provide an open structure, with high permeability, resulting in fast acquisition or distribution of fluid away from the point of insult and away from the user's skin. Permeability is maintained even when the SAP is swollen due to the physical constraints of the container restricting further swelling. This allows the liquid to spread more efficiently toward the regions further away from the target zone (crotch area), and contributes to better performance and utilization of the absorbent core. At regions away from the crotch region, such as regions proximate the periphery of the core and beyond, permeability is reduced to slow down the fluid. Absorption capacity is increased by the larger pockets allowing the SAP to swell more fully and hold on to more fluid.

[00125] In FIG. 15A, large diamond shaped containers or pockets 514 of absorbent particles aggregate 522 are present in a region anatomically aligned with the point of insult. The containers then gradually reduce in size toward the sides and front and rear margins or edges of the core 510. There are three distinct regions of containers. In the crotch region "A", large diamond shaped pockets are provided. Adjacent and surrounding the crotch region is an intermediate region "B" of pockets of smaller size than those in the crotch region (A). Among other things, the smaller pockets of this intermediate region (B) present breaks in the potential fluid flow around the SAP aggregates and along embossing lines. As described previously, the presentation of such barriers to direct escape of fluid flow through the side margins prevents leakage and promote utilization of the SAP aggregates. Finally, a third region "C" of pockets is present near each of the end edges of the core 510 populated by even smaller sized pockets of SAP aggregates.

[00126] FIG. 15B illustrates a second exemplary arrangements of SAP aggregates 522 and pockets 514. In this example, small, diamond shaped pockets 522 are disposed in the region anatomically aligned with the point of fluid insults. The pockets then gradually increase in size in regions disposed toward the sides and front and rear edges of the core. The two arrangements (in FIGS. 15A and 15B) provide alternative ways of structuring the expected flow gradient and as well, handling of the liquid insults. The absorbent composite and arrangement of pockets in FIG. 15A may provide for a center region with a larger capacity initially, but which, over time, will redistribute liquid in its void volume, or from subsequent liquid insults, to smaller adjacent pockets or cells. With the pattern of FIG. 15B, the center region may be equipped with smaller capacity initially, which will cause the liquid to travel to larger cells. It may also generate a surface topography that prevents leakage from the sides and ends of the diaper, *i.e.*, "dams" will be created that intercept and absorb surface flow.

[00127] FIGS. 15C and 15D provide alternate arrangements wherein circular pockets for SAP aggregates are employed. In FIG. 15C, large, circular shaped pockets are present in a region anatomically aligned with the point of insult. The pockets 534 gradually reduce in size toward the sides and front and rear edges of the core 530. The pattern is similar to that employed in FIG. 15A but with circular pockets rather than diamond-shaped ones. Many of the characteristics of the arrangement in FIG. 15A translate to the design of FIG. 15C.

[00128] However, unlike a diamond shaped pocket, it is not possible to produce a perfectly close packed pattern with circular shaped pockets and the resulting space between the circular pockets could be disposed in a number of ways. It is envisaged that the space

between the circular pockets could either be completely embossed (*i.e.*, have large embossed, thermally bonded regions between the pockets), partially embossed or not embossed. The spaces could also contain SAP or be free of SAP.

[00129] FIG. 15D illustrates a further embodiment of the present invention, with a pattern analogous to that found in FIG. 15B. In this example, small, circular shaped pockets 544 are disposed in the region anatomically aligned with the point of fluid insults. The pockets 544 gradually increase in size in regions disposed towards the sides and front and rear edges of the core. Again the space between the pockets 544 could be utilized in a number of ways as described above.

[00130] It should be noted that arrangements and embossed patterns are not limited to employment of diamond shaped pockets or circular shaped pockets. Other shapes are contemplated. Some arrangements may even utilize different pocket shapes within the same pattern.

[00131] The following table summarizes the characteristics of the different pocket sizes, assuming the SAP concentration remains uniform throughout the core.

[00132] Table 1. Summary of Performance by Product Size and degree of SAP Saturation

SAP Saturation	Small	Pocket Size Medium	Large
Dry (0%)		Very high permeability Moderate absorption rate High capacity remaining	
Low (10-20%)	High permeability High absorption rate Low capacity remaining	High permeability High absorption rate Moderate capacity remaining	High permeability High absorption rate High capacity remaining
Medium (20-60%)	High permeability No further absorption	High permeability Low absorption rate Low capacity remaining	High permeability High absorption rate Moderate capacity remaining
High (60%+)	-	Moderate permeability No further absorption	Low permeability Low absorption rate Low capacity remaining

[00133] Systems, Method, and Structures for Absorbent Particles Construction and/or Stabilization

[00134] In a further variation of providing an absorbent composite according to the present disclosure, one or more of the nonwoven webs employed in previous examples is replaced with a more open structure. Examples of such a nonwoven include, carded PET webs, airthrough bonded nonwovens, resin bonded nonwovens and non-absorbent air-laid structures. Materials known as acquisition and distribution layers (ADL) are included in this list of suitable materials. The resulting structure provides an alternative means for containing absorbent particles and more specifically, within a fibrous network but without using an absorbent matrix of fibers (*i.e.*, without pulp). The structure promotes the distribution of the SAP within a network of fibers provided by the non-woven web layer. This distribution of SAP particles into the more open web provides, among other things, a mechanism for further stabilization of the SAP within the nonwoven simply through entanglement of the particles within the fibrous network.

[00135] FIG. 16A illustrates a composite structure as previously described. The composite employs a non-woven as a bottom layer (NW1) and a top layer (NW2) to sandwich a layer of SAP material (SAP). FIG. 16B illustrates an alternative structure, wherein a bulky non-woven ("bulky" NW1) is employed as a base layer. The bulky non-woven layer NW1 provides fibers that extend outward and entangle SAP particles. Such entanglement with the fibers in the more open material leads to stabilization of the SAP within the absorbent composite. In a manufacturing process, SAP particles applied onto a sheet or web of the bulky woven may be energized so as to promote penetration into the fibrous network of the more open nonwoven web. The effect of gravity on the particles may be sufficient to promote the desired penetration as the SAP particles are laid down onto the web. Techniques such as vacuum or vibration could be used to further enhance the penetration of the SAP particles into the open, fibrous network.

[00136] Stabilization of the SAP prevents movement of the material during processing, storage and use. In exemplary embodiments, the absorbent composite or core may employ the "bulky nonwoven" structure (as in FIG. 16B) for stabilizing the SAP in addition to the use of adhesive and containers or pockets of SAP aggregates, as previously described.

[00137] It should also be noted that the more open nonwoven material can provide additional performance features. These include faster acquisition of fluid and improved dryness (rewet) for the user. Also, the absorbent matrix will feel softer (spongier) than "flat" nonwoven webs, and will provide a more flexible composite. This results in greater comfort for the user and a better fit around the contours of the user's body leading to less chance of leakage.

[00138] Referring now to the illustrations in FIGS. 17A-17B, the exemplary absorbent composite is preferably provided with top layer of "bulky" nonwoven. The illustrations may be regarded as simplified cross-sectional views of the composite in FIG. 15A. Because the substrate used to contain the SAP is an open structure nonwoven, it is characterized by large pores (~ 2000 microns). Embossing will set and stabilize the local pore structure of the bulky, resilient fiber web substrate. Areas wherein the embossing pattern is small (utilizes small containers) (FIG. 17A) creates smaller pores (see FIG. 17A) compared to areas with larger embossing patterns (FIG. 17B) which creates larger capillary pores (17B). In other words, the smaller inter-fiber distance characterized by the smaller patterns lead to higher densities and higher capillarity. The larger patterns provide greater inter-fiber distances which lead to low density and low capillarity. The result of this combination of pockets across the core is an optimized wicking structure, as illustrated in FIG. 17C. With larger pores situated in the target area and smaller pores away from the insult point, an effective conduit for fluid flow results. This conduit may be utilized to transport liquid against gravity more efficiently. (See illustration of liquid movement in FIG. 17c). Such an advantageous structure can be created within the nonwoven substrate by the appropriate choice of embossing patterns hence allowing the liquid to spread further, enhancing core utilization and intake.

[00139] In further embodiments and in reference to FIGS. 17C and 17D, 3-D patterns or contours may be formed during use (uptake of liquid) as a consequence of SAP swelling. As shown in FIGS. 17C and 17D, different size pockets provide differences in swelling capacities, which in turn lead to differential swelling. In one respect, dams may be created by the pockets with greater swells (*i.e.*, larger pillows). This structural consequence helps to reduce side and waist leakage. In most cases, uncontrolled liquid (liquid pooling on the surface of the product) lead to product leakage. The 3-D topography generated as SAP swells is defined by the embossing pattern size/frequency. An absorbent core that can self-generate a surface topography can inhibit cross-directional surface flow (to prevent side leakage) or discourage leakage at the waist region (longitudinal ends of the core). The structure and arrangement of pockets in FIG. 15A would be well suited to achieve these properties in an absorbent core.

[00140] Further Exemplary Methods and Systems for Making an Absorbent Composite Employing SAP

[00141] In a method referred to as profiling, the SAP dosing rate is varied to produce a profiled core. See *e.g.*, U.S. Pat. Applic. No12/925,765 for profiled core designs, which

document is incorporated by reference and made a part of the disclosure. The profiled core structure provides improved diaper performance by providing more absorbent material in areas of the core where it is needed. The profile may also be achieved by stacking multiple layers of the absorbent composite, but at different lengths (*e.g.*, short top core, full length bottom core). A more efficient solution may be to vary the SAP dosing rate during application of the SAP and align the high SAP dose areas with the crotch area of the diaper when the core is converted in the diaper line. Such a method may be more efficient as it utilizes less nonwoven material than the stacked core. It is also cost effective.

[00142] In one embodiment, a powdered hotmelt adhesive is mixed with the SAP to provide additional bonding. The SAP and adhesive mixture is distributed between the two nonwoven webs and the hotmelt adhesive is "activated" by passing the composite through a heating device. Suitable devices include heated rollers, infra-red heater and the like. The adhesive melts and bonds the SAP and nonwovens together. This can also be combined with the patterned embossing/ultrasonic processes to produce pocket patterns as described previously. Typically, the adhesive/SAP is mixed at a ratio of 10 to 100 parts SAP to 1 part adhesive by weight (1-10% adhesive by weight). Too much adhesive will limit the absorption performance of the SAP, while too little adhesive may sacrifice structural integrity. Preferably, the adhesive is applied at a rate of about 1 to 2 particles of adhesive per particle of SAP. The exact rates may be worked out if the average particle size and density of the SAP and adhesive are known.

[00143] The absorbent composites described thus far are well suited for manufacturing in both offline and online manufacturing processes. In the offline process, the core machine stands separate to any other process and produces rolls, spools or boxes of festooned material that is then delivered to the diaper converting line. Typically, but not necessarily, the machine associated with the product of FIGS. 6-7, as described previously, would produce a wide sheet of the absorbent composite. The product is then slit to produce a number of rolls of material for use on the diaper converting line, *e.g.*, a 1.5m wide machine would produce 15 rolls of material at 100mm width. In the offline process, the offline machine will typically run at speeds much slower than the diaper converting line. In the online process, the core machine is part of the diaper converting line and the core is made a part of the diaper converting process. The output speed of the core machine must match the speed of the diaper converting line and the width of the core will match the width of the core in the product.

[00144] In an offline process depicted in FIG. 18A, a SAP sandwich is formed having a substrate A, a second substrate B, and a SAP coating disposed between the two substrates. In one embodiment, the SAP is immobilized by bonding the two substrates together to contain the SAP in discrete planar volumes between the layers. One or a combination of the following methods for SAP stabilization may be employed. In a first process, heat embossing or ultrasonic bonding is employed to fuse the substrate layers in a defined pattern. In a second process, an adhesive is applied to one or both of the substrate inner surfaces. The two substrates are then strategically bonded together according to an advantageous embossing pattern. Thirdly, a thermal binder, such as low melting adhesive particles, may be mixed with the SAP particles. External heating is then applied to the composite to activate or melt the adhesive, thereby binding the particles to the substrate and to each other. Here, a patterned embossing step may be used to enhance the lamination quality while maintaining a more open SAP layer structure for enhanced liquid intake. If a patterned is not desired, a smooth calendar roll (not patterned) may also be employed to bond the cover layer to the SAP layer to produce the sandwich structure.

[00145] In an online process, the core forming process is directly coupled to the diaper converting process. The SAP sandwich structure is formed as with the first and second process discussed above, at speeds 3-4 times that of the offline process. The third method may not be suited to the faster online process because of the short dwell time required to heat and activate the thermal binder that is mixed in with the SAP. The offline process is designed to produce a wide material at slower speeds. The material output is then slit into narrower widths to supply several diaper lines. In contrast, the online process is designed to produce a narrow (1-wide) material at higher speeds and supply core material for only one diaper machine at a time.

[00146] So, in a preferred embodiment using the offline method according to the third method described above, a small quantity (10% or less) of hot melt particles is mixed in with the SAP. This particle mix is uniformly deposited on substrate A and then, subjected to radiant IR heating to melt the adhesive particles. The second substrate B is then laid on top while the material is still hot. The layers are immediately laminated together using heat embossing with a patterned roll/smooth anvil embossing system. Table 2 below summarizes the process and provides certain parameters of a preferred embodiment.

[00147] Table 2. Exemplary Offline Process of Manufacturing Using Hot Melt Adhesive

Core Structure	Substrate A	SAP BW, gsm	Hot Melt	Activation	Substrate B	Bonding Pattern
A	20-80 gsm ADL web	150 - 750	Abifor 1605, 5-10%	IR Heating	Tissue	Diamond, 22 x 50mm

[00148] A coating line manufactured by Santex, Tobel, in Switzerland may provide the SAP scattering technology, IR heating and web handling. See *e.g.*, FIG. 18B. As shown in FIG. 18B, a scatter unit utilizes a hopper and a standard rotating needle roll to mix and apply the mixture on the web. The SAP material is chosen according to its suitability for the application, but in general, SAP with high retention capacity and high absorbency under load are preferred, for example, Centrifuge Retention Capacity (CRC) of from 20 – 40 g/g, a Pressure Absorbency Index (PAI) greater than 100 g/g An exemplary SAP is M-151 manufactured by Nippon Shokubai. A suitable hot melt adhesive is low melting EVA polymer, Abifor 1605, 0-200 micron particle size grade, which is currently available from Abifor Powder Technology, Switzerland. As shown in the detail of FIG. 18, a readily available scatter unit employs a needle roll in mixing and applying the mixture on the web. The bonding pattern specified for this embodiment is an elongated diamond with a major axis length of 50mm oriented in the MD direction and a minor axis length of 22mm. See *e.g.*, FIG. 18C.

[00149] FIG. 19 depicts an absorbent composite 910 that is produced by the method and system as described in respect to FIGS. 18A-18C above. Preferably, the composite 910 includes a bottom substrate A that is a bulky nonwoven, a top layer or substrate B, and superabsorbent particles S situated between the two layers and interspersed with hot melt adhesive particles HM (as described above). More preferably, the top substrate B is provided by a tissue material readily available and understood in the art. The top substrate B may, in the alternative, be provided by a second bulky nonwoven layer or an SMS or spunbond ("non-bulky") nonwoven layer.

[00150] As described above, a laminate of the absorbent composite 910 may be manufactured on-line or off-line. The laminate may be modified to incorporate additional or differential SAP loading (*i.e.*, Profiled Core) as also discussed above. In an off-line process, the composite may be delivered as a wide sheet that is slitted and divided into individual core composite sections.

[00151] FIGS. 20A and 20B are cross-sectional views of a disposable absorbent article 812 (laid flat) incorporating an absorbent core laminate 812 or absorbent composite 810. For

convenience in describing the accompanying Figures, a complete absorbent composite extended to provide a complete absorbent core of a disposable absorbent article may be referred to as an absorbent core laminate while an absorbent composite may be used to describe components of a section or portion of the laminate. Elsewhere, including the claims, the terms may be used interchangeably. The absorbent core laminate 812 features a plurality of spaced apart pockets 814 with an aggregate 816 of SAP (superabsorbent particles (S)) contained therein. FIG. 20C provides a detail cross-sectional, elevated view of one of these pockets 814. FIG 20C also depicts the components of a preferred absorbent composite 810.

[00152] Now referring to FIG. 28, a basic disposable absorbent article 862 (in a laid flat state) is shown incorporating an absorbent core laminate 812 as the absorbent core, according to the disclosure. The absorbent core laminate 860 is completely covered by a topsheet 864 but, for convenience, the topsheet 864 is shown to be transparent. The absorbent core laminate 860 is supported on a wide backsheet 866 with side margins 868. Each side margins 868 is provided with a cutout that exhibit a concave shape on either side of the absorbent core laminate 860. As generally known, the concave cutout will coincide or correspond to leg holes about the thighs of the user.

[00153] Referring again to FIG. 20C, in a preferred construction, a nonwoven material provides a base or bottom layer 818 of the composite (during manufacture of the absorbent article product). During product use, the base layer 818 may be described as being positioned away from the body, as opposed to being positioned on the body-side of the absorbent composite 810 in direct receipt of intake. Further in this embodiment, the base nonwoven layer 818 has an adhesive layer 822 applied thereon. The adhesive layer 822 is preferably delivered, as a continuous bead, atop the base nonwoven 818 and in an advantageous open pattern, as will be described below.

[00154] The absorbent composite also includes a SAP layer 806 positioned above the adhesive layer 822 and in between the bottom nonwoven 818 and a top nonwoven layer 826. In this embodiment, the SAP layer 824 is composed of SAP particles S only, without any form of binder material or matrix. It may be described also as being fluffless or pulpless. The top nonwoven layer 826 is preferably provided by a bulky nonwoven material with fibers that extend toward and laterally entangle some SAP on or near the top surface of the SAP layer 806. The top nonwoven 826 is preferably bonded to the base nonwoven 818 by embossing and more preferably, by point bonding. Bond points 828 define the periphery of the pocket 814 and also, compress the resilient bulky nonwoven 826 at the pocket periphery to present an overall bubble or domed cross section (as shown in FIG. 20C). The simplified

illustration of FIG. 29 provides an alternate view of the absorbent composite 810 and, more particularly, the components of the composite, without showing point bonding and compression about the periphery of the pocket 814.

[00155] In this preferred construction, the bulky non-woven layer 826 contacts and covers the SAP layer 824 thereby restricting travel of SAP particles S. The bulky non-woven layer 826 is also advantageously positioned as a top layer during manufacturing and product handling, thereby restricting travel or migration of SAP particles even before use. During use of the absorbent article, the bulky non-woven 826 is also advantageously positioned on the bodyside to receive and distribute intake to the SAP layer and beyond.

[00156] In this preferred construction, the SAP is organized into discrete, spaced-apart aggregates or clumps 816 of SAP, each of which is maintained in a pocket or container 814 as described previously. The two non-woven layers 818, 826 are bonded at bond sites or, more specifically, at an arrangement of discrete, spaced-apart bond points 828. The bulky non-woven 826 is, therefore, multiply and intermittently secured over the SAP aggregates 816, and helps maintain the SAP aggregates 816 in place. The unique functions and properties imparted on the absorbent composite and absorbent core laminate through use of the bulky nonwoven are described further below.

[00157] The exploded view of FIG. 21 reveals the various components or layers of the absorbent composite 810 or absorbent laminate 812 and their relative positions, according to a preferred embodiment. FIG. 22 provides additional exploded views that illustrate a basic process or steps for making the composite, by showing the order by which the components of the composite are brought together. Reference should also be made to preceding descriptions of making an absorbent composite or an absorbent article employing the composite, including FIGS. 1-5 and descriptions associated therewith. Many of the process steps and process components described therein may be applicable or adaptable for use in the making of the absorbent composite of FIGS. 19 -29.

[00158] In an initial step of the preferred method, a web of nonwoven 818 is conveyed in the conventional manner and then, passed beside an adhesive applicator. The spray adhesive applicator preferably delivers a continuous bead onto the nonwoven 818 in an open adhesive pattern (see FIG. 22A). In this way, loops of adhesive 822a are provided on the surface of the nonwoven material 818 characterized by or defining open regions free of adhesive (rather than a uniform layer or film). The loops 822a in exemplary embodiments are smaller (*i.e.*, width or diameter) than the pockets 814 previously described, with diameters typically in the order of 1mm to 25mm.

[00159] FIG. 22B illustrates the delivery of SAP aggregates 816 by methods described herein, or otherwise known in the art, onto a substrate composed of the base nonwoven layer 818 with an adhesive layer 822 or open pattern pre-applied thereon. Specifically, SAP is delivered via an airstream and, through the use of a conventional vacuum system or suction mechanism, such as those previously described herein or otherwise known in the art. Suction applied on and beneath the web of nonwoven 818 draws SAP toward the nonwoven 818 and organizes the SAP into the desired prearrangement of aggregates or clumps 816 of SAP (as shown in FIG. 22B). The vacuum system may employ a screen or mesh interface to better engage the bottom of the non-woven and define the target geometry of the SAP aggregates. Thus, the interface presents a suction pattern that corresponds with the desired pocket pattern of the SAP aggregates 816. The vacuum system preferably draws the SAP directly from the stream above the web and into discrete clumps or aggregates on the web above the suction mechanism. Certain regions, including regions along the sides and ends are designated as SAP-free (as well as adhesive-free) zones and will be purposely left free of SAP.

[00160] SAP generally falls directly into the desired arrangement as opposed to being first distributed across the web and then moved about the web before forming tighter concentrations on the web (as in alternate embodiments). The SAP generally does not have to travel over adhesive on the web to form the target plurality of SAP aggregates 816. The resulting web is, therefore, composed of a nonwoven base layer 818 with an open adhesive pattern 822 thereon and an arrangement or layer 806 of discrete, spaced apart SAP aggregates 816. The clumps of SAP generally lay on and contact the adhesive, but the open pattern of the adhesive occupies substantially less than the bottom layer of that SAP aggregate contacts. It should be noted, however, that a SAP particle contacting adhesive may be generally immobilized. Another SAP particle positioned adjacent and in contact with such immobilized SAP particle may, in turn, be restricted (in movement) by and at least partly immobilized by that SAP particle (and/or other adjacent SAP particles). Such friction mechanism at least hinders horizontal movement of SAP particles.

[00161] As the web of nonwoven-SAP moves forward and away from the vacuum system, the adhesive pattern 822 acts to maintain the desired arrangement and position of SAP aggregates 816. In a subsequent step, a web of a second nonwoven 826 is conveyed toward and then applied over the nonwoven-SAP laminate. See FIG. 22C. As discussed above, the preferred top nonwoven 826 layer is a bulky nonwoven. With further processing and travel of the SAP aggregates 816 in a process of making an absorbent article such as a diaper or training pants, the additional nonwoven 826 provides additional cover and acts to

retain the SAP aggregates 816 in the desired pattern. In addition to providing advantageous functions in the finished product and during use, the bulky nonwoven 826 entangles top layered SAP particles S, as represented in FIG. 29, thereby furthering the immobilization of the SAP aggregates 816 (during product manufacture and then post-manufacture product handling). Entanglement of the SAP with the fibers of the bulky nonwoven restricts lateral and vertical movement of SAP near the top of the SAP aggregate 816 and also hinders movement of SAP directly beneath it. As noted herein, the SAP and bulky nonwoven are defined and selected in consideration of the desired degree of entanglement and penetration.

[00162] Next, the web of two nonwovens and SAP aggregates therebetween is passed over to a calendar roll that engages and compresses the web. The calendar roll is equipped with a surface engraving having a pattern that corresponds with the pocket pattern on the web, as described previously. FIG. 23 depicts a typical bonded absorbent composite laminate 812 using discontinuous point bonding. The dots reflect indentation in the bulky nonwoven 826 after embossing. The dots are also the bond points 828 for the pockets 814 (see also the cross-sectional views of FIGS. 20A-20C). Securing the two nonwovens together about the SAP aggregates 816 provides another mechanism for maintaining the arrangement of SAP aggregates 816 and the resultant absorbent laminate 812. As will be discussed herein, the arrangement of bond sites provides a geometric grid 830 that locate and define the pockets 814 of SAP aggregates 816.

[00163] Thus, in this exemplary embodiment, the preferred SAP laminate construction draws from several structural features to inhibit the migration of SAP particles from the desired arrangement of SAP aggregates during absorbent article product manufacture and post-manufacture handling. First, adhesive is provided on the base non-woven layer and SAP aggregates are laid on the adhesive. The optional adhesive layer is delivered, however, in an open pattern of closed loops that contact only certain bottom layered SAP particles but inhibit travel of SAP particles beyond these contacted SAP articles. The application of the top nonwoven layer over the SAP aggregates augments the minimally-applied adhesive to further restrict movement of the SAP. Advantageously, the SAP layer delivered onto the base nonwoven is pulp-free and free of a matrix or binder, which optimizes the composite's absorption and fluid handling properties. It is also free of adhesive but for the bottom layer of adhesive. Thus, much of the SAP layer, particularly, the middle part of the SAP layer, consists of SAP, although other materials may, in alternative embodiments, be included to impart beneficial properties. The predominance of the SAP-only constituency results in a thinner, softer, more flexible SAP construction, as discussed previously. Also, the large

sections of SAP-only constitution, which are adequately maintained in position (inhibiting SAP particle migration), provide improved absorbent properties and fluid handling characteristics.

[00164] As a further enhancement, the preferred SAP laminate construction utilizes an arrangement of discrete or intermittent bonding points in conjunction with the laminate construction of FIG. 22. See FIG. 23. The embossing pattern that provides the intermittent or spaced part bonding points provides a synergistic effect with utilization of the SAP laminate construction of FIGS. 20-22 and/or the use of a bulky nonwoven layer as a top or bodyside layer of the absorbent laminate (or vice versa). The gap provided between bond points allow for fluid to pass between SAP aggregates, including fluid flow passing from the SAP-only middle sections of the SAP laminate. The provision of the bulky nonwoven and/or adhesive reduces the need for complete or continuous bonding lines. Similarly, the position of the bulky nonwoven and/or point bonding reduces the amount of adhesive required for SAP stabilization.

[00165] Furthermore, reduced constriction of the bulky nonwoven layer by using the embossing points, rather than longer bond points or solid bond lines, allow for the resilient bulky woven to expand and advantageously receive and distribute fluid intake. Pressure applied by the embossing compresses the bulky nonwoven at the bond point as shown in FIG. 20C, but the resilient bulky nonwoven "bounces up" from the bond point. See also FIG. 30. This results in a more open substructure well capable of fluid handling functions. Further, the SAP-only constituent functions to receive and absorb the fluid intake and, as necessary, pass fluid intake to adjacent SAP pockets via the gap between bonds. In one respect, there is a fluid channel that runs from the top surface of the relatively open bulky nonwoven layer, through the bulky nonwoven layer, and into the SAP-only body, and from the SAP-only body middle layer, sideways through the gap between bond points, and then into another preferably, substantially SAP-only aggregate.

[00166] The plan view of FIG. 24 presents a bonded absorbent core laminate 812 mutually secured by discrete bond points 828. FIG. 24 depicts a preferred pattern of SAP pockets 814, according to this exemplary embodiment. The laminate 812 is elongated having a lateral width dimension and a longitudinal length dimension. The shape of the laminate 812 at this stage is generally rectangular. The embossing process preferably employs an intermittent bonding pattern to enhance fluid flow between pockets, as described above. The selected pocket pattern uses diamond shaped embossing to produce diamond shaped pockets 814. An advantage to the use of a diamond shape pockets and the corresponding grid is that,

with its straight, intersecting lines, it is easier to design and match engraving patterns on embossing rolls and interfaces for vacuum systems.

[00167] Preferably, the diamond shapes are arranged such that the embossing lines or series of bond points are not square with the side margins of the core. The straight lines (SL) that aligned bond sites may present on the surface of the laminate 812 are advantageously oriented at less than a ninety degree angle to the side margins and more preferably, between about 60 degrees and 30 degrees. In this way, the interconnected bonding lines (SL), which can provide a potential fluid pathway (*i.e.*, above the surface as well as in the pockets 814 and along the lines) are longer than a perpendicular line to the side margins 834 (which another pattern may represent). This addresses possible fluid leakage to the side margin 834 and encourages fluid path diversion into non-saturated pockets downstream.

[00168] The absorbent core laminate 812 also features SAP free lanes 838 proximate side margins 834 and proximate end margins 836. The steps for delivering SAP and organizing SAP aggregates on the bottom nonwoven layer are designed to leave these regions free of SAP to minimized SAP usage. The regions are later sealed and in the case of the side margins, a curved section may be cut out of the absorbent core laminate 812 to accommodate leg cutouts and/or produce an hourglass shaped core. The absence of SAP in these regions makes for a more flexible and foldable material layers. This also avoids having to cut (or seal) through the relatively harder, stiffer SAP material as may be required in the manufacturing process, thereby promoting cleaner and more precise cuts (and seals). Perhaps, more importantly, this avoids extra wear on cutting blades and maintenance and downtime of manufacturing equipment.

[00169] The plan view of FIG. 25 illustrates an alternative absorbent core laminate 840 employing an alternative pocket pattern and bonding pattern. Instead of intermittent bonding, the bond pattern employs continuous bond lines 842 that generates a solid grid. As with the previously described embodiment, diamond shaped pockets 844 are used. Among other things, the potential fluid pathway created by the connection of the bond lines is directed to an angle away from the side margin (*i.e.*, 45 degrees), thereby somewhat mitigating the risk of direct fluid strand to side margin.

[00170] As used herein, diamond shaped pockets mean a pocket having four sides and with two corners preferably mutually aligned with the longitudinal direction and the other two corners with the lateral directions. The pockets are preferably not oriented as rectangles square with the lateral and longitudinal centerlines of the laminate, wherein bond lines make for a "direct" straight line path to the side margins. As used herein, the term "grid" means the

geometry established by intersecting lines along the bond sites or embossing line. Further, as used herein in respect to an arrangement or geometry of pockets, "direct" straight line path means one or more bond lines that connect to make for a continuous and unobstructed (not "broken") path from proximate the longitudinal centerline to the side margins wherein, the path is generally perpendicular to the side margins. Such a direct straight line path makes for the shortest fluid path to the side margins. For clarity, such straight line paths that are more than thirty degrees deviated from the perpendicular shall be referred to as an indirect straight line path and do not direct straight line paths. Straight line paths that are not so deviated are considered "direct straight" line paths.

[00171] It should be noted that other "grids" and other pockets shapes and pocket arrangements may be employed. Some pocket shapes employed will not exhibit any direct or for that matter, any straight line, paths to the side margins. These include some arrangements previously described herein, including arrangement of circle or elliptical shaped pockets.

[00172] Profiled Core Composite

[00173] In this preferred embodiment, the method of manufacturing an absorbent core includes steps for delivering a profiled core construction. The method is a further version of the method previously described, and in one preferred process, incorporates all of the steps of the previous method. For example, while the earlier method may employ a single SAP applicator, the present method employs a second SAP applicator to augment SAP delivery by the first SAP applicator. The second SAP applicator may be positioned upstream (in front) or downstream of the first applicator. Whereas a nozzle of the first applicator may be sized to cover the width of the target core, the second applicator may be sized to cover a narrowed portion of the core. Further, the second applicator may be programmed for delivery for a specified period that is a fraction of the delivery period of the first applicator. For example, the first applicator may be programmed to continuously deliver to almost the entire width of the SAP core (except for a narrow SAP-free lane at the side margins). The second applicator may be sized and programmed to deliver SAP to a narrower central region and/or for an intermittent period that will correspond to a central region of the core. In exemplary embodiments, the second SAP applicator is positioned downstream of the first SAP applicator thereby delivering a second dose or load of SAP over the SAP first deposited on the web of nonwoven. Thus, the arrangements of SAP aggregates sourced by the second applicator (as well as the first applicator) have a higher SAP loading than other SAP aggregates sourced only by the first applicator.

[00174] As before, the preferred process employs suction mechanisms and screens to organize the SAP pockets on the web. Upon delivery, the SAP loads are quickly drawn into the SAP aggregate formation. SAP aggregates sourced by two SAP applicators provide pockets with a thicker and larger SAP layer, than pockets that are not so sourced.

[00175] In the preferred arrangement, the dual SAP-loaded pockets are located in a central region where most intake occurs. In further embodiments, the constituents of the two SAP loadings may be varied to achieve a desired mixture or the desired absorbent or fluid handling properties. In yet further embodiments, additional SAP applicators may be employed and strategically located to produce the desired SAP pocket pattern and function.

[00176] Use of Bulky Nonwovens

[00177] The "bulky" nonwoven referred to herein is, and provides, an open, fibrous network or web of hydrophilic but non-absorbent fibres. Further, as used herein, a bulky nonwovens is a fibrous web material having a thickness of between 100µm and 10,000µm (preferably 1,000µm to 5,000µm), basis weight between 15g/m^2 and 200g/m^2 (preferably, between 20g/m^2 and 80g/m^2), and density between 0.01 g/cc and 0.3 g/cc (preferably between 0.01– 0.08g/cc). Moreover, the bulky nonwoven will have an effective pore diameter between 300 µm to 2000µm. Typically, particles of the SAP selected will have an average particle size of about 300 µm, which ensures some penetration or entanglement between SAP and the selected bulky nonwoven. Tables 3 and 4 below may be used in further defining the bulky nonwoven and showing the interrelation between the key properties. (The shaded areas in the Tables point to bulky nonwoven materials according to the disclosure.) The effective pore diameter is estimated from web density, fiber diameter and fiber density values following the method of Dunstan & White, J. Colloid Interface Sci, 111 (1986), 60 wherein effective pore diameter = 4 * (1-solid volume fraction) / (solid volume fraction * solid density * solid specific surface area).

[00178] Suitable fibres include polypropylene (PP), polyethylene (PE), polyethylene terephthalate (PET), polylactic acid (PLA), polyolefins, copolymers thereof and any combination thereof including bicomponent fibres. The fibres are usually treated with a surface active agent, surfactant, to modify the surface tension of the fibres so that they are hydrophilic.

[00179] Table 3.

Web Thickness (in microns) vs. Basic Weight and Density

Basis Weight	Web Density 0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.1	0.15	0.2	0.3
15	1500	750	500	375	300	250	214	188	167	150	100	75	50
20	2000	1000	667	500	400	333	286	250	222	200	133	100	67
30	3000	1500	1000	750	600	500	429	375	333	300	200	150	100
40	4000	2000	1333	1000	800	667	571	500	444	400	267	200	133
50	5000	2500	1667	1250	1000	833	714	625	556	500	333	250	167
60	6000	3000	2000	1500	1200	1000	857	750	667	600	400	300	200
70	7000	3500	2333	1750	1400	1167	1000	875	778	700	467	350	233
80	8000	4000	2667	2000	1600	1333	1143	1000	889	800	533	400	267
90	9000	4500	3000	2250	1800	1500	1286	1125	1000	900	600	450	300
100	**10000**	5000	3333	2500	2000	1667	1429	1250	1111	1000	667	500	333
110	11000	5500	3667	2750	2200	1833	1571	1375	1222	1100	733	550	367
120	12000	6000	4000	3000	2400	2000	1714	1500	1333	1200	800	600	400
130	13000	6500	4333	3250	2600	2167	1857	1625	1444	1300	867	650	433
140	14000	7000	4667	3500	2800	2333	2000	1750	1556	1400	933	700	467
150	15000	7500	5000	3750	3000	2500	2143	1875	1667	1500	1000	750	500
160	16000	8000	5333	4000	3200	2667	2286	2000	1778	1600	1067	800	533
170	17000	8500	5667	4250	3400	2833	2429	2125	1889	1700	1133	850	567
180	18000	9000	6000	4500	3600	3000	2571	2250	2000	1800	1200	900	600
190	19000	9500	6333	4750	3800	3167	2714	2375	2111	1900	1267	950	633
200	20000	10000	6667	5000	4000	3333	2857	2500	2222	2000	1333	1000	667

[00180] Table 4.

Pore Diameter (in microns) vs. Density at a given Fiber Size and Fiber Density

Fiber Type	Fiber Denier	Fiber Density	Web Density 0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.1	0.15	0.2	0.3
Polyolefin (PP or PE)	**1.5**	**0.91**	1374	680	448	332	263	216	183	158	139	124	77	54	31
	3	**0.91**	1944	961	633	470	371	306	259	224	197	175	109	77	44
	6	**0.91**	2749	1359	896	664	525	433	366	317	278	247	155	108	62
	12	**0.91**	3887	1922	1267	939	743	612	518	448	394	350	219	153	88
	20	**0.91**	5018	2481	1636	1213	959	790	669	579	508	452	283	198	113
Polyester (PET, PLA)	**1.5**	**1.3**	1648	818	541	402	319	264	224	195	172	153	98	70	43
	3	**1.3**	2331	1156	765	569	452	373	317	276	243	217	139	99	60
	6	**1.3**	3296	1635	1082	805	639	528	449	390	344	307	196	141	85
	12	**1.3**	4662	2313	1530	1138	903	747	635	551	486	434	277	199	120
	20	**1.3**	6018	2986	1975	1470	1166	964	820	711	627	560	358	257	156
PET/PE Bicomponent	**1.5**	**1.1**	1514	750	495	368	292	241	204	177	156	139	88	63	37
	3	**1.1**	2141	1061	701	521	412	340	289	250	220	196	124	88	52

	6	1.1	3028	1500	991	736	583	481	409	354	312	278	176	125	74
	12	1.1	4282	2121	1401	1041	825	681	578	501	441	393	249	177	105
	20	1.1	5528	2739	1809	1344	1065	879	746	647	569	507	321	228	135
Cellulosic (Rayon)	1.5	1.5	1772	880	583	434	345	285	243	211	186	167	107	77	48
	3	1.5	2506	1245	824	614	488	404	344	299	264	235	151	109	67
	6	1.5	3544	1760	1166	868	690	571	486	422	373	333	214	155	95
	12	1.5	5013	2489	1648	1228	976	807	687	597	527	471	303	219	135
	20	1.5	6471	3214	2128	1585	1260	1042	887	771	680	608	391	282	174

[00181] As described above in respect to FIGS. 16 and 17, there are fluid handling benefits that arise from the employment of a bulky nonwoven as a fabric in the absorbent composite. Furthermore, orientation of the absorbent composite with the bulky nonwoven positioned on the body side is particularly advantageous as it enhances the absorbent composite's capacity for acquisition and distribution of fluid intake. The bulky nonwoven has a high void volume and permeability, and allows the composite to quickly capture and efficiently distribute the fluid away from the insult point.

[00182] Additionally, the bulky nonwoven with the embossing patterns described also has the following features:

- The "pillow" structure (see *e.g.*, FIG. 20C, FIG. 29 and FIG. 30) provided by the bulky nonwoven as a bodyside layer creates a compressible and resilient structure that enhances the perception of softness.
- Within a pocket area, a pore size gradient exists (*see e.g.*, FIG. 20C and FIG. 30) that encourages the liquid to move from the crests (more open area with larger interfiber distance, I) to the bonded area (more dense area with smaller interfiber spacing). This is illustrated in FIG. 30 which shows the bulky nonwoven 826 exhibiting smaller interfiber distances I toward the bond point 828. Since capillarity is inversely related to density, the capillarity of the denser area is higher than the more open area hence liquid within the nonwoven will tend to be drawn towards the denser areas. This is particularly important for dryness perception since it allows any remaining liquid at the crests to drain away towards the bonded areas and further into the underlying SAP structure where the liquid is tightly held. Hence, a top surface that is relatively free of liquid is created which contributes to the perception of dryness. This pore gradient also discourages fluid from flowing back to the surface.
- The discontinuous bonding pattern also contributes to the softness perception by creating a more flexible composite.

[00183] Spray Adhesive

[00184] Adhesives can be used to provide additional bonding for the composite and can be used to help secure the SAP on the nonwoven. This is needed during manufacture of the composite, subsequent and further processing of the disposable absorbent article incorporating the composite, and the storage and eventual use of the composite in the absorbent article. Ideally, the adhesive is applied to at least one of the nonwoven webs of the composite or adhesive can be applied to both the upper and lower nonwoven webs.

[00185] Suitable adhesives include hotmelt adhesives that are applied by either a slot coat or a spray coat applicator (such as those supplied by Nordson Corporation). In a preferred embodiment, the adhesive is applied by a spray method where continuous beads of hotmelt adhesive are directed by air streams into patterns, such as a spiral pattern or a more random pattern. FIGS. 22 show one such pattern. The diameter of the spiral is in the range of 1mm to 25mm. The advantage of such spray patterns is that the adhesive coverage on the nonwoven web is not uniform and there are open areas that are substantially free of adhesive. These open areas provide unrestricted access for fluid flow through the nonwoven web and into the superabsorbent layer, whereas a uniform coating may slow down or reduce the flow of fluid through the web.

[00186] In other and various embodiments in which adhesives are, the preferred adhesive is hydrophillic. Moreover, the concentration of adhesive in a coat varies between 0.5 and 100 grams per square meter. Optimally, the concentration is between 1 and 25 GSM. In a preferred embodiment, the concentration is between 2 and 10 GSM.

[00187] To illustrate possible variations of the preferred embodiment, FIG. 26 provides an exploded view of an absorbent core laminate 850 according to an alternate embodiment. The absorbent core laminate 850 employs a base nonwoven layer 818 with an adhesive pattern 822 pre-applied thereon, as described previously. The laminate 850 also provides a first layer 816 of spaced apart SAP aggregates that occupy substantially the lateral and longitudinal expanse of the laminate 850. The adhesive pattern 822 and the SAP aggregates may be applied as described previously, with the SAP being delivered by a SAP applicator and organized into the desired pocket pattern with the aid of a conventional vacuum system and the like, as described previously. In this variation, a second SAP applicator may be positioned downstream of the first SAP applicator to deposit SAP onto a selected region(s) of the web having the first layer 816 of SAP aggregates already provided thereon. A region selected to receive additional SAP constituent or perhaps, absorbent material having properties different from the SAP first delivered, is typically a central region that will

correspond to a crotch region when the disposable absorbent article is in use. In the process in which the machine direction of the laminate 850 coincides with the lateral direction, the SAP applicator may be equipped with a nozzle or spray area that is narrower than that of the first SAP applicator. The region on which SAP is delivered will, therefore, be narrower than the SAP layer 816. If the machine direction coincides with the longitudinal direction, the second SAP applicator may be programmed to deliver SAP only during a period aligned with travel of the central region under the second SAP applicator.

[00188] Referring to FIGS. 20A and 20B, the pockets 814 in a central region 854 contain concentrations or SAP aggregates that are greater than SAP concentrations in pockets 814 near longitudinal end regions 856 of the absorbent core laminate 812. Intermediate of these regions and the central regions, there are pockets 857 containing SAP in concentrations that is somewhere in the middle. The concentrations of SAP in these pockets 857 may be determined by the extent of the second SAP applicator and possibly a sharing of excess SAP between adjacent pockets. These pockets 857 may serve as a gradual transition between high and low capacities of SAP and absorption and swell properties, and may produce beneficial fluid flow (across the absorbent core), as discussed herein.

[00189] Referring again to FIG. 26, this embodiment is also equipped with a second adhesive pattern 862 to help secure SAP in the pockets. The adhesive pattern 862 may be identical to the open pattern 822 preferred for application on the bottom nonwoven, and will be pre-applied to the top nonwoven 826 before introduction of the top nonwoven 826 into the resulting laminate 850. In the resulting construction, this second adhesive pattern 862 helps secure particles of the SAP aggregate that contact or nearly contact the top non-woven 826. If a bulky nonwoven is employed as a top nonwoven 826, the adhesive helps secure SAP in the top layer region of the SAP aggregate with fibers of the bulky nonwoven, including promoting SAP entanglement. It is possible that when two adhesive patterns are employed in a laminate design, as with the laminate of FIG. 26, the total amount of adhesive (e.g., thickness of the bead, size of the loops) used in each pattern may be reduced. Moreover, the number or frequency of bond points may also be reduced. The various mechanisms for securing SAP in the pockets 814 act differently on the SAP and from various perspectives, but work together to obtain a common objective.

[00190] FIG. 27 illustrates a subsequent stage in an exemplary process of making an absorbent core laminate and/or disposable absorbent article. A web 870 of separable absorbent core laminates 872 is shown being conveyed with the lateral direction coinciding with the machine direction. The laminates 872 are shown being prepared with an hourglass

shape. The delivery of SAP onto the bottom nonwoven is provided such that SAP-free regions 874 are present near or along the eventual side margins 876 of individual absorbent core laminates. Furthermore, as shown in FIG. 27, wider regions 878 near the center of the side margins 876 are also void of SAP in preparation of a cut to accommodate a leg hole and/or simply, produce the preferably hourglass shape that helps to more readily fit or accommodate the user around the crotch region. In this way, SAP usage and material cost may be reduced.

[00191] In any event, a narrow region or layer 852 of SAP aggregates is deposited atop the first layer 816, and in the selected central region. The vacuum system may again be employed to direct the deposit of SAP to the target areas. In this way, SAP aggregates of higher concentrations are generated.

[00192] Typically, the absorbent core laminate 812 is elongated with a pair of longitudinally-spaced apart end regions 856 and a central region 854 therebetween. The absorbent core laminate is situated between the topsheet and backsheet in what is referred to as a "core envelope" 880. See also cross-sections FIG. 20A and 20B. FIG. 20A may be described as a cross-sectional view laterally across the core envelope 880 (*i.e.*, a cross lateral centerline XX) while FIG. 20B is a cross-sectional view longitudinally across the core envelope 880 (*i.e.*, across longitudinal centerline YY). Absorbent core laminate 812 may also be described as having side margins that extend between the end regions 856. An arrangement of the pockets 814 of SAP aggregates 816 is set between the side margins 812. As can be seen from the drawings, the arrangement defines a pattern or grid on the absorbent core laminate 812. About the central region 854, a pair of cutouts 882 into the side margin 856 provides a concavity in the generally rectangular laminate 812, which reduces the population of pockets 814 in the central region 854. The concavity makes for a generally hourglass shape to the absorbent core laminate 812. As the central region 854 generally corresponds with crotch region of the disposable absorbent article 862, the concavity of the absorbent laminate 812 and general absence of the relatively stiffer (than the topsheet and backsheet material) core material facilitates the deformation of the absorbent article 862 in the crotch region during use and helps to accommodate the contour of the user.

[00193] The present disclosure is, therefore, well adapted to carry out the objects and attain the ends and the advantages mentioned, as well as others inherent therein. While presently preferred embodiments (in the form of a diaper) have been described, numerous changes to the details of construction, arrangement of the article's parts or components, and the steps to the processes may be made. For example, the various topsheets, backsheet,

absorbent core, containment walls and other absorbent composite structures may be utilized in other parts of the article or with other articles other than diapers. Such changes will readily suggest themselves of those skilled in the art and are encompassed within the spirit of invention and in the scope of the appended claims.

[00194] Although the present disclosure and its advantages have been described in detail, it should be understood that various changes, substitutions and alterations can be made herein without departing from the invention as defined by the appended claims. Moreover, the scope of the present application is not intended to be limited to the particular embodiments of the process, machine, manufacture, composition of matter, means, methods and steps described in the specification. As one will readily appreciate from the disclosure, processes, machines, manufacture, compositions of matter, means, methods, or steps, presently existing or later to be developed that perform substantially the same function or achieve substantially the same result as the corresponding embodiments described herein may be utilized. Accordingly, the appended claims are intended to include within their scope such processes, machines, manufacture, compositions of matter, means, methods, or steps.

CLAIMS

What is claimed is:

1. An absorbent core composite for a disposable absorbent article, comprising:

a first fabric;

a body side second fabric; and

a plurality of aggregates of superabsorbent particles (SAP) situated between said first and second fabric;

wherein, about each of a plurality of said SAP aggregates, an arrangement of spaced apart bond sites secure the second fabric to the first fabric and form a pocket in which the SAP aggregate is secured between the first fabric and the second fabric;

wherein spaced apart bond sites about said SAP aggregates provide gaps between bond sites that communicate one of said pockets with an adjacent said pocket; and

wherein said body side second fabric is a bulky nonwoven including fibers entangling at least some particles in said SAP aggregate.

2. The absorbent core composite of claim 1, wherein each said SAP aggregate is free of an absorbent matrix.

3. The absorbent core composite of claim 1, wherein said SAP aggregates consist of superabsorbent particles.

4. The absorbent core composite of claim 1, wherein said second fabric includes fibers that penetrate the SAP aggregate at a top layer of superabsorbent particles, the SAP aggregate being free of an absorbent matrix.

5. The absorbent core composite of claim 1, further comprising:

an adhesive pattern applied on the first fabric and adhesively contacting superabsorbent particles of said SAP aggregate positioned in a bottom layer of particles in said SAP aggregate adjacent said first fabric, to at least partially secure the superabsorbent particles of said SAP aggregate.

6. The absorbent core composite of claim 5, wherein said adhesive pattern applied on said first fabric contains a plurality of intersecting loops defining open regions free of adhesive.

7. The absorbent core composite of claim 1, wherein said open regions free of adhesive generally have a width or diameter less than a width or diameter of said pockets situated on said adhesive pattern.

8. The absorbent core composite of claim 1, wherein said bulky nowoven second fabric has a thickness between 1,000µm to 5,000µm , density between 0.02g/cc and 0.07 g/cc, basis weight between 20g/m^2 and 80g/m^2, density between 0.01g/cc and 0.08g/cc, and effective pore diameter greater than 300µm.

9. The absorbent composite of claim 8, wherein said bulky nonwoven includes fibers selected from the group consisting of: polypropylene (PP), polyethylene (PE), polyethylene terephthalate (PET), polylactic acid (PLA); polyolefins, copolymers thereof, and combinations thereof; and wherein said fibers are treated fibers that are hydrophilic.

10. The absorbent composite of claim 10, wherein said first fabric is a nonwoven material, and said first and second fabrics define, at least partially, an elongated laminate having a lateral width, a longitudinal width, and a central region positioned about an intersection of a lateral centerline and a longitudinal centerline of said elongated laminate.

11. The absorbent composite of claim 10, wherein said bond sites form a plurality intersecting lines defining a grid of diamond shaped pockets.

12. The absorbent composite of claim 10, wherein said bond sites form a plurality of intersecting lines defining a grid of shaped pockets, wherein all straight lines defined by a series of pockets extending from the longitudinal centerline toward side margins of the laminate are oriented at an angle less than sixty degrees from the longitudinal centerline.

13. The absorbent composite of claim 10, wherein said plurality of pockets include pockets of different swell capacities that impart unto said laminate a property of exhibiting a surface topography sensitive to liquid intake.

14. The absorbent composite of claim 10, wherein said plurality of pockets include pockets of different swell capacities, wherein pockets in the central region have a lesser swell capacity than pockets outside the central region.

15. The absorbent composite of claim 10, wherein said plurality of pockets in the central region are smaller than pockets outside the central region.

16. The absorbent composite of claim 1, wherein said bond sites are intermittent bond points.

17. The absorbent composite of claim 1, wherein each said fabric is pre-applied with an adhesive pattern having loops defining open regions free of adhesive; and

wherein said SAP aggregates are pulpless and free of an absorbent matrix.

18. A method of manufacturing an absorbent composite laminate for a disposable absorbent article, comprising:

conveying a first fabric into position to receive superabsorbent particles (SAP);

depositing SAP on said first fabric to provide discrete aggregates of SAP;

conveying a second fabric of a bulky nonwoven;

positioning the second fabric relative to said first fabric such that fibers of said bulky nonwoven entangle particles in a top layer of particles of the SAP aggregate, thereby securing, at least partly, the SAP aggregate therebetween;

bonding said first and second fabric at a network of bond sites to form an elongated laminate having a plurality of pockets of SAP aggregate, whereby each pocket is defined by bond sites positioned about a SAP aggregate and securing the second fabric to the first fabric; and

conveying the elongated laminate, whereby said bulky nonwoven and said pockets inhibit SAP particle migration from said pockets.

19. The method of claim 18, wherein said SAP deposited is free of an absorbent matrix such that said SAP aggregates are free of an absorbent matrix.

20. The method of claim 18, wherein said conveying said fabric is preceded by applying an adhesive pattern on said first fabric, such that said depositing superabsorbent particles on said first fabric includes delivering a plurality of SAP aggregates on said first fabric with the adhesive pattern preapplied thereon.

21. The method of claim 20, wherein said applying adhesive includes applying adhesive in a continuous open pattern having enclosed open regions free of adhesive.

22. The method of claim 21, wherein said open regions have an average width smaller than an average width of said pockets.

23. The method of claim 23, further comprising applying an adhesive pattern on said second fabric prior to positioning said second fabric relative to said first fabric.

24. The method of claim 18, wherein said bonding includes bonding said fabrics using arrangements of discontinuous bond sites about said SAP aggregates to produce pockets bounded by spaced apart bond sites with gaps therebetween for fluid passage.

25. The method of claim 24, wherein the arrangements of bond sites form a grid characterized by straight bond lines directed generally laterally toward side margins of the laminate at angles deviated more than fifteen degrees from a line perpendicular to a longitudinal centerline of said elongated laminate.

26. The method of claim 25, wherein the arrangements of bond sites form diamond shaped pockets.

27. The method of claim 24, wherein said bonding includes providing an embossing pattern corresponding to the arrangement of SAP aggregates on the first fabric, the embossing pattern presenting arrangements of discontinuous bond sites that surround a SAP aggregate during bonding.

28. The method of claim 27, wherein the pattern includes a grid free of any direct straight line paths to the side margin.

29. The method of claim 18, wherein said bulky nowoven second fabric has an effective pore diameter greater than 300μm and an average size of SAP particles is about 300μm.

30. The method of claim 18, wherein said bulky nowoven second fabric has a thickness between 1,000μm to 5,000μm , density between 0.02g/cc and 0.07 g/cc, basis weight between 20g/m^2 and 80g/m^2, density between 0.01g/cc and 0.08 g/cc, and an effective pore diameter greater than 300μm.

31. The method of claim 30, wherein said bulky nonwoven includes fibers selected from the group consisting of: polypropylene (PP), polyethylene (PE), polyethylene terephthalate (PET), polylactic acid (PLA); polyolefins, copolymers thereof, and combinations thereof; and wherein said fibers are treated fibers that are hydrophilic.

32. The method of claim 18, further comprising, independent of said depositing superabsorbent particles on said first fabric, further depositing superabsorbent particles in select regions of said first fabric, such that pockets of SAP aggregates formed after said bonding of first and second fabrics in said select regions contain greater concentrations of SAP aggregates than pockets outside of said select regions.

33. The method of claim 18, wherein said bond sites are spaced apart bond points defining fluid gaps therebetween and between adjacent pockets.

34. A method of making a disposable absorbent article, said method comprising:

conveying a first fabric into position to receive superabsorbent particles (SAP);

depositing superabsorbent particles on said first fabric to provide discrete aggregates of SAP free of an absorbent matrix;

conveying a second fabric of a bulky nonwoven;

positioning the second fabric relative to said first fabric such that fibers of said bulky nonwoven entangle particles in a top layer of particles of said SAP aggregate, thereby securing, at least partly, the SAP aggregate; and

bonding said first and second fabric at a network of bond sites to form an elongated absorbent core laminate having a plurality of pockets of SAP aggregate, whereby each pocket is defined by bond sites positioned about a SAP aggregate and securing the second fabric to the first fabric;

conveying the elongated laminate, whereby said bulky nonwoven and said pockets inhibit SAP particle migration from said pockets;

situating the elongated core laminate between a topsheet and a backsheet, thereby forming a core envelope of said topsheet, backsheet, and absorbent core laminate, the topsheet and backsheet further providing a chassis supporting said absorbent core laminate;

forming leg holes in said chassis; and

joining end regions of said chassis to form a disposable absorbent article, whereby said bulky nonwoven and said pockets inhibit SAP particle migration from said pockets.

35. The method of claim 34, wherein said conveying said fabric is preceded by applying an adhesive pattern on said first fabric.

36. The method of claim 35, wherein said applying adhesive includes applying adhesive in a continuous open pattern having enclosed open regions free of adhesive, and wherein said open regions have an average width smaller than an average width of said pockets.

37. The method of claim 34, wherein said bonding includes bonding said fabrics using arrangements of bond points about said SAP aggregates to produce pockets bounded by spaced apart bond points with gaps therebetween for fluid passage.

38. The method of claim 34, wherein the arrangements of bond points form a grid characterized by lines through the bond points directed generally laterally toward side margins of the elongated laminate at angles less that ninety degrees from a longitudinal centerline of said laminate.

39. A disposable absorbent article, comprising:

a chassis body defined by a first end margin and a second end margin longitudinally spaced from the first end margin, the end margins partially defining front and back waist regions that are fastenable about a waist of a user;

a topsheet;

a backsheet; and

an absorbent composite disposed between the topsheet and backsheet, the absorbent composite including

a first fabric;

a second fabric bonded to said first fabric; and

absorbent particles secured between said first and second fabric; and

wherein the first fabric is intermittently attached to the second fabric to define a plurality of pockets situated between the first fabric and the second fabric and containing an aggregate of superabsorbent particles (SAP); and

wherein discontinuous and spaced apart bond sites secure the first fabric with the second fabric;

wherein said second fabric is a bulky nonwoven material positioned on a bodyside of the absorbent composite and over the SAP aggregate such that fibers of the bulky nonwoven entangle superabsorbent particles; and

wherein said SAP aggregate is free of an absorbent matrix in a middle portion extending from beneath the bulky nonwoven material.

40. The disposable absorbent particle of claim 39, wherein said SAP aggregates consists of SAP.

41. The disposable absorbent article of claim 39, wherein said absorbent composite includes an adhesive pattern preapplied on the first fabric.

42. The disposable absorbent article of claim 39, wherein said first fabric is a nonwoven material, and said first and second fabrics define, at least partially, an elongated laminate having a lateral width, a longitudinal width, and central region positioned about an intersection of a lateral centerline and a longitudinal centerline and wherein said plurality of pockets include pockets situated in said central region having concentrations of superabsorbent particles greater than pockets proximate longitudinal end regions adjacent a longitudinal extent of said laminate

43. The disposable absorbent article of claim 39, wherein said bond sites form a plurality intersecting lines defining a grid of diamond shaped pockets.

44. The disposable absorbent article of claim 39, wherein said bond sites form a plurality of intersecting lines defining a grid of shaped pockets, wherein all straight lines through bond sites in a series of pockets extending from the longitudinal centerline toward side margins of the laminate are oriented at an angle less than sixty degrees from the longitudinal centerline.

45. The disposable absorbent article of claim 39, wherein said absorbent composite includes concave portions along each side margin such that said absorbent composite has an hourglass shape.

46. An absorbent composite comprising:

a bulky nonwoven substrate;

a top fabric bonded with said bulky nonwoven substrate; and

a layer of superabsorbent particles (SAP) secured therebetween, including hot melt adhesive interspersed with said SAP to mutually secure said SAP with said bulky nonwoven substrate and said top fabric.

47. The absorbent composite of claim 46, wherein said bulky nowoven has a thickness between 1,000µm to 5,000µm , density between 0.02g/cc and 0.08 g/cc, basis weight between 20g/m^2 and 80g/m^2, density between 0.01/cc and 0.08 g/cc, and an effective pore diameter greater than 300µm.

48. The absorbent composite of claim 46, wherein said top fabric is a tissue layer.

49. The absorbent composite of claim 46, wherein said SAP is disposed along a plane between said bulky nonwoven substrate and said top fabric.

50. The absorbent composite of claim 46, wherein bonding between said bulky nonwoven substrate and said top fabric define a bonding pattern of geometric enclosures surrounding SAP.

51. A method of manufacturing an absorbent composite, said method comprising:

conveying a first substrate of a nonwoven material;

delivering a mixture of superabsorbent particles (SAP) with hot melt adhesive particles onto the conveyed first substrate;

as the first substrate with said mixture is conveyed, applying heat to the first substrate, thereby activating the hot melt adhesive particles and bonding the SAP with the hot melt particles and the first substrate; and

applying a second substrate atop the first substrate and SAP layer bonded therewith.

52. The method of claim 51, further comprising:

bonding the first substrate with the second substrate to produce an absorbent composite laminate.

53. The method of claim 52, wherein said bonding includes using heat embossing to create a bonding pattern on the absorbent composite laminate.

54. The method of claim 51, wherein the first substrate is a bulky nonwoven material.

55. The method of claim 54, wherein said bulky nowoven has a thickness between 1,000µm to 5,000µm , density between 0.02g/cc and 0.07 g/cc, basis weight between 30g/m^2 and 80g/m^2, density between 0.02g/cc and 0.07 g/cc, and an effective pore diameter greater than 300µm.

56. The method of claim 51, wherein said hot melt particles and said SAP are mixed at a ratio between 1 to 10% hot melt adhesive by weight.

57. A disposable absorbent article, comprising:

a chassis body defined by a first end margin and a second end margin longitudinally spaced from the first end margin, the end margins partially defining front and back waist regions that are fastenable about a waist of a user;

a topsheet;

a backsheet; and

an absorbent composite disposed between the topsheet and backsheet, the absorbent composite including

a first fabric;

a second fabric bonded to said first fabric; and

absorbent particles adhered between said first and second fabric; and

wherein the first fabric is intermittently attached to the second fabric to define a plurality of containers situated between the first fabric and the second fabric and containing an aggregate of absorbent particles; and

wherein the absorbent composite includes regions of containers of absorbent particles aggregates including a primary region having containers of a first size and a secondary region having a plurality of containers of a second size different from the first size; and

wherein the topsheet and backsheet define longitudinal and lateral margins of the chassis body.

58. The disposable absorbent garment of claim 57, wherein the primary region corresponds a crotch region of the article, said crotch region being located centrally intermediate the longitudinal margins of the chassis body, and wherein the absorbent particles are superabsorbent particles.

59. The disposable absorbent garment of claim 58, wherein containers of the primary region have perimeters that are greater than perimeters of containers in the secondary region.

60. The disposable absorbent garment of claim 59, wherein the containers of the secondary region surround the primary region.

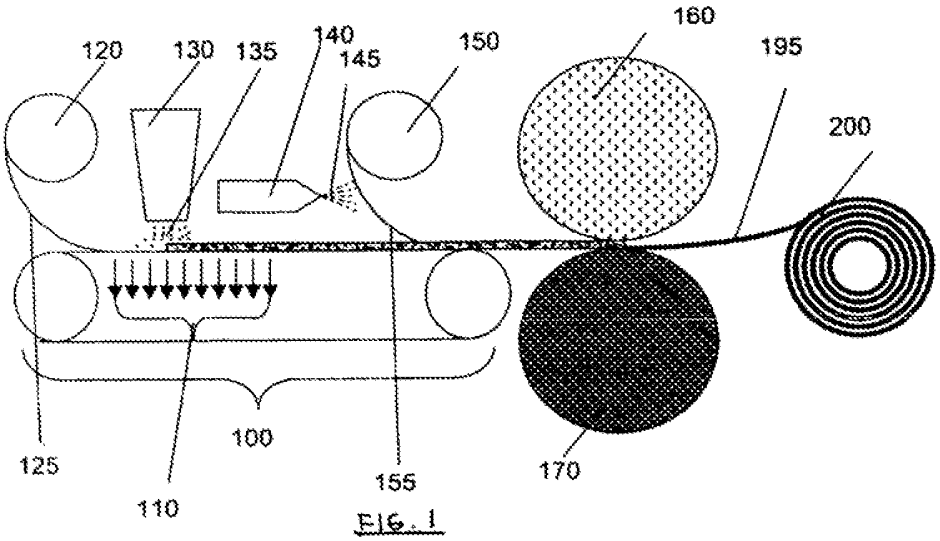
61. The disposable absorbent garment of claim 60, wherein the absorbent composite further includes end regions having containers of a size different from the size of containers in the secondary region; and wherein the secondary region is intermediate the primary region and an end region.

62. The disposable absorbent garment of claim 61, wherein each of the end regions have containers with perimeters that are substantially smaller than the perimeters of containers in the secondary region.

63. The disposable absorbent garment of claim 61, wherein containers of the end regions have perimeters that are larger than the perimeters of containers in the secondary region.

64. The disposable absorbent region of claim 61, wherein the primary region further includes a second class of containers, the second class of containers having perimeters that are substantially smaller than a first class of containers, and wherein the containers of the second class are positioned to fill voids between adjacent containers of the first class.

65. The disposable absorbent garment of claim 64, wherein the containers at the first size have a larger concentration of superabsorbent particles than the containers of the second size.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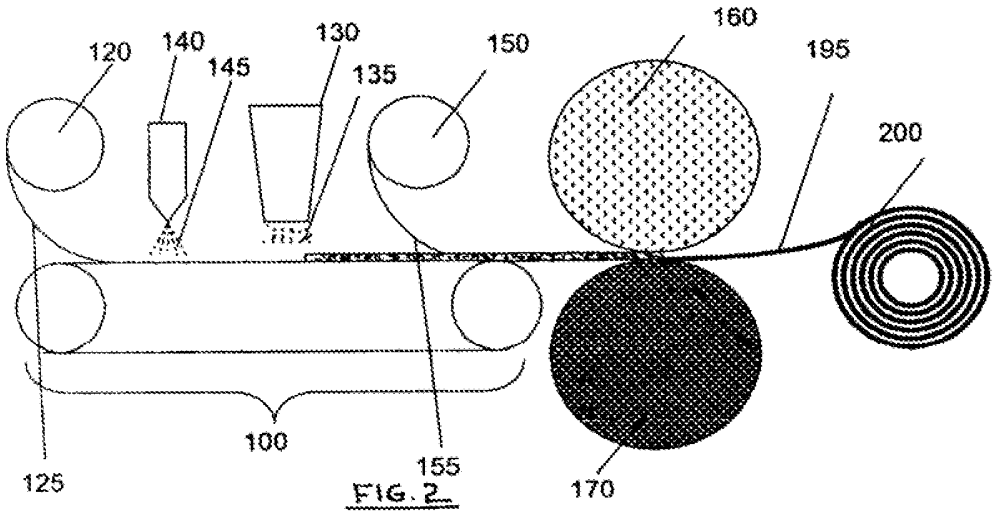
170

FIG. 1


120
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125
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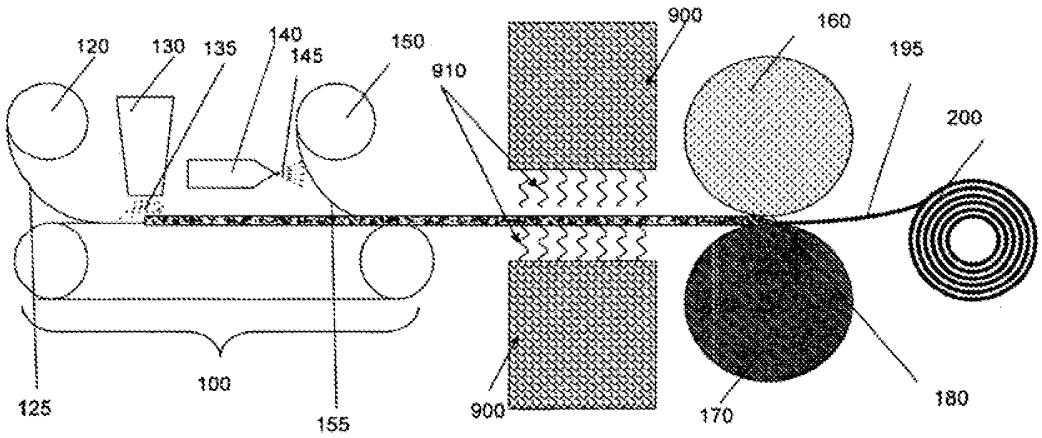
170

FIG. 2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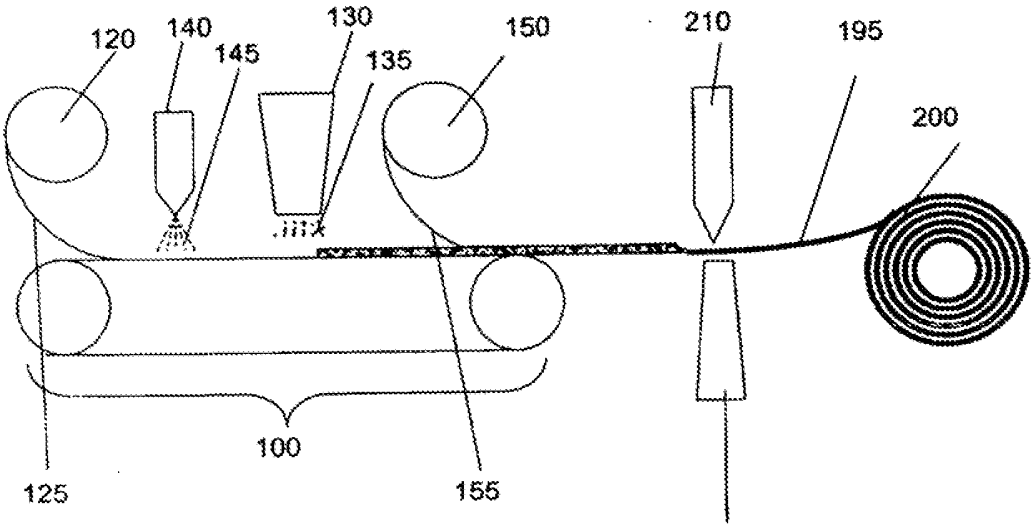
900
170
180

FIG. 3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200
125
100
155
210b

FIG. 4

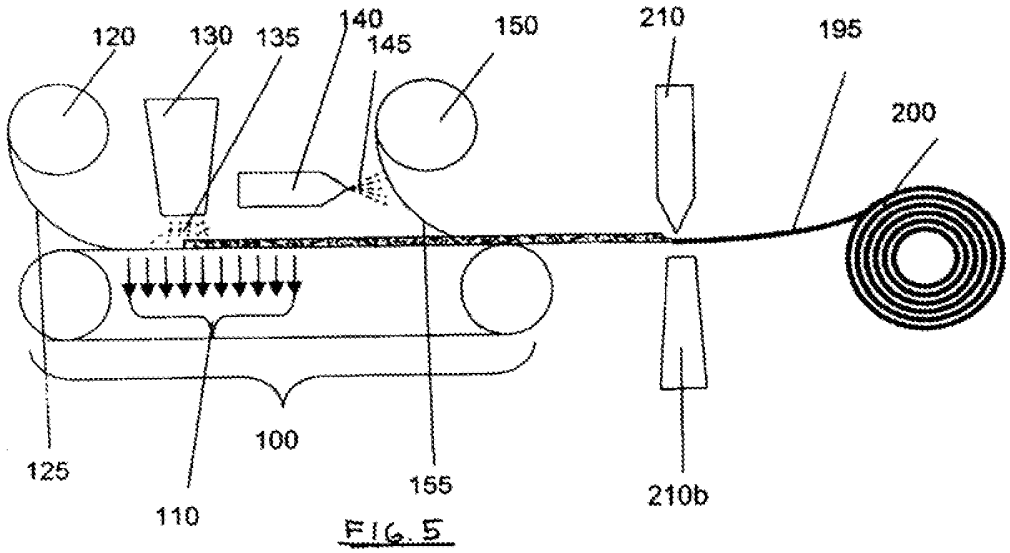


FIG. 5

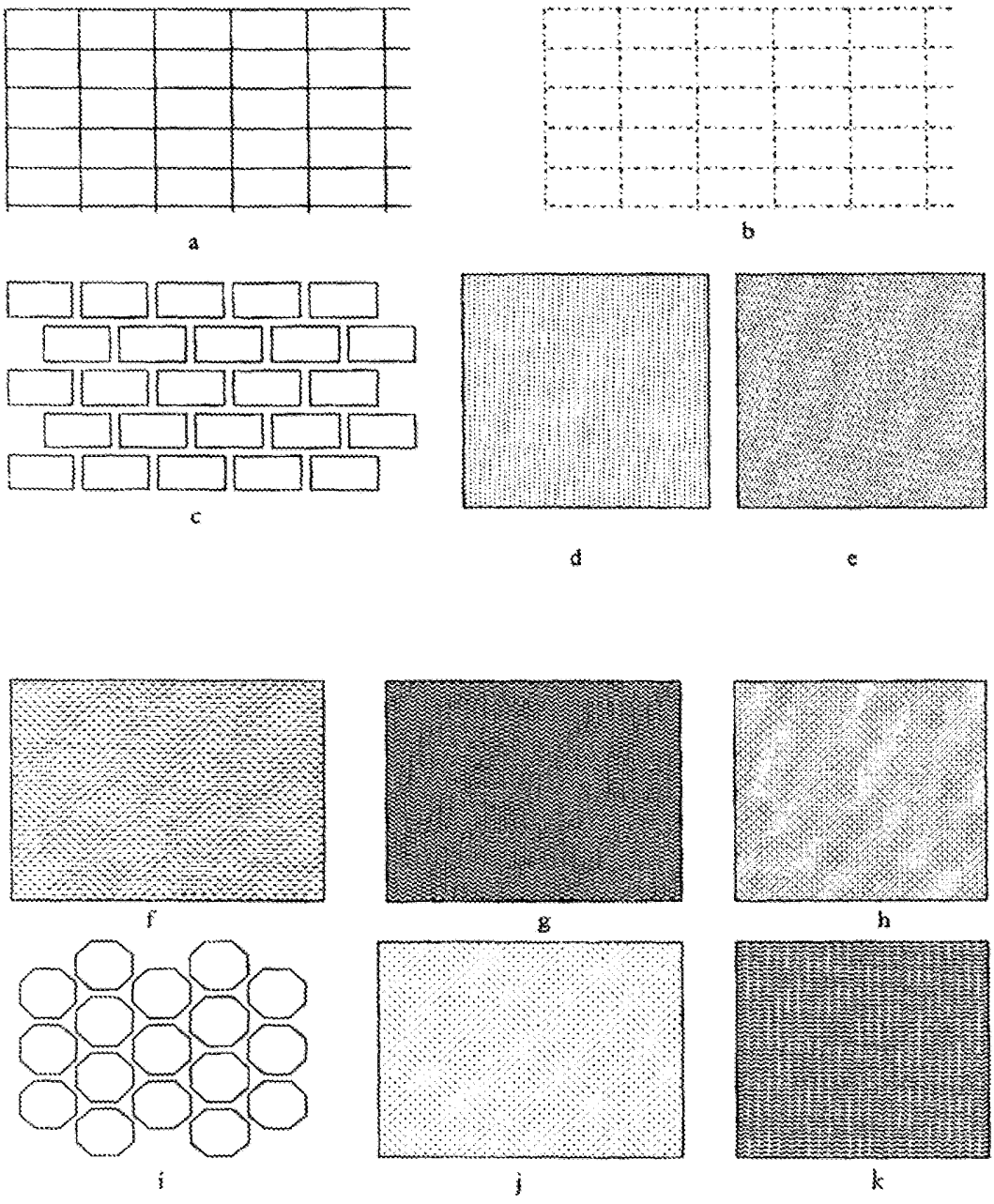
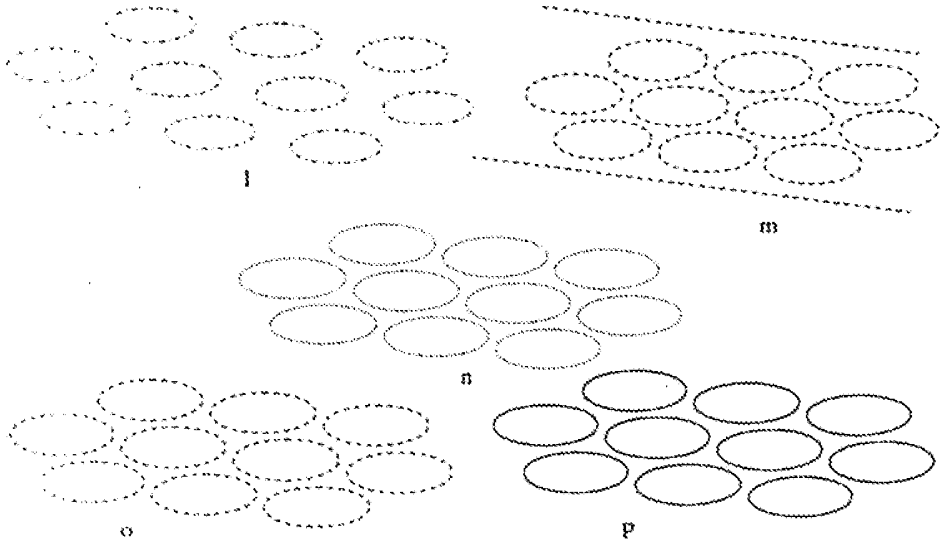


FIG. 6



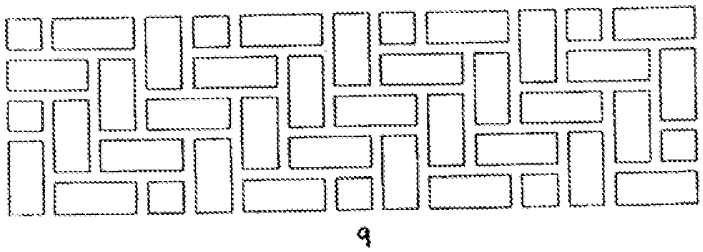


FIG. 6 (cont'd)

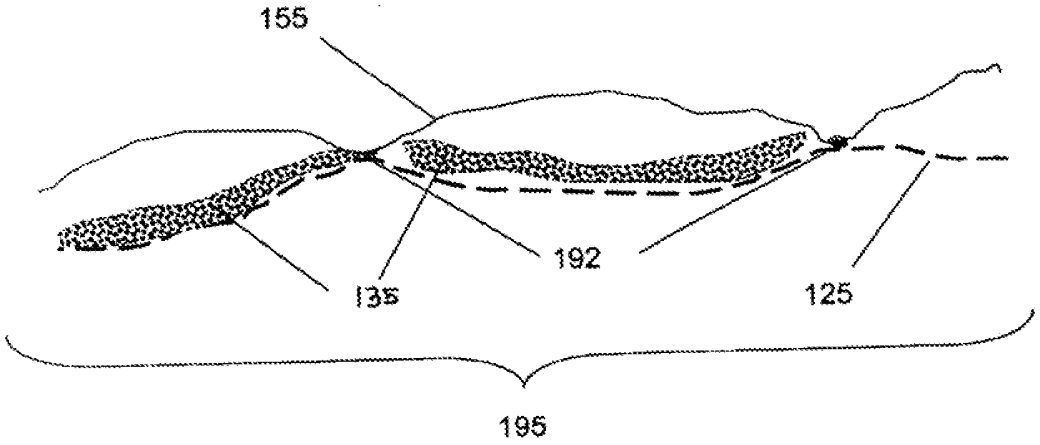


FIG. 7

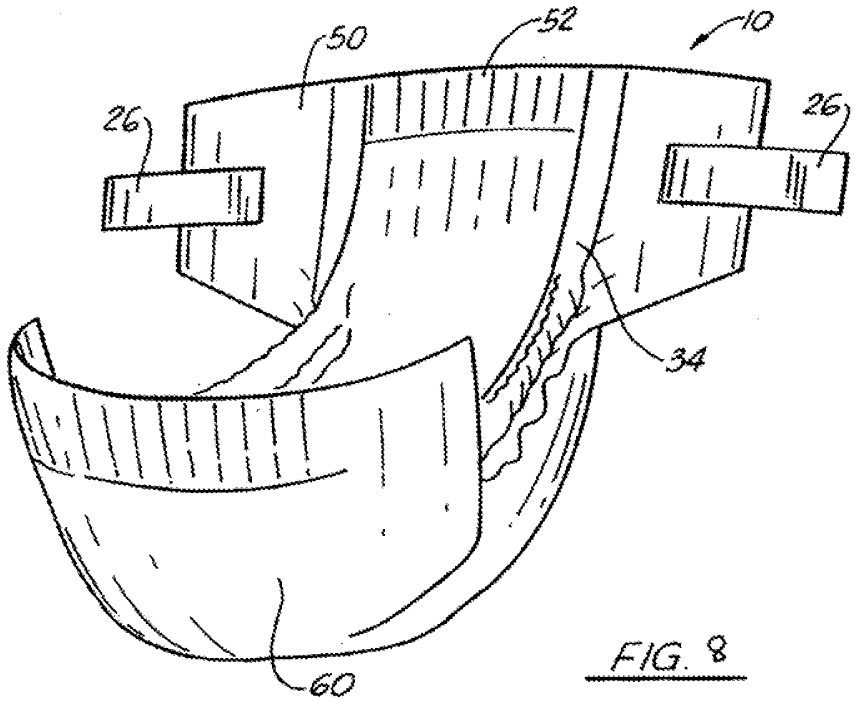


FIG. 8

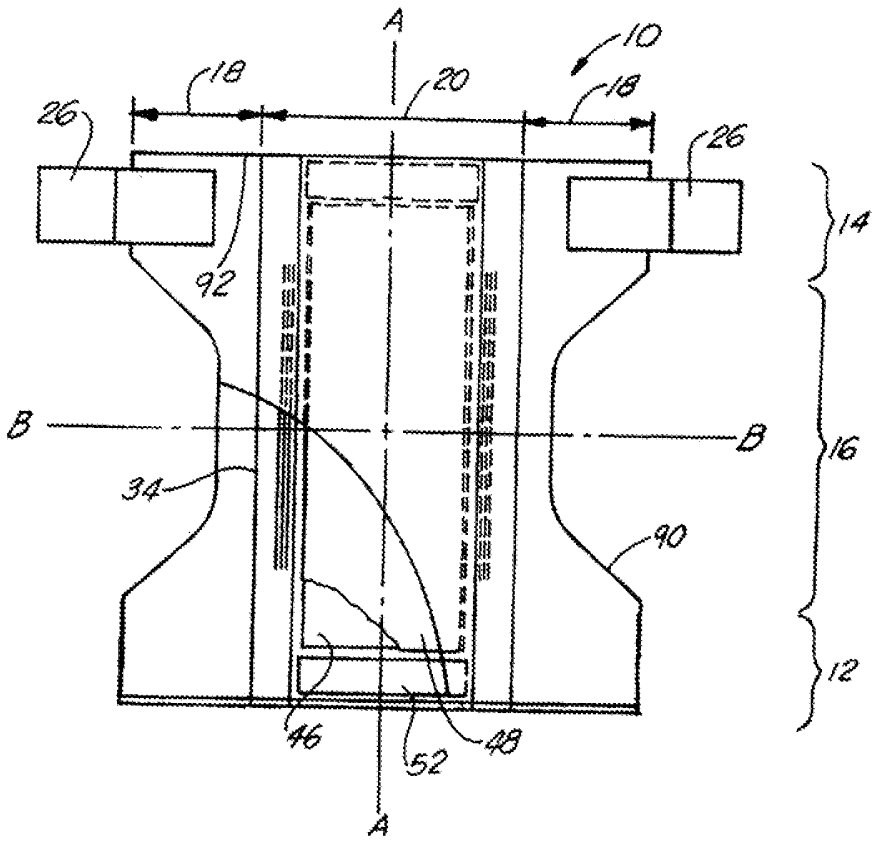


FIG. 9

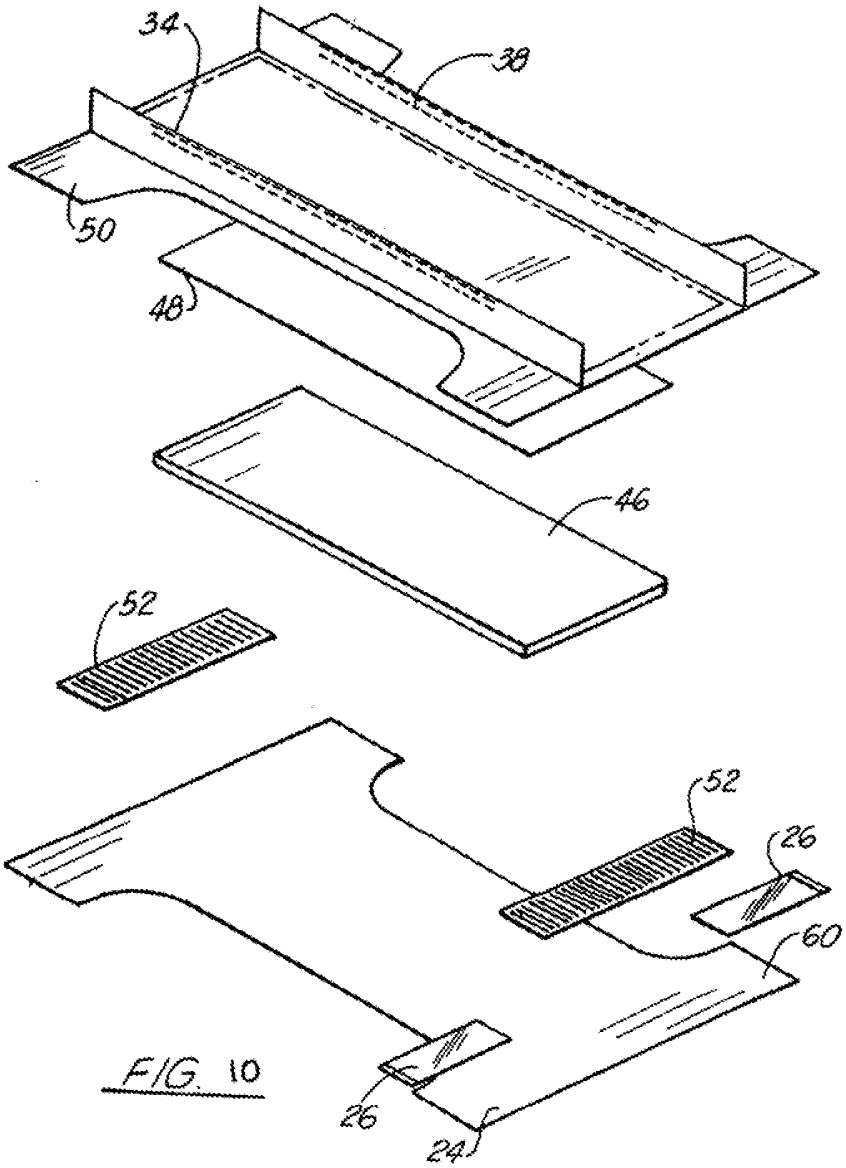


FIG. 10

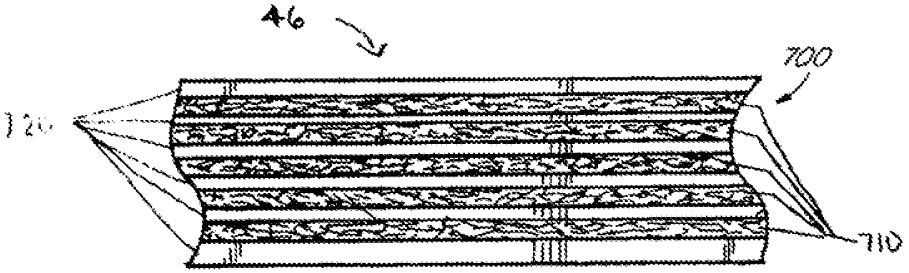


FIG 11

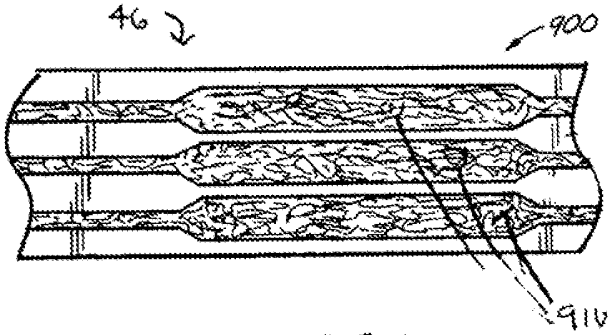


FIG. 12

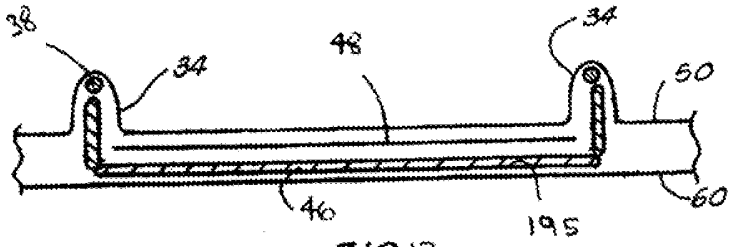


FIG.13

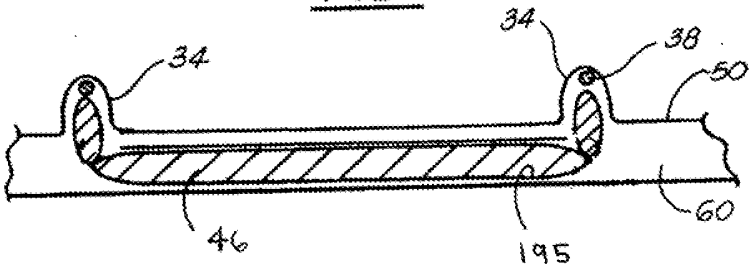


FIG. 14

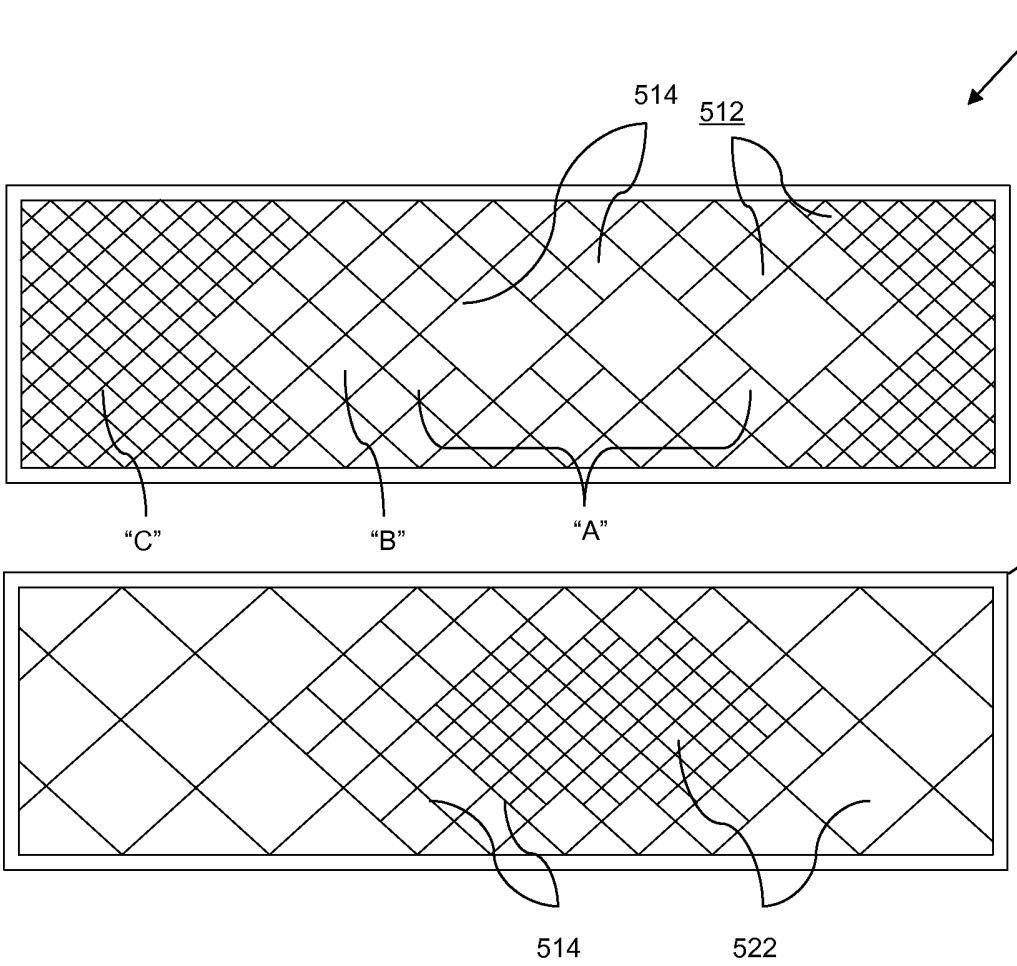


FIG. 15A

FIG. 15B

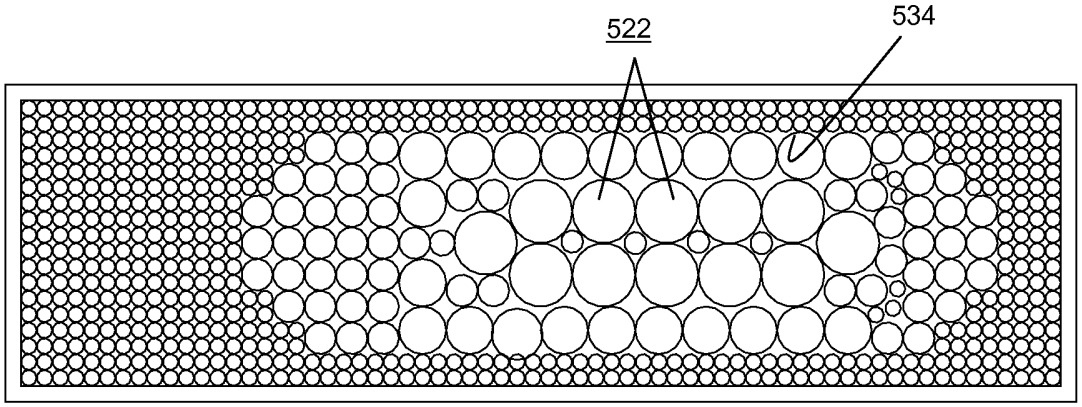


FIG. 15C

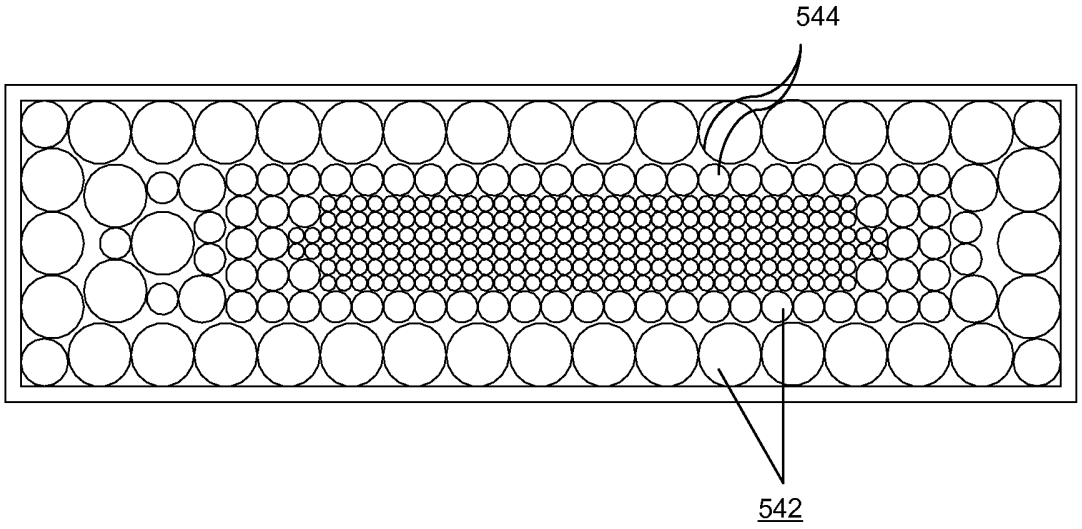


FIG. 15D

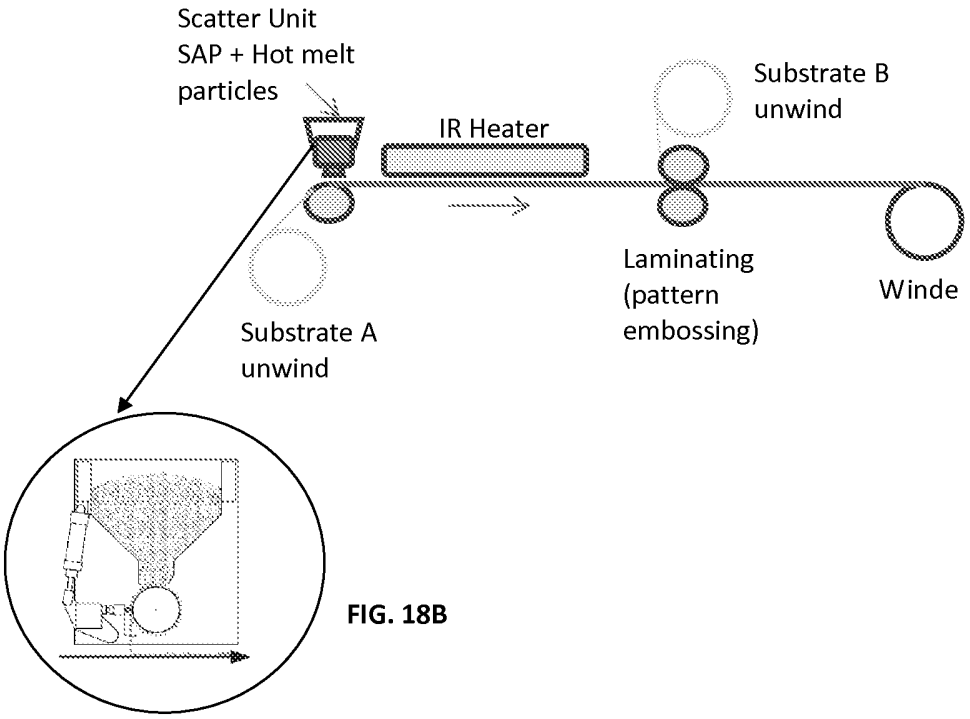


FIG. 18A

FIG. 18B

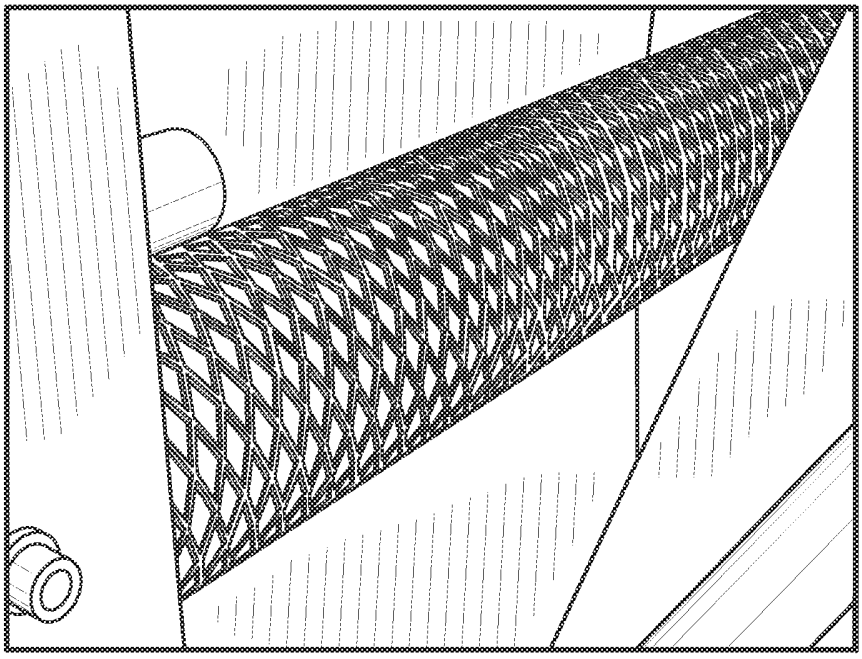


FIG. 18C

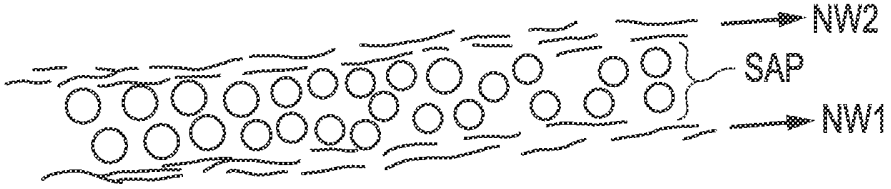


FIG. 16A

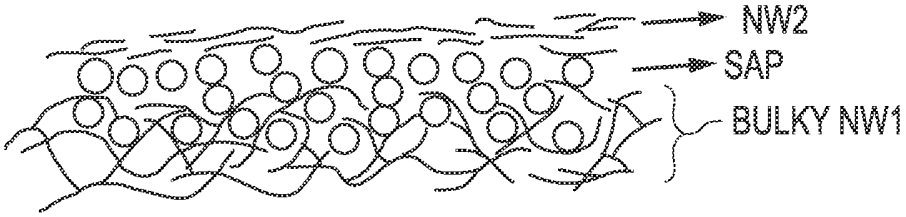


FIG. 16B

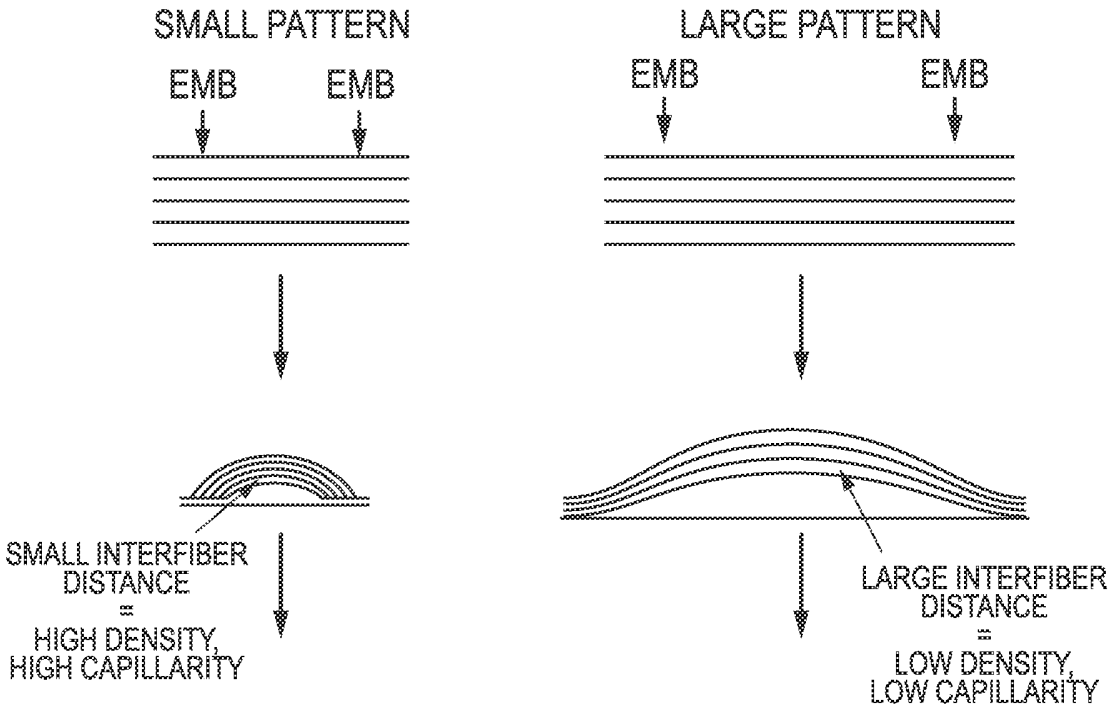


FIG. 17A FIG. 17B

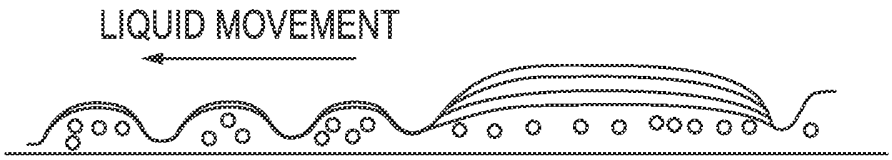


FIG. 17C

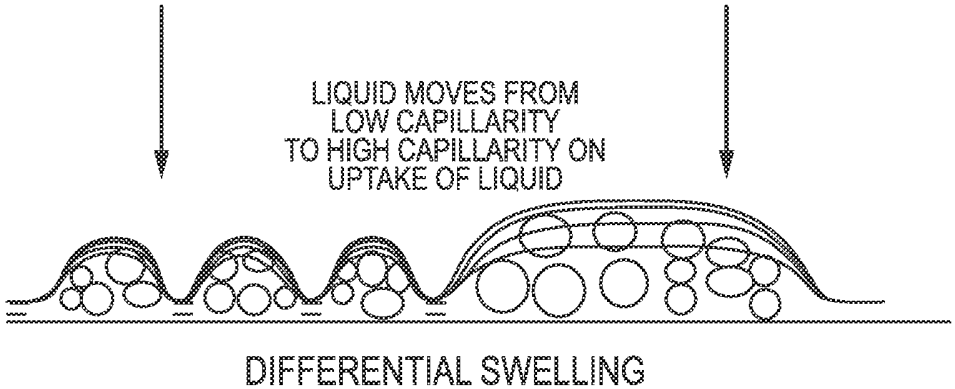


FIG. 17D

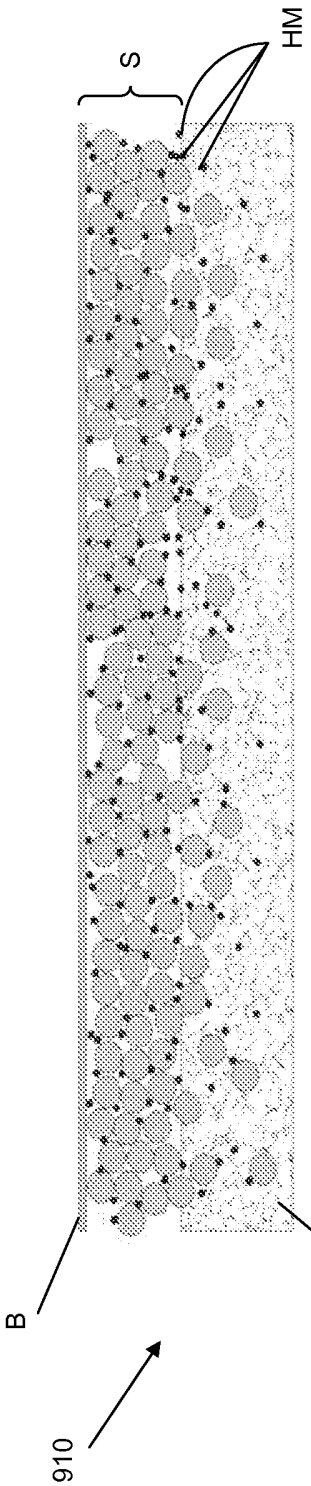


FIG. 19

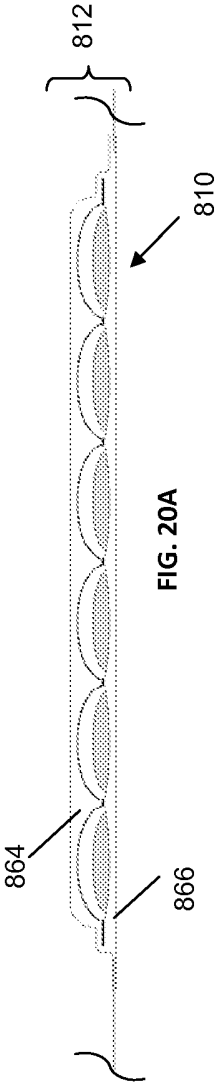


FIG. 20A

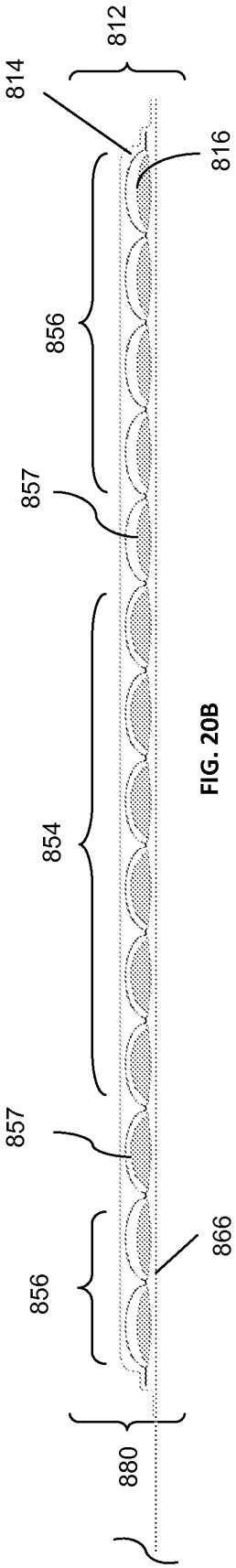


FIG. 20B

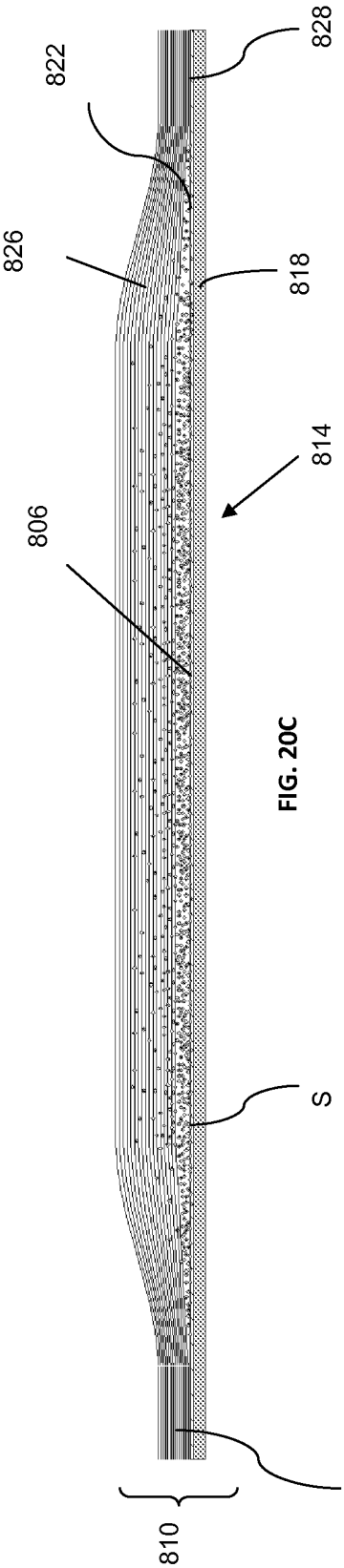


FIG. 20C

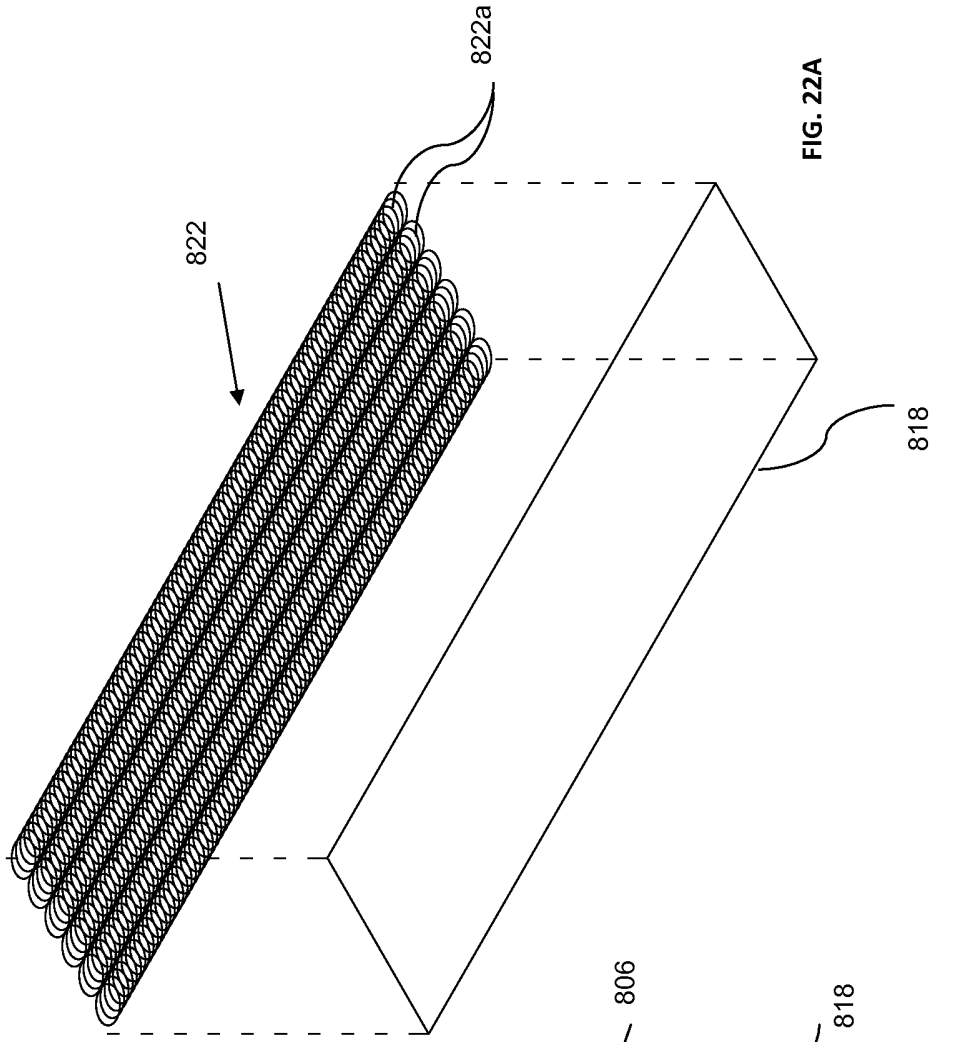


FIG. 22A

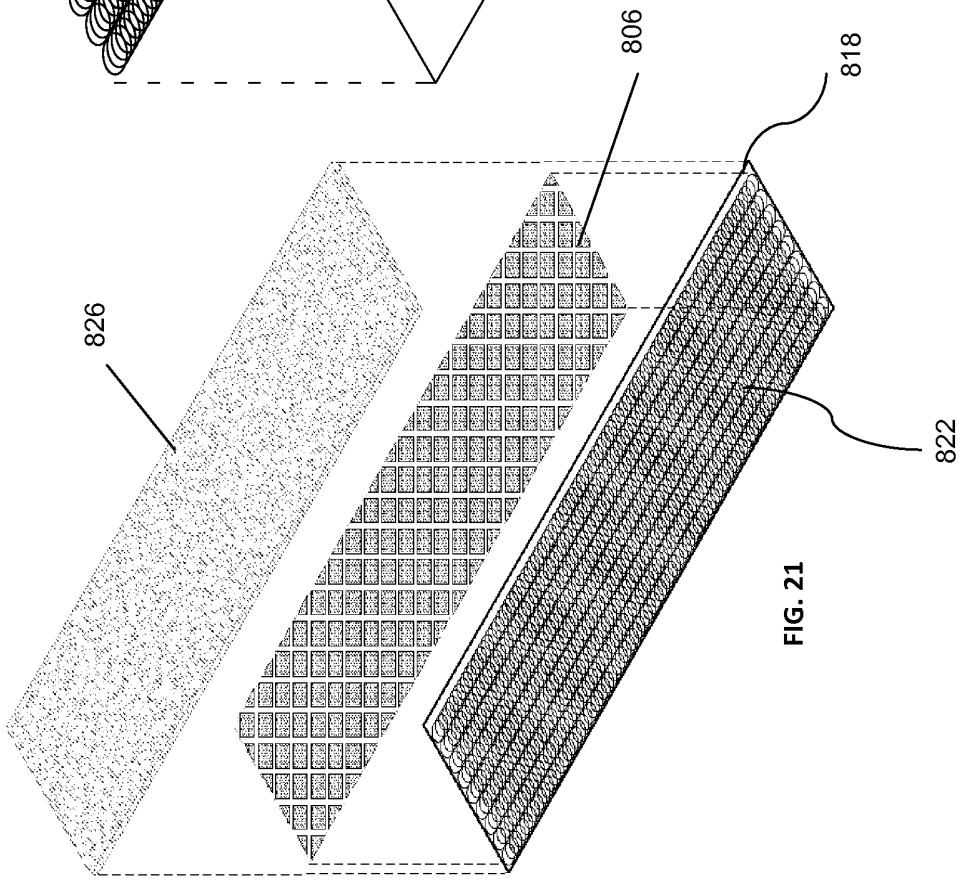


FIG. 21

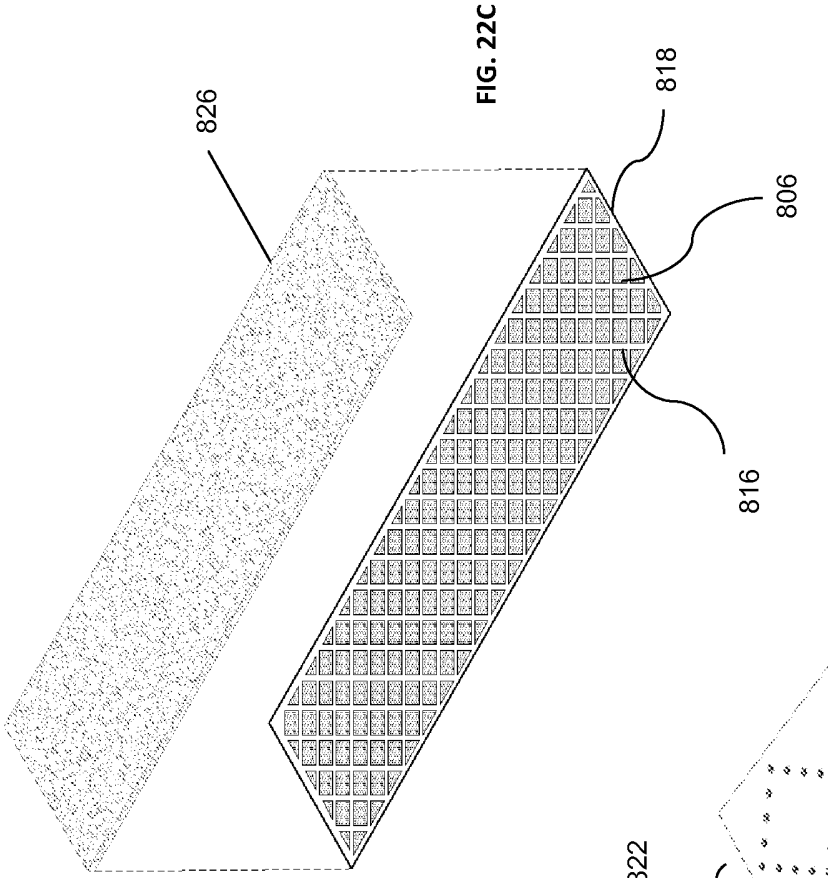


FIG. 22C

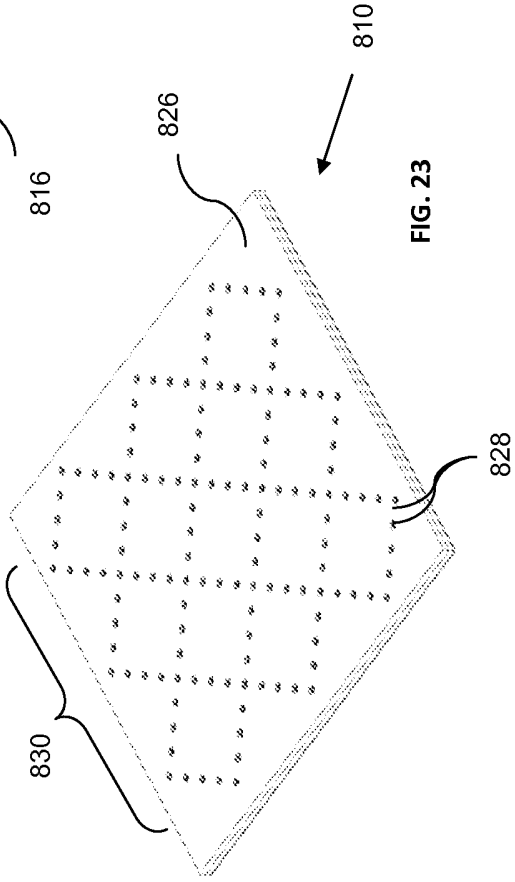


FIG. 23

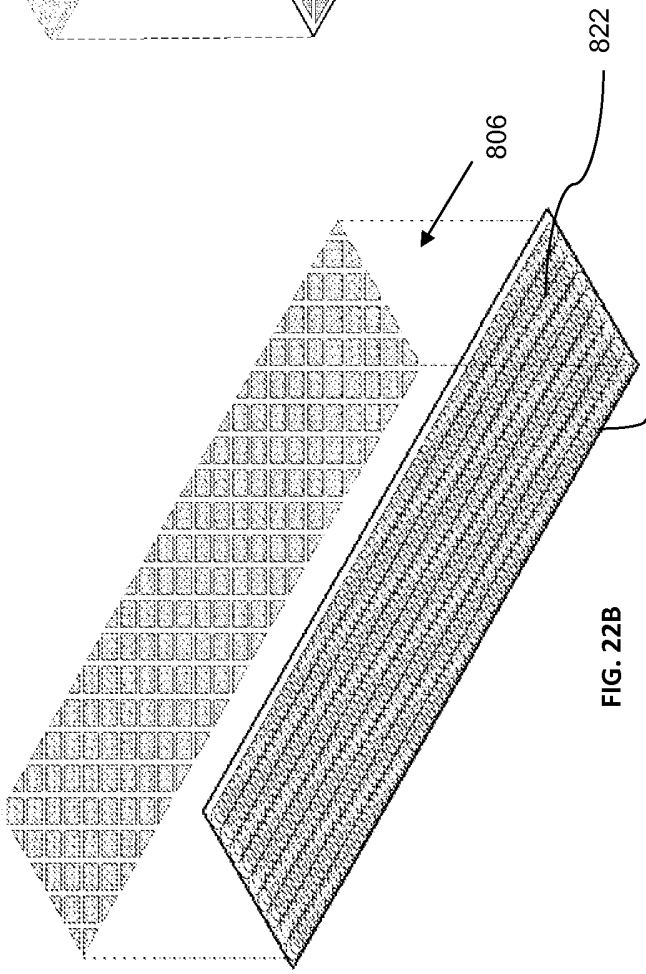


FIG. 22B

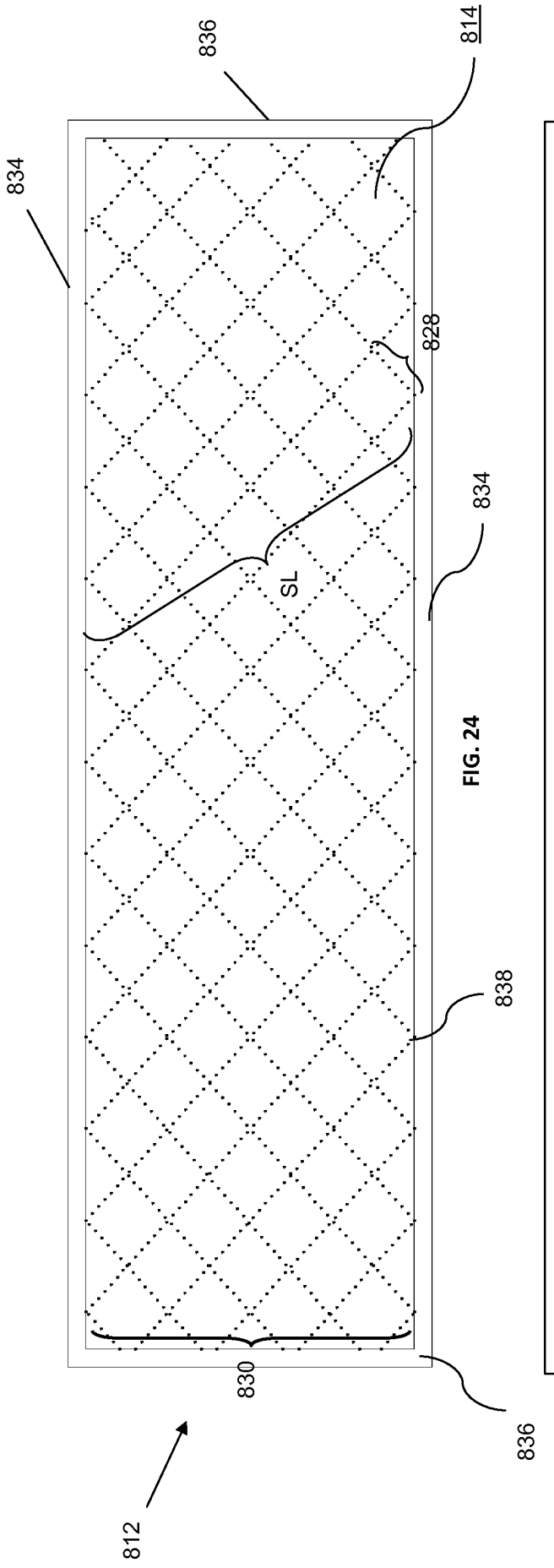


FIG. 24

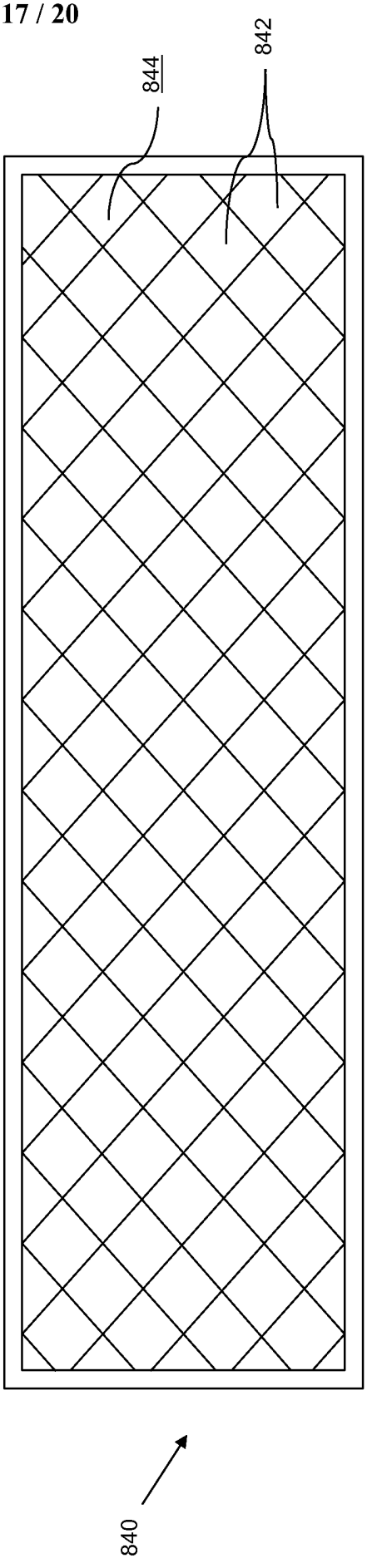


FIG. 25

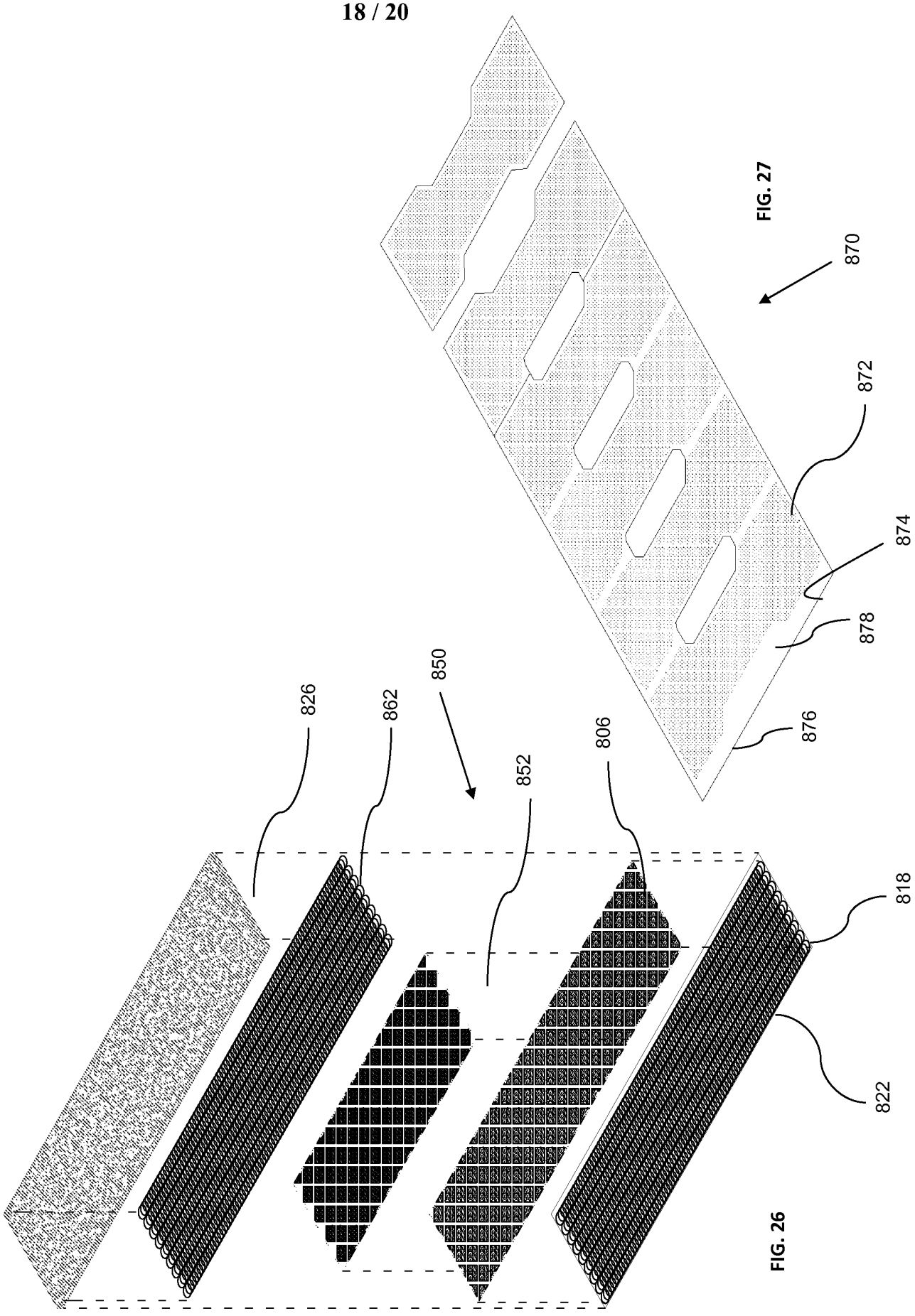


FIG. 26

FIG. 27

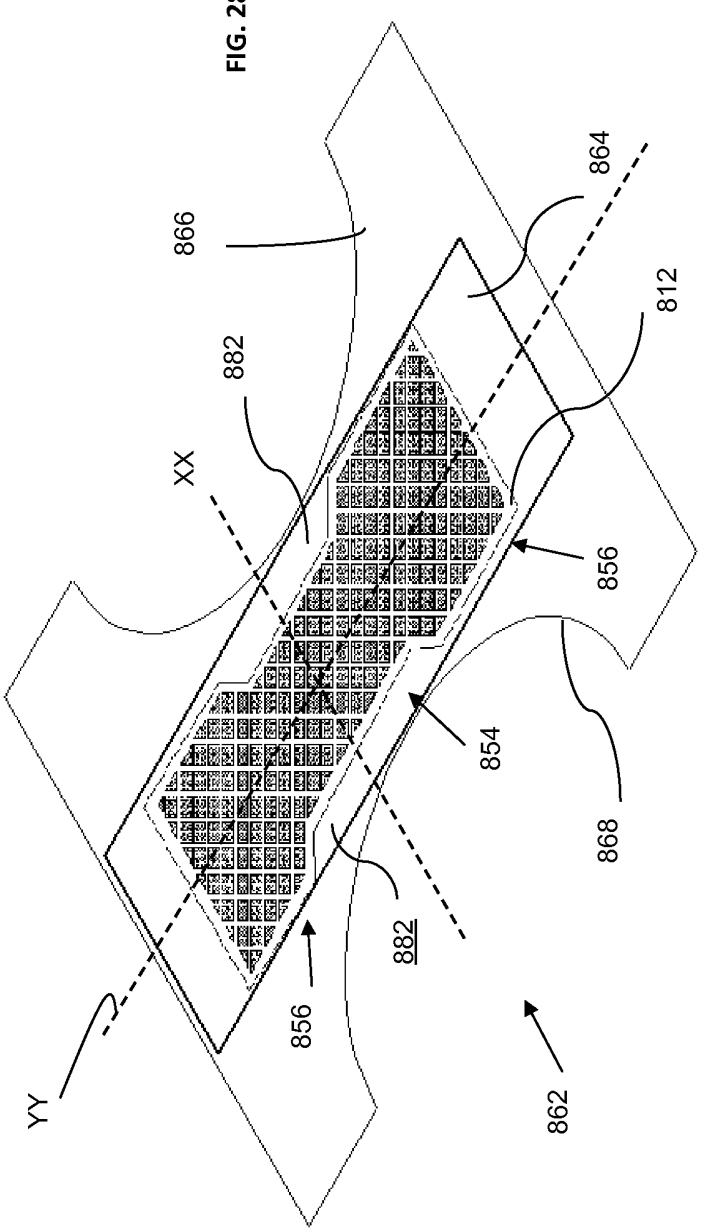


FIG. 28

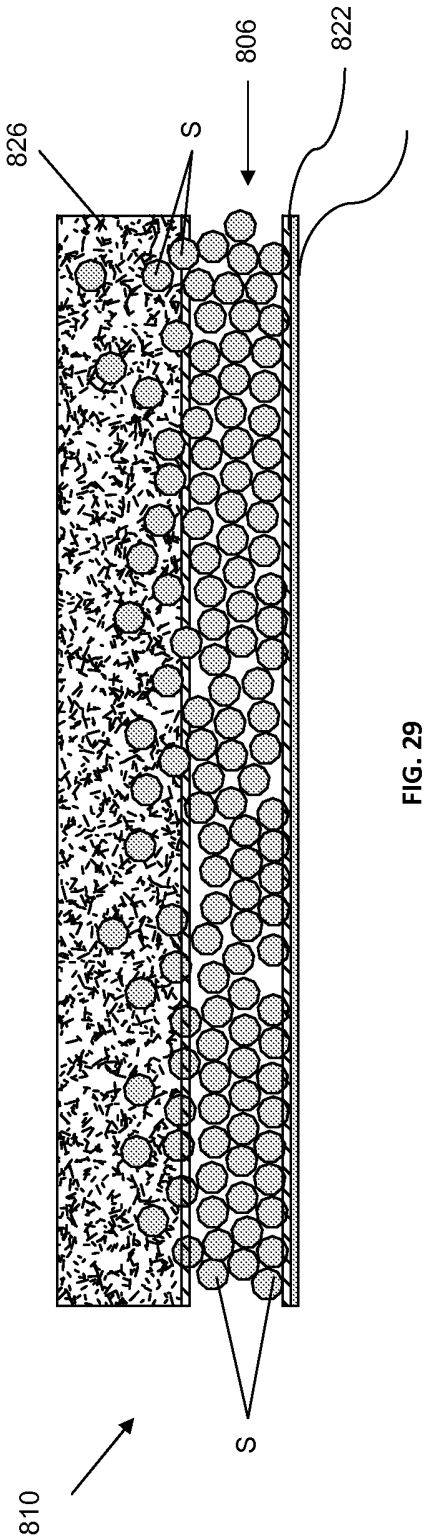


FIG. 29

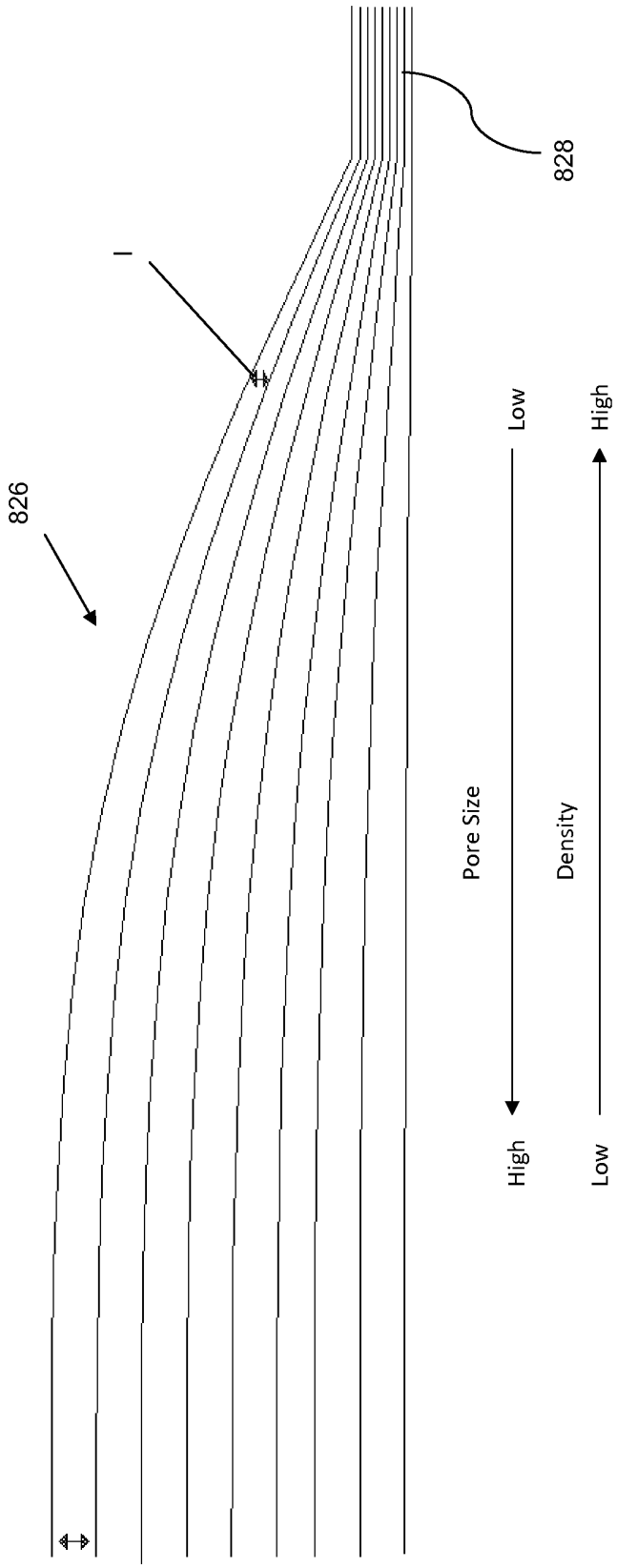


FIG. 30

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
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(43) International Publication Date
18 September 2014 (18.09.2014)

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15 March 2014 (15.03.2014)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/801,620 15 March 2013 (15.03.2013) US

(71) Applicant: **DSG TECHNOLOGY HOLDING LTD**; Craigmuir Chambers, P.O. Box 71, Read Town, Tortola (VG).

(72) Inventors; and
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(74) Agent: **AMATONG, Alberto, Q., Jr.**; The Amatong Law Firm, PLLC, P.O. Box 70889, Houston, TX 77270 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report (Art. 21(3))*
— *with amended claims (Art. 19(1))*

(88) Date of publication of the international search report:
29 January 2015

(54) Title: METHOD OF MAKING AN ABSORBENT COMPOSITE AND ABSORBENT ARTICLES EMPLOYING THE SAME

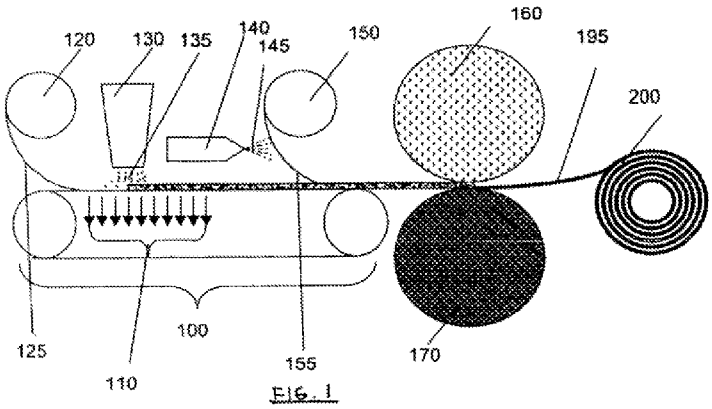

Fig. 1

(57) Abstract: Disclosed is an absorbent core composite for a disposable absorbent article. The absorbent composite has a first fabric, a body side second fabric, and a plurality of aggregates of superabsorbent particles (SAP) situated between the first fabric second fabric. About each of a plurality of the SAP aggregates, an arrangement of spaced apart bond sites secure the second fabric to the first fabric and form a pocket in which the SAP aggregate is secured between the first fabric and the second fabric. The body side second fabric is a bulky nonwoven including fibers that entangle at least some particles in the SAP aggregate.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/030051

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A61F 13/49 (2014.01)
USPC - A61F 13/535 (2014.09)
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)
IPC(8) - A61F 13/15, 13/49, 13/53; A61L 15/42, 15/60 (2014.01)
CPC - A61F 13/535, 13/539, 13/5323, 13/53747; A61L 15/60 (2014.09)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC - 604/366, 367, 368, 378, 385.01

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2012/0175056 A1 (TSANG et al) 12 July 2012 (12.07.2012) entire document	1-5, 8, 10, 13, 16, 18-20, 24, 25, 29, 30, 32-35, 37, 39-41, 57-60
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Y		6, 7, 9, 11, 12, 14, 15, 17, 21-23, 26-28, 31, 36, 38, 42-56, 61-63
Y	US 5,433,715 A (TANZER et al) 18 July 1995 (18.07.1995) entire document	6, 7, 17, 21-23, 36
Y	US 2012/0238977 A1 (OKU et al) 20 September 2012 (20.09.2012) entire document	9, 11, 12, 26-28, 31, 38, 43, 44, 46-56
Y	US 6,677,498 B2 (CHEN et al) 13 January 2004 (13.01.2004) entire document	14, 15, 42, 45, 61-63
Y	US 2006/0167424 A1 (CHANG et al) 27 July 2006 (27.07.2006) entire document	17

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
03 October 2014	28 OCT 2014
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/030051

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
See extra sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/030051

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees need to be paid.

Group I, claims 1-45 are drawn to an absorbent core comprising pockets.
Group II, claims 46-56 are drawn to an absorbent composite comprising hot melt adhesive.
Group III, claims 57-65 are drawn to a disposable absorbent article comprising a plurality of containers.

The inventions listed in Groups I, II and III do not relate to a single general inventive concept under PCT Rule 13.1, because under PCT Rule 13.2 they lack the same or corresponding special technical features for the following reasons:

The special technical features of Group I, an absorbent core comprising an arrangement of spaced apart bond sites securing a first fabric and a second fabric and forming pockets in which superabsorbent particles (SAP) aggregate is secured, are not present in Groups II, III; the special technical features of Group II, an absorbent composite comprising hot melt adhesive interspersed with superabsorbent particles (SAP) to mutually secure the SAP, are not present in Groups I, III; and the special technical features of Group III, a disposable absorbent article comprising a first fabric intermittently attached to a second fabric to define a plurality of containers wherein the absorbent composite includes regions of containers of absorbent particles aggregates including a primary region having containers of a first size and a secodary region having a plurality of containers of a second size different than the first size, are not present in Groups I, II.

Groups I and II share the technical features of a bulky nonwoven substrate, a top fabric bonded with the bulky nonwoven substrate, and a layer of superabsorbent particles (SAP) secured therebetween. However, these shared technical features do not represent a contribution over the prior art. Specifically, US 2007/0197987 A1 to Tsang et al. teaches of a bulky nonwoven substrate (155, Fig. 7; Para. [0045] regarding non-woven), a top fabric (125, Fig. 7) bonded with the bulky nonwoven substrate (at 192, Fig. 7), and a layer of superabsorbent particles (SAP) secured therebetween (135, Fig. 7).

Groups I and III share the technical features of a disposable absorbent article, comprising: a chassis body defined by a first end margin and a second end margin longitudinally spaced from the first end margin, the end margins partially defining front and back waist regions that are fastenable about a waist of a user; a topsheet; a backsheet; and an absorbent composite disposed between the topsheet and backsheet, the absorbent composite including a first fabric; a second fabric bonded to said first fabric; and absorbent particles secured between said first and second fabric; and wherein the first fabric is intermittently attached to the second fabric, containing an aggregate of superabsorbent particles (SAP). However, these shared technical features do not represent a contribution over the prior art. Specifically, US 2003/0167046 A1 to Klemp et al. teaches of a disposable absorbent article (diaper 10, Fig. 1; diaper 10', Fig. 6; Para. [0028]), comprising: a chassis body defined by a first end margin (upper 92, Fig. 1) and a second end margin (lower 92, Fig. 1) longitudinally spaced from the first end margin (Fig. 1), the end margins partially defining front and back waist regions (12, 14, Fig. 1) that are fastenable about a waist of a user (via 26, Fig. 1); a topsheet (50, Fig. 2; 50', Fig. 6); a backsheet (40, Fig. 2); and an absorbent composite disposed between the topsheet and backsheet (46 including 148, 42, Fig. 2; 46' including not illustrated layer under 50' where Para. [0072] describes including an acquisition layer or surge layer between the topsheet and the core and the layer illustrated directly under 46', Fig. 6), the absorbent composite including a first fabric (148, Fig. 2; not illustrated layer under 50' where Para. [0072] describes including an acquisition layer or surge layer between the topsheet and the core); a second fabric (42, Fig. 2; layer illustrated directly under 46', Fig. 6) bonded to said first fabric (148 and 42 are bonded as illustrated in Fig. 3; at 106', Fig. 6); and absorbent particles secured between said first and second fabric (46, Fig. 2; 46', Fig. 6; Para. [0069]) and wherein the first fabric is intermittently attached to the second fabric (at 106', Fig. 6), containing an aggregate of superabsorbent particles (SAP) (46', Fig. 6; Para. [0069]).

Since none of the special technical features of the Groups I, II, and III inventions are found in more than one of the inventions, unity is lacking.

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(54) Title: METHOD OF MAKING AN ABSORBENT COMPOSITE AND ABSORBENT ARTICLES EMPLOYING THE SAME

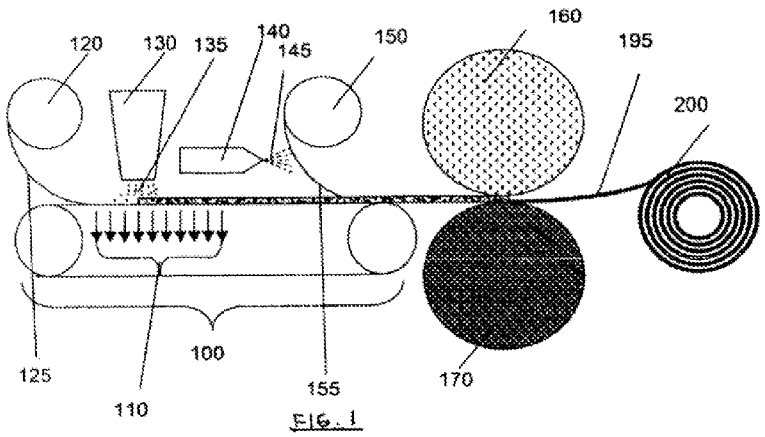

FIG. 1

(57) Abstract: Disclosed is an absorbent core composite for a disposable absorbent article. The absorbent composite has a first fabric, a body side second fabric, and a plurality of aggregates of superabsorbent particles (SAP) situated between the first fabric second fabric. About each of a plurality of the SAP aggregates, an arrangement of spaced apart bond sites secure the second fabric to the first fabric and form a pocket in which the SAP aggregate is secured between the first fabric and the second fabric. The body side second fabric is a bulky nonwoven including fibers that entangle at least some particles in the SAP aggregate.

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AMENDED CLAIMS

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What is claimed is:

1. An absorbent core composite for a disposable absorbent article, comprising:

a first fabric;

a body side second fabric; and

a plurality of aggregates of superabsorbent particles (SAP) situated between said first and second fabric;

wherein, about each of a plurality of said SAP aggregates, an arrangement of spaced apart bond sites secure the second fabric to the first fabric and form a pocket in which the SAP aggregate is secured between the first fabric and the second fabric;

wherein spaced apart bond sites about said SAP aggregates provide gaps between bond sites that communicate one of said pockets with an adjacent said pocket;

wherein said body side second fabric is a bulky nonwoven including fibers entangling at least some particles in said SAP aggregate; and

wherein said bulky nonwoven second fabric has a thickness between 1,000μm to 5,000μm , density between 0.02g/cc and 0.07 g/cc, basis weight between 20g/m2 and 80g/m2, density between 0.01g/cc and 0.08g/cc, and effective pore diameter greater than 300μm.

2. The absorbent core composite of claim 1, wherein each said SAP aggregate is free of an absorbent matrix.

3. The absorbent core composite of claim 1, wherein said SAP aggregates consist of superabsorbent particles.

4. The absorbent core composite of claim 1, wherein said second fabric includes fibers that penetrate the SAP aggregate at a top layer of superabsorbent particles, the SAP aggregate being free of an absorbent matrix.

5. The absorbent core composite of claim 1, further comprising:

an adhesive pattern applied on the first fabric and adhesively contacting superabsorbent particles of said SAP aggregate positioned in a bottom layer of particles in said SAP aggregate adjacent said first fabric, to at least partially secure the superabsorbent particles of said SAP aggregate.

6. The absorbent core composite of claim 5, wherein said adhesive pattern applied on said first fabric contains a plurality of intersecting loops defining open regions free of adhesive.

7. The absorbent core composite of claim 1, wherein said open regions free of adhesive generally have a width or diameter less than a width or diameter of said pockets situated on said adhesive pattern.

8. (Canceled)

9. The absorbent composite of claim 8, wherein said bulky nonwoven includes fibers selected from the group consisting of: polypropylene (PP), polyethylene (PE), polyethylene terephthalate (PET), polylactic acid (PLA); polyolefins, copolymers thereof, and combinations thereof; and wherein said fibers are treated fibers that are hydrophilic.

10. The absorbent composite of claim 1, wherein said first fabric is a nonwoven material, and said first and second fabrics define, at least partially, an elongated laminate having a lateral width, a longitudinal width, and a central region positioned about an intersection of a lateral centerline and a longitudinal centerline of said elongated laminate.

11. The absorbent composite of claim 10, wherein said bond sites form a plurality intersecting lines defining a grid of diamond shaped pockets.

12. The absorbent composite of claim 10, wherein said bond sites form a plurality of intersecting lines defining a grid of shaped pockets, wherein all straight lines defined by a series of pockets extending from the longitudinal centerline toward side margins of the laminate are oriented at an angle less than sixty degrees from the longitudinal centerline.

13. The absorbent composite of claim 10, wherein said plurality of pockets include pockets of different swell capacities that impart unto said laminate a property of exhibiting a surface topography sensitive to liquid intake.

14. The absorbent composite of claim 10, wherein said plurality of pockets include pockets of different swell capacities, wherein pockets in the central region have a lesser swell capacity than pockets outside the central region.

15. The absorbent composite of claim 10, wherein said plurality of pockets in the central region are smaller than pockets outside the central region.

16. The absorbent composite of claim 1, wherein said bond sites are intermittent bond points.

17. The absorbent composite of claim 1, wherein each said fabric is pre-applied with an adhesive pattern having loops defining open regions free of adhesive; and

wherein said SAP aggregates are pulpless and free of an absorbent matrix.

18. A method of manufacturing an absorbent composite laminate for a disposable absorbent article, comprising:

conveying a first fabric into position to receive superabsorbent particles (SAP);

depositing SAP on said first fabric to provide discrete aggregates of SAP;

conveying a second fabric of a bulky nonwoven;

positioning the second fabric relative to said first fabric such that fibers of said bulky nonwoven entangle particles in a top layer of particles of the SAP aggregate, thereby securing, at least partly, the SAP aggregate therebetween;

bonding said first and second fabric at a network of bond sites to form an elongated laminate having a plurality of pockets of SAP aggregate, whereby each pocket is defined by bond sites positioned about a SAP aggregate and securing the second fabric to the first fabric;

conveying the elongated laminate, whereby said bulky nonwoven and said pockets inhibit SAP particle migration from said pockets; and

wherein said bulky nonwoven second fabric has a thickness between 1,000μm to 5,000μm , density between 0.02g/cc and 0.07 g/cc, basis weight between 20g/m2 and 80g/m2, density between 0.01g/cc and 0.08 g/cc, and an effective pore diameter greater than 300μm.

19. The method of claim 18, wherein said SAP deposited is free of an absorbent matrix such that said SAP aggregates are free of an absorbent matrix.

20. The method of claim 18, wherein said conveying said fabric is preceded by applying an adhesive pattern on said first fabric, such that said depositing superabsorbent particles on said first fabric includes delivering a plurality of SAP aggregates on said first fabric with the adhesive pattern preapplied thereon.

21. The method of claim 20, wherein said applying adhesive includes applying adhesive in a continuous open pattern having enclosed open regions free of adhesive.

22. The method of claim 21, wherein said open regions have an average width smaller than an average width of said pockets.

23. The method of claim 18, further comprising applying an adhesive pattern on said second fabric prior to positioning said second fabric relative to said first fabric.

24. The method of claim 18, wherein said bonding includes bonding said fabrics using arrangements of discontinuous bond sites about said SAP aggregates to produce pockets bounded by spaced apart bond sites with gaps therebetween for fluid passage.

25. The method of claim 24, wherein the arrangements of bond sites form a grid characterized by straight bond lines directed generally laterally toward side margins of the laminate at angles deviated more than fifteen degrees from a line perpendicular to a longitudinal centerline of said elongated laminate.

26. The method of claim 25, wherein the arrangements of bond sites form diamond shaped pockets.

27. The method of claim 24, wherein said bonding includes providing an embossing pattern corresponding to the arrangement of SAP aggregates on the first fabric, the embossing pattern presenting arrangements of discontinuous bond sites that surround a SAP aggregate during bonding.

28. The method of claim 27, wherein the pattern includes a grid free of any direct straight line paths to the side margin.

29. The method of claim 18, wherein said bulky nowoven second fabric has an effective pore diameter greater than 300μm and an average size of SAP particles is about 300μm.

30. (Canceled)

31. The method of claim 30, wherein said bulky nonwoven includes fibers selected from the group consisting of: polypropylene (PP), polyethylene (PE), polyethylene terephthalate (PET), polylactic acid (PLA); polyolefins, copolymers thereof, and combinations thereof; and wherein said fibers are treated fibers that are hydrophilic.

32. The method of claim 18, further comprising, independent of said depositing superabsorbent particles on said first fabric, further depositing superabsorbent particles in select regions of said first fabric, such that pockets of SAP aggregates formed after said bonding of first and second fabrics in said select regions contain greater concentrations of SAP aggregates than pockets outside of said select regions.

33. The method of claim 18, wherein said bond sites are spaced apart bond points defining fluid gaps therebetween and between adjacent pockets.

34. A method of making a disposable absorbent article, said method comprising:

conveying a first fabric into position to receive superabsorbent particles (SAP);

depositing superabsorbent particles on said first fabric to provide discrete aggregates of SAP free of an absorbent matrix;

conveying a second fabric of a bulky nonwoven;

positioning the second fabric relative to said first fabric such that fibers of said bulky nonwoven entangle particles in a top layer of particles of said SAP aggregate, thereby securing, at least partly, the SAP aggregate; and

bonding said first and second fabric at a network of bond sites to form an elongated absorbent core laminate having a plurality of pockets of SAP aggregate, whereby each pocket

is defined by bond sites positioned about a SAP aggregate and securing the second fabric to the first fabric;

conveying the elongated laminate, whereby said bulky nonwoven and said pockets inhibit SAP particle migration from said pockets;

situating the elongated core laminate between a topsheet and a backsheet, thereby forming a core envelope of said topsheet, backsheet, and absorbent core laminate, the topsheet and backsheet further providing a chassis supporting said absorbent core laminate;

forming leg holes in said chassis;

joining end regions of said chassis to form a disposable absorbent article, whereby said bulky nonwoven and said pockets inhibit SAP particle migration from said pockets; and

wherein said bulky nonwoven second fabric has a thickness between 1,000μm to 5,000μm , density between 0.02g/cc and 0.07 g/cc, basis weight between 20g/m2 and 80g/m2, density between 0.01g/cc and 0.08g/cc, and effective pore diameter greater than 300μm.

35. The method of claim 34, wherein said conveying said fabric is preceded by applying an adhesive pattern on said first fabric.

36. The method of claim 35, wherein said applying adhesive includes applying adhesive in a continuous open pattern having enclosed open regions free of adhesive, and wherein said open regions have an average width smaller than an average width of said pockets.

37. The method of claim 34, wherein said bonding includes bonding said fabrics using arrangements of bond points about said SAP aggregates to produce pockets bounded by spaced apart bond points with gaps therebetween for fluid passage.

38. The method of claim 34, wherein the arrangements of bond points form a grid characterized by lines through the bond points directed generally laterally toward side margins of the elongated laminate at angles less that ninety degrees from a longitudinal centerline of said laminate.

39. A disposable absorbent article, comprising:

a chassis body defined by a first end margin and a second end margin longitudinally spaced from the first end margin, the end margins partially defining front and back waist regions that are fastenable about a waist of a user;

a topsheet;

a backsheet; and

an absorbent composite disposed between the topsheet and backsheet, the absorbent composite including

a first fabric;

a second fabric bonded to said first fabric; and

absorbent particles secured between said first and second fabric; and

wherein the first fabric is intermittently attached to the second fabric to define a plurality of pockets situated between the first fabric and the second fabric and containing an aggregate of superabsorbent particles (SAP); and

wherein discontinuous and spaced apart bond sites secure the first fabric with the second fabric;

wherein said second fabric is a bulky nonwoven material positioned on a bodyside of the absorbent composite and over the SAP aggregate such that fibers of the bulky nonwoven entangle superabsorbent particles;

wherein said SAP aggregate is free of an absorbent matrix in a middle portion extending from beneath the bulky nonwoven material; and

wherein said bulky nonwoven second fabric has a thickness between 1,000μm to 5,000μm, density between 0.02g/cc and 0.07 g/cc, basis weight between 20g/m2 and 80g/m2, density between 0.01g/cc and 0.08g/cc, and effective pore diameter greater than 300μm.

40. The disposable absorbent particle of claim 39, wherein said SAP aggregates consists of SAP.

41. The disposable absorbent article of claim 39, wherein said absorbent composite includes an adhesive pattern preapplied on the first fabric.

42. The disposable absorbent article of claim 39, wherein said first fabric is a nonwoven material, and said first and second fabrics define, at least partially, an elongated laminate having a lateral width, a longitudinal width, and central region positioned about an intersection of a lateral centerline and a longitudinal centerline and wherein said plurality of pockets include pockets situated in said central region having concentrations of superabsorbent particles greater than pockets proximate longitudinal end regions adjacent a longitudinal extent of said laminate

43. The disposable absorbent article of claim 39, wherein said bond sites form a plurality intersecting lines defining a grid of diamond shaped pockets.

44. The disposable absorbent article of claim 39, wherein said bond sites form a plurality of intersecting lines defining a grid of shaped pockets, wherein all straight lines

through bond sites in a series of pockets extending from the longitudinal centerline toward side margins of the laminate are oriented at an angle less than sixty degrees from the longitudinal centerline.

45. The disposable absorbent article of claim 39, wherein said absorbent composite includes concave portions along each side margin such that said absorbent composite has an hourglass shape.

46. An absorbent composite comprising:

a bulky nonwoven substrate;

a top fabric bonded with said bulky nonwoven substrate; and

a layer of superabsorbent particles (SAP) secured therebetween, including hot melt adhesive particles interspersed with said SAP to mutually secure said SAP with and within said bulky nonwoven substrate and said top fabric.

47. The absorbent composite of claim 46, wherein said bulky nowoven has a thickness between 1,000μm to 5,000μm , density between 0.02g/cc and 0.08 g/cc, basis weight between 20g/m^2 and 80g/m^2, density between 0.01/cc and 0.08 g/cc, and an effective pore diameter greater than 300μm.

48. The absorbent composite of claim 46, wherein said top fabric is a tissue layer.

49. The absorbent composite of claim 46, wherein said SAP is disposed along a plane between said bulky nonwoven substrate and said top fabric.

50. The absorbent composite of claim 46, wherein bonding between said bulky nonwoven substrate and said top fabric define a bonding pattern of geometric enclosures surrounding SAP.

51. A method of manufacturing an absorbent composite, said method comprising:

conveying a first substrate of a nonwoven material;

delivering a mixture of superabsorbent particles (SAP) with hot melt adhesive particles onto the conveyed first substrate;

as the first substrate with said mixture is conveyed, applying heat to the first substrate, thereby activating the hot melt adhesive particles and bonding the SAP with the hot melt particles and the first substrate;

applying a second substrate atop the first substrate and SAP layer bonded therewith; and

wherein the first substrate is a bulky nonwoven material having a thickness between 1,000μm to 5,000μm, density between 0.2g/cc and 0.07 g/cc, basis weight between 30g/m^2

and 80g/m^2, density between 0.02g/cc and 0.07 g/cc, and an effective pore diameter greater than 300μm.

52. The method of claim 51, further comprising:

bonding the first substrate with the second substrate to produce an absorbent composite laminate.

53. The method of claim 52, wherein said bonding includes using heat embossing to create a bonding pattern on the absorbent composite laminate.

54. (Canceled)

55. (Canceled)

56. The method of claim 51, wherein said hot melt particles and said SAP are mixed at a ratio between 1 to 10% hot melt adhesive by weight.

57. A disposable absorbent article, comprising:

a chassis body defined by a first end margin and a second end margin longitudinally spaced from the first end margin, the end margins partially defining front and back waist regions that are fastenable about a waist of a user;

a topsheet;

a backsheet; and

an absorbent composite disposed between the topsheet and backsheet, the absorbent composite including

a first fabric;

a second fabric bonded to said first fabric; and

absorbent particles adhered between said first and second fabric; and

wherein the first fabric is intermittently attached to the second fabric to define a plurality of containers situated between the first fabric and the second fabric and containing an aggregate of absorbent particles; and

wherein the absorbent composite includes regions of containers of absorbent particles aggregates including a primary region having containers of a first size and a secondary region having a plurality of containers of a second size different from the first size;

wherein the topsheet and backsheet define longitudinal and lateral margins of the chassis body; and

wherein each of the containers is formed by the first fabric bonding to the second fabric such that the containers are disposed on the same first fabric.

58. The disposable absorbent garment of claim 57, wherein the primary region corresponds a crotch region of the article, said crotch region being located centrally

intermediate the longitudinal margins of the chassis body, and wherein the absorbent particles are superabsorbent particles.

59. The disposable absorbent garment of claim 58, wherein containers of the primary region have perimeters that are greater than perimeters of containers in the secondary region.

60. The disposable absorbent garment of claim 59, wherein the containers of the secondary region surround the primary region.

61. The disposable absorbent garment of claim 60, wherein the absorbent composite further includes end regions having containers of a size different from the size of containers in the secondary region; and wherein the secondary region is intermediate the primary region and an end region.

62. The disposable absorbent garment of claim 61, wherein each of the end regions have containers with perimeters that are substantially smaller than the perimeters of containers in the secondary region.

63. The disposable absorbent garment of claim 61, wherein containers of the end regions have perimeters that are larger than the perimeters of containers in the secondary region.

64. The disposable absorbent region of claim 61, wherein the primary region further includes a second class of containers, the second class of containers having perimeters that are substantially smaller than a first class of containers, and wherein the containers of the second class are positioned to fill voids between adjacent containers of the first class.

65. The disposable absorbent garment of claim 64, wherein the containers at the first size have a larger concentration of superabsorbent particles than the containers of the second size.

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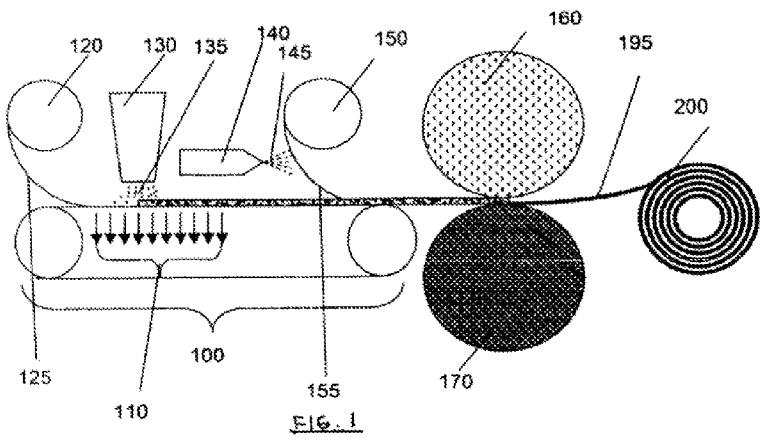

FIG. 1

(57) Abstract: Disclosed is an absorbent core composite for a disposable absorbent article. The absorbent composite has a first fabric, a body side second fabric, and a plurality of aggregates of superabsorbent particles (SAP) situated between the first fabric second fabric. About each of a plurality of the SAP aggregates, an arrangement of spaced apart bond sites secure the second fabric to the first fabric and form a pocket in which the SAP aggregate is secured between the first fabric and the second fabric. The body side second fabric is a bulky nonwoven including fibers that entangle at least some particles in the SAP aggregate.

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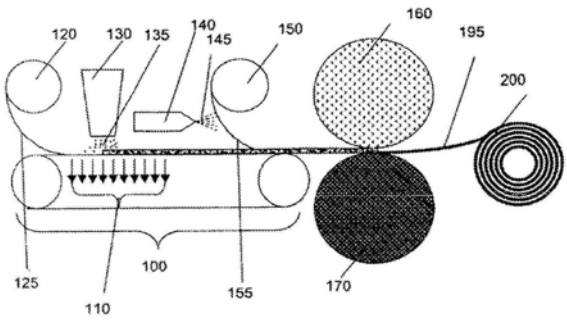
按照条约第19条修改的权利要求书6页

(54)发明名称

制备吸收复合物的方法和采用其的吸收制品

(57)摘要

公开了一种用于一次性吸收制品的吸收芯复合物。该吸收芯复合物具有第一织物、体侧第二织物、和位于第一织物和第二织物之间的多个超吸收颗粒(SAP)聚集体。在多个SAP聚集体各自周围,空间分开的结合位点的排列将第二织物固定在第一织物上并形成袋,SAP聚集体在袋中固定在第一织物和第二织物之间。体侧第二织物是大体积的无纺布,包括在SAP聚集体中缠结至少一些颗粒的纤维。



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1.一种用于一次性吸收制品的吸收芯复合物,所述复合物包含:

第一织物;

体侧第二织物;和

位于所述第一和第二织物之间的多个超吸收颗粒(SAP)聚集体;

其中,在所述多个SAP聚集体各自周围,间隔分开的结合位点的排列将所述第二织物固定到所述第一织物上并形成袋,所述SAP聚集体在袋中固定在所述第一织物和第二织物之间;

所述SAP聚集体周围的间隔分开的结合位点提供了结合位点之间的间隙,其使所述袋之一与相邻的袋连通;并且

所述体侧第二织物是蓬松性无纺布,包括在所述SAP聚集体中缠结至少一些颗粒的纤维。

2.如权利要求1所述的吸收芯复合物,其特征在于,各所述SAP聚集体不含吸收基质。

3.如权利要求1所述的吸收芯复合物,其特征在于,所述SAP聚集体由超吸收颗粒组成。

4.如权利要求1所述的吸收芯复合物,其特征在于,所述第二织物包含在顶部超吸收颗粒层处透过所述SAP聚集体的纤维,所述SAP聚集体不含吸收基质。

5.如权利要求1所述的吸收芯复合物,其特征在于,所述复合物还包含:

施加在所述第一织物上并粘合接触所述SAP聚集体的超吸收颗粒的粘合剂图案,所述超吸收颗粒位于所述第一织物相邻的所述SAP聚集体的底层颗粒中,以至少部分固定所述SAP聚集体的超吸收颗粒。

6.如权利要求5所述的吸收芯复合物,其特征在于,施加在所述第一织物上的所述粘合剂图案含有多个互连环,其限定了不含粘合剂的开放区域。

7.如权利要求1所述的吸收芯复合物,其特征在于,所述不含粘合剂的开放区域的宽度或直径一般小于位于所述粘合剂图案上的所述袋的宽度或直径。

8.如权利要求1所述的吸收芯复合物,其特征在于,所述蓬松性无纺布第二织物的厚度为1000μm至5000μm,密度为0.02g/cc至0.07g/cc,基重为20g/m^2至80g/m^2,密度为0.01g/cc至0.08g/cc,并且有效孔直径超过300μm。

9.如权利要求8所述的吸收复合物,其特征在于,所述蓬松性无纺布包括选自下组的纤维:聚丙烯(PP)、聚乙烯(PE)、聚对苯二甲酸乙二酯(PET)、聚乳酸(PLA);聚烯烃、其共聚物,及其组合;并且所述纤维是亲水性的经处理纤维。

10.如权利要求10所述的吸收复合物,其特征在于,所述第一织物是无纺布材料,并且所述第一和第二织物至少部分限定具有一定横向宽度、一定纵向宽度和一定中心区域的长形层叠体,所述中心区域位于所述长形层叠体的横向中心线和纵向中心线的交叉处周围。

11.如权利要求10所述的吸收复合物,其特征在于,所述结合位点形成多条交叉线,所述交叉线限定菱形袋的网格。

12.如权利要求10所述的吸收复合物,其特征在于,所述结合位点形成多条交叉线,所述交叉线限定成形状袋的网格,其中由一系列从所述层叠体的纵向中心轴向侧缘延伸的袋限定的所有直线都取向为偏离所述纵向中心轴不到60度的角度。

13.如权利要求10所述的吸收复合物,其特征在于,所述多个袋包括具有不同溶胀能力的袋,其赋予所述层叠体展示对液体摄取敏感的表面形貌的性质。

14.如权利要求10所述的吸收复合物，其特征在于，所述多个袋包括具有不同溶胀能力的袋，其中中心区域的袋的溶胀能力比所述中心区域外的袋低。

15.如权利要求10所述的吸收复合物，其特征在于，所述多个中心区域中的袋小于所述中心区域外的袋。

16.如权利要求1所述的吸收复合物，其特征在于，所述结合位点是间断性结合位点。

17.如权利要求1所述的吸收复合物，其特征在于，各所述织物预先施加有粘合剂图案，所述粘合剂图案具有限定无粘合剂开放区域的环；并且

所述SAP聚集体是无浆料并不含吸收基质。

18.一种制造用于一次性吸收制品的吸收复合物层叠体的方法，所述方法包括：

将第一织物传送到接收超吸收颗粒(SAP)的位置上；

在所述第一织物上沉积SAP以提供SAP的离散聚集体；

传送蓬松性无纺布的第二织物；

相对于所述第一织物放置所述第二织物，使得所述蓬松性无纺布的纤维缠结所述SAP聚集体顶部颗粒层中的颗粒，从而至少部分固定其间的所述SAP聚集体；

在成网络的结合位点处结合所述第一和第二织物以形成具有多个SAP聚集体袋的长形层叠体，从而使各袋由位于SAP聚集体周围的结合位点限定，并将所述第二织物固定到所述第一织物上；并且

传送所述长形层叠体，从而所述蓬松性无纺布和所述袋阻止SAP颗粒从所述袋中迁移。

19.如权利要求18所述的方法，其特征在于，所述沉积的SAP不含吸收基质，使得所述SAP聚集体不含吸收基质。

20.如权利要求18所述的方法，其特征在于，在所述第一织物上施加粘合剂图案之后传送所述织物，使得在所述第一织物上沉积超吸收颗粒包括向具有预先施加其上的粘合剂图案的所述第一织物递送多个SAP聚集体。

21.如权利要求20所述的方法，其特征在于，所述施加粘合剂包括以连续开放图案施加粘合剂，所述连续开放图案具有不含粘合剂的封闭开放区域。

22.如权利要求21所述的方法，其特征在于，所述开放区域的平均宽度小于所述袋的平均宽度。

23.如权利要求23所述的方法，其特征在于，所述方法还包括在相对于所述第一织物放置所述第二织物之前，向所述第二织物施加粘合剂图案。

24.如权利要求18所述的方法，其特征在于，所述结合包括使用在所述SAP聚集体周围的不连续结合位点的排列结合所述织物以产生由间隔分开的结合位点结合的袋，所述间隔分开的结合位点在之间具有间隙用于流体通过。

25.如权利要求24所述的方法，其特征在于，所述结合位点的排列形成网格，所述网格的特征在于直线结合线，所述直线结合线的方向一般是在横向上与所述层叠体的侧缘呈一定角度，所述角度相对于所述长形层叠体的纵向中心线的垂直线偏离超过15度。

26.如权利要求25所述的方法，其特征在于，所述结合位点的排列形成菱形袋。

27.如权利要求24所述的方法，其特征在于，所述结合包括提供对应于所述第一织物上的SAP聚集体排列的压印图案，所述压印图案在结合期间提供SAP聚集体周围的不连续结合位点的排列。

28.如权利要求27所述的方法，其特征在于，所述图案中的网格不含任何直接通向所述侧缘的直线路径。

29.如权利要求18所述的方法，其特征在于，所述蓬松性无纺布第二织物的有效孔直径超过300μm，并且SAP颗粒的平均尺寸为约300μm。

30.如权利要求18所述的方法，其特征在于，所述蓬松性无纺布第二织物的厚度为1000μm至5000μm，密度为0.02g/cc至0.07g/cc，基重为20g/m^2至80g/m^2，密度为0.01g/cc至0.08g/cc，并且有效孔直径超过300μm。

31.如权利要求30所述的方法，其特征在于，所述蓬松性无纺布包括选自下组的纤维：聚丙烯(PP)、聚乙烯(PE)、聚对苯二甲酸乙二酯(PET)、聚乳酸(PLA)；聚烯烃、其共聚物，及其组合；并且其中所述纤维是亲水性的经处理纤维。

32.如权利要求18所述的方法，其特征在于，所述方法还包括，独立于在所述第一织物上沉积超吸收颗粒，还在所述第一织物的选择区域中沉积超吸收颗粒，使得所述第一和第二织物结合之后在所述选择区域中形成的SAP聚集体的袋中的SAP聚集体浓度高于所述选择区域外的袋。

33.如权利要求18所述的方法，其特征在于，所述结合位点是间隔分开的结合点，所述结合点限定了其间和相邻袋之间的流体间隙。

34.一种制备一次性吸收制品的方法，所述方法包括：

将第一织物传送到接收超吸收颗粒(SAP)的位置上；

在所述第一织物上沉积超吸收颗粒以提供不含吸收基质的SAP离散聚集体；

传送蓬松性无纺布的第二织物；

相对于所述第一织物放置所述第二织物，使得所述蓬松性无纺布的纤维缠结所述SAP聚集体的顶部颗粒层，从而至少部分固定所述SAP聚集体；并且

在结合位点网络处结合所述第一和第二织物以形成具有多个SAP聚集体袋的长形吸收芯层叠体，从而使各袋由位于SAP聚集体周围的结合位点限定，并将所述第二织物固定到所述第一织物上；

传送所述长形层叠体，从而所述蓬松性无纺布和所述袋抑制SAP颗粒从所述袋中迁移；

在顶层和背面层之间放置长形芯层叠体，从而形成所述顶层、背面层和吸收芯层叠体的芯封套，所述顶层和背面层还提供支承所述吸收芯层叠体的底盘；

在所述底盘中形成腿洞；并且

结合所述底盘的端部区域以形成一次性吸收制品，从而所述蓬松性无纺布和所述袋阻止SAP颗粒从所述袋迁移。

35.如权利要求34所述的方法，其特征在于，传送所述织物之前向所述第一织物上施加粘合剂图案在。

36.如权利要求35所述的方法，其特征在于，所述施加粘合剂包括以连续开放图案施加粘合剂，所述连续开放图案具有不含粘合剂的封闭的开放区域，并且所述开放区域的平均宽度小于所述袋的平均宽度。

37.如权利要求34所述的方法，其特征在于，所述结合包括使用在所述SAP聚集体周围的结合位点的排列结合所述织物以产生由间隔分开的结合位点结合的袋，所述间隔分开的结合位点在其间具有间隙用于流体通过。

38.如权利要求34所述的方法，其特征在于，所述结合位点的排列形成网格，所述网格的特征在于通过结合点的线，所述线的方向一般在横向上与所述长形层叠体的侧缘呈一定角度，所述角度相对于所述层叠体的纵向中心线的垂直线偏离小于90度。

39.一种一次性吸收制品，其包括：

由第一端部边缘和与第一端部边缘纵向隔开的第二端部边缘限定的底盘，端部边缘部分限定前后腰区域，可在用户的腰部周围扣紧；

顶层；

背面层；和

在所述顶层和背面层之间沉积的吸收复合物，所述吸收复合物包含

第一织物；

与所述第一织物结合的第二织物；和

固定在所述第一和第二织物之间的吸收颗粒；并且

所述第一织物间断性连接到所述第二织物以限定位于所述第一织物和所述第二织物之间并且容纳超吸收颗粒(SAP)的聚集体的多个袋；并且

其中不连续和间隔分开的结合位点将第一织物与第二织物固定；

所述第二织物是位于所述吸收复合物体侧上和所述SAP聚集体上的蓬松性无纺布材料，使得所述蓬松性无纺布的纤维缠结超吸收颗粒；并且

所述SAP聚集体在所述蓬松性无纺布材料下铺展的中间部分中不含吸收基质。

40.如权利要求39所述的一次性吸收颗粒，其特征在于，所述SAP聚集体由SAP组成。

41.如权利要求39所述的一次性吸收颗粒，其特征在于，所述吸收复合物包含预先施加在所述第一织物上的粘合剂图案。

42.如权利要求39所述的一次性吸收制品，其特征在于，所述第一织物是无纺布材料，并且所述第一和第二织物至少部分限定具有一定横向宽度、一定纵向宽度和一定中心区域的长形层叠体，所述中心区域位于所述长形层叠体的横向中心线和纵向中心线的交叉处周围，并且所述多个袋包含位于所述中心区域的袋，所述位于所述中心区域的袋的超吸收颗粒浓度超过靠近纵向端部区的袋，所述纵向端部区在与所述层叠体纵向端相邻。

43.如权利要求39所述的一次性吸收制品，其特征在于，所述结合位点形成多条交叉线，所述交叉线限定菱形袋的网格。

44.如权利要求39所述的一次性吸收制品，其特征在于，所述结合位点形成多条交叉线，所述交叉线限定有形袋的网格，其中，通过从所述层叠体的纵向中心轴向侧缘延伸的一系列袋的结合位点的所有直线都取向为偏离所述纵向中心轴不到60度的角度。

45.如权利要求39所述的一次性吸收制品，其特征在于，所述吸收复合物包含沿各所述侧缘的凹形部分，使得所述吸收复合物具有沙漏形状。

46.一种吸收复合物，所述复合物包含：

蓬松性无纺布基材；

与所述蓬松性无纺布基材结合的顶部织物；和

固定在其间的超吸收颗粒(SAP)层，包括散布有所述SAP、使所述SAP与所述蓬松性无纺布基材和所述顶部织物互相固定的热熔粘合剂。

47.如权利要求46所述的吸收复合物，其特征在于，所述蓬松性无纺布的厚度为1000μm

至5000μm，密度为0.02g/cc至0.08g/cc，基重为20g/m^2至80g/m^2，密度为0.01g/cc至0.08g/cc，并且有效孔直径超过300μm。

48.如权利要求46所述的吸收复合物，其特征在于，所述顶部织物是棉纸层。

49.如权利要求46所述的吸收复合物，其特征在于，所述SAP沿着所述蓬松性无纺织基材和所述顶部织物之间的平面沉积。

50.如权利要求46所述的吸收复合物，其特征在于，所述蓬松性无纺布基材和所述顶部织物之间的结合限定了SAP周围几何包围的结合图案。

51.一种制造吸收复合物的方法，所述方法包括：

传送无纺布材料的第一基材；

向所述传送的第一基材上递送热熔粘合剂颗粒和超吸收颗粒(SAP)的混合物；

在传送具有所述混合物的第一基材时，对所述第一基材加热，从而活化所述热熔粘合剂颗粒并将所述SAP与热熔颗粒和第一基材结合；和

在所述第一基材和其上结合的SAP层上施加第二基材。

52.如权利要求51所述的方法，所述方法还包括：

结合所述第一基材与所述第二基材以产生吸收复合物层叠体。

53.如权利要求52所述的方法，所述结合包括使用热压印以在所述吸收复合物层叠体上产生结合图案。

54.如权利要求51所述的方法，其特征在于，所述第一基材是蓬松性无纺布材料。

55.如权利要求54所述的方法，其特征在于，所述蓬松性无纺布的厚度为1000μm至5000μm，密度为0.02g/cc至0.07g/cc，基重为30g/m^2至80g/m^2，密度为0.02g/cc至0.07g/cc，并且有效孔直径超过300μm。

56.如权利要求51所述的方法，其中，所述热熔颗粒和所述SAP以1至10重量％热熔粘合剂的比例混合。

57.一种一次性吸收制品，其包括：

由第一端部边缘和与第一端部边缘纵向隔开的第二端部限定的底盘，所述端部边缘部分限定前后腰区域，其可在用户的腰部周围扣紧；

顶层；

背面层；和

在所述顶层和背面层之间沉积的吸收复合物，所述吸收复合物包含

第一织物；

与所述第一织物结合的第二织物；和

粘合在所述第一和第二织物之间的吸收颗粒；并且

所述第一织物间断性连接所述第二织物以限定位于所述第一织物和所述第二织物之间并且容纳吸收颗粒聚集体的多个容器；并且

所述吸收复合物包含吸收颗粒聚集体的容器区，包括具有第一尺寸的容器的主要区和具有多个第二尺寸的容器的次要区，所述第二尺寸不同于所述第一尺寸；并且

所述顶层和背面层限定所述底盘的纵向和横向边缘。

58.如权利要求57所述的一次性吸收服装，其特征在于，所述主要区对应于所述制品的胯部区，所述胯部区位于所述底盘的纵向边缘之间的中心区，并且所述吸收颗粒是超吸收

颗粒。

59.如权利要求58所述的一次性吸收服装，其特征在于，所述主要区的容器的周长超过所述次要区中容器的周长。

60.如权利要求59所述的一次性吸收服装，其特征在于，所述次要区的容器在所述主要区周围。

61.如权利要求60所述的一次性吸收服装，其特征在于，所述吸收复合物还包含端部区，所述端部区的容器的尺寸不同于所述次要区中容器的尺寸，并且所述次要区在所述主要区和所述端部区中间。

62.如权利要求61所述的一次性吸收服装，其特征在于，各所述端部区的容器的周长基本小于所述次要区中容器的周长。

63.如权利要求61所述的一次性吸收服装，其特征在于，所述端部区的容器的周长大于所述次要区中容器的周长。

64.如权利要求61所述的一次性吸收服装，其特征在于，所述主要区还包含第二类容器，所述第二类容器的周长基本小于第一类容器，并且所述第二类容器的定位填充相邻的所述第一类容器之间的空穴。

65.如权利要求64所述的一次性吸收服装，其特征在于，第一尺寸的容器的超吸收颗粒的浓度高于第二尺寸的容器。

制备吸收复合物的方法和采用其的吸收制品

[0001] 背景

[0002] 本申请要求2013年3月15日提交的美国临时申请系列号61/801,620(在审)的权益,该文的全部内容通过引用纳入本文用于所有目的并组成本发明的一部分。

[0003] 本发明一般涉及吸收复合物(或吸收芯层叠体)和制备吸收复合物的方法。本发明一般还涉及采用吸收复合物的一次性吸收制品及其制备方法。这类一次性吸收制品包括尿布、训练裤、成人失禁产品,身体渗出物吸收产品、妇女卫生产品和其它吸收产品(统称为“一次性吸收制品”或“一次性吸收产品”)。

[0004] 一次性吸收制品一般采用三种基本结构元件:形成内表面的顶层,形成外表面的背面层,和置于顶层和背面层之间的吸收芯。顶层设计成使液体从吸收制品的外侧通过顶层并到吸收芯中。顶层可由多种可透液体和蒸汽的亲水性或疏水性材料制成。可通过使用表面活性试剂(“表面活性剂”)来提高顶层的可透性。表面活性剂降低了液体-固体截面的接触角或表面能量并促使液体通过顶层。

[0005] 背面层设计成防止流体从吸收芯通过背面层并流出吸收制品。背面层可由延伸制品的完整宽度的不透性膜或服装样材料和不透性膜的组合制成。背面层也可具有蒸汽传递性质(“可透气性”),其使得蒸汽通过背面层而不释放在吸收芯中储存的流体。背面层也可由对液体不透但可传递蒸汽的无纺布材料制成,如纺粘、熔喷、纺粘(“SMS”);纺粘、熔喷、熔喷、纺粘(“SMMS”);微米、纳米或可分裂纤维;纺熔或射流喷网;梳理等。

[0006] 吸收芯设计成容纳并分布通过顶层的流体。一般的吸收芯由吸收基质稳定化的高或超级吸收聚合物(SAP)制成。SAP通常有以下材料制成:聚乙烯醇、聚丙烯酸酯、各种接枝淀粉,和交联的聚丙烯酸钠。SAP可以是规则或不规则形状的颗粒、纤维、泡沫、网、球、聚集体,和膜。吸收基质一般是去纤维化的木浆或类似材料。吸收基质相对于顶层、背面层和SAP是非常蓬松性的。尿布的大部分厚度来自吸收芯。

[0007] 有趣的是,吸收制品的消费者正要求更薄的吸收制品。为了满足这些要求,生产商正通过减少吸收芯中使用的吸收基质的量来降低吸收制品的厚度。虽然所得的吸收芯更薄,但是它们的性能存在缺陷。由于吸收基质的量减少,稳定化SAP-防止SAP在吸收芯内迁移的效果较差。由于SAP在芯内迁移,吸收芯失去其效果并不再具有均匀的吸收性。例如,不含的SAP往往在润湿的区域中聚成一团,并且无法有效地处理后续排泄。

[0008] 生产商已经尝试通过创造小的单独SAP袋或通过胶粘SAP来解决这一问题。然而,这些解决方案很大程度上是不成功的。SAP袋仅将迁移限制为在袋内运动。然而,由于仍然存在颗粒运动,吸收芯没有显示出均匀的吸收性。胶粘SAP使SAP稳定,但是导致不舒服的较硬的吸收芯和SAP溶胀能力的丧失。申请人已经发现,许多含有SAP的方法可能对SAP和吸收芯接收并分布摄入物的能力造成负面影响。

[0009] 因此,需要改善的吸收产品,该产品延续了减少产品厚度的趋势,同时最小化产品硬度并另外显示出出色的吸收和流体处理性质。由至少一名本发明的共同发明人共同转让和指定的美国专利号8,148,598的说明书描述了对本领域状态的在先改进并用作本发明的背景。美国专利号8,148,598在此通过引用全文纳入本文用于所有目的并组成本发明的一

部分。在一个方面中，本发明可被认为继续并发展了这种努力以提供改进的吸收产品及其制造方法。

发明内容

[0010] 在一个方面中，本发明提供了改进的吸收复合物及其制备方法。所述的实施方式聚焦于吸收复合物的组成或组分排列。在一个实施方式中，一次性吸收制品的吸收芯复合物具有第一织物，体侧第二织物，和位于第一织物和第二织物之间的多个超吸收颗粒(SAP)的聚集体。在多个SAP聚集体各自周围，间隔分开的结合位点的排列将第二织物固定在第一织物上并形成袋，SAP聚集体在袋中固定在第一织物和第二织物之间。体侧第二织物是蓬松性的无纺布，包括在SAP聚集体中缠结至少一些颗粒的纤维。在优选的实施方式中，可在第一织物上预先施加粘合剂图案(例如，具有多个限定不含粘合剂的开口区域的互连环的图案)。

[0011] 在另一个方面中，公开了一种用于制造用于一次性吸收制品的吸收复合物层叠体的方法。该方法包括将第一织物输送到接收超吸收颗粒(SAP)的位置上并在第一织物上沉积SAP以提供SAP的离散聚集体。然后输送蓬松性无纺布的第二织物并相对于第一织物放置使得蓬松性无纺布的纤维缠结SAP聚集体顶部颗粒层中的颗粒。这至少部分将SAP聚集体固定在它们之间。然后在结合位点的网络处结合第一织物和第二织物以形成具有多个SAP聚集体袋的长形层叠体，从而由位于SAP聚集体周围的结合位点限定各袋并将第二织物固定到第一织物上；并且输送长形层叠体，从而使蓬松性无纺布和袋阻止SAP颗粒从所述袋中迁移。在优选的实施方式中，结合位点是结合点和/或形成菱形袋和相应网格的结合位点，而没有任何直接通向侧缘的直线路径。

[0012] 也公开了一种一次性吸收制品，其具有由第一端部边缘和与第一端部边缘纵向隔开的第二端部限定的底盘，端部边缘部分限定前后腰区域，可在用户的腰部周围扣紧。该制品还包括顶层、背面层以及放置在顶层和背面层之间的吸收复合物。该吸收复合物包括第一织物、与第一织物结合的第二织物、固定在第一和第二织物之间的吸收颗粒。第一织物间断性连接到第二织物以限定位于第一织物和第二织物之间并含有超吸收颗粒(SAP)的聚集体的多个袋，其中不连续和间隔分开的结合位点将第一织物与第二织物固定在一起。第二织物是位于吸收复合物的体侧上和SAP聚集体上的蓬松性无纺布材料，使得蓬松性无纺布的纤维缠结超吸收颗粒，其中SAP聚集体在从蓬松性无纺布材料下延伸的中间部分中不含吸收基质。

[0013] 在另一个方面，公开了一种吸收复合物，其具有蓬松性无纺布基质，与蓬松性无纺布基质结合的面织物，和固定在其间的超吸收颗粒(SAP)层。此外，热熔粘合剂与SAP散置以互相固定SAP与蓬松性无纺布基质和面织物。面织物可以是优选实施方式中的棉质材料。

[0014] 在另一个方面中，公开了一种用于制造吸收复合物的方法。该方法包括输送无纺布材料的第一基材，向输送的第一基材上递送热熔粘合剂与超吸收颗粒(SAP)的混合物，并且，随着输送含有混合物的第一基材，向所述第一基材施加热量，从而激活热熔粘合剂颗粒并使SAP与热熔颗粒和第一基材结合。然后向第一基材和与之结合的SAP层的顶部施加第二基材。

[0015] 公开了各种实施方式，其中吸收颗粒的聚集体策略性地位于和/或构成在顶层和

底层之间，并穿过复合物或芯的区域。通过改变聚集体的位置或对聚集体进行限制，可管理或影响吸收复合物的性能和容量。在某些实施方式中，吸收颗粒的聚集体位于容器或袋中。在其它实施方式中，专门提供了容器或袋的储存、间隔、排列和/或几何或形状以实现特定芯流体处理性质。

[0016] 在一个实施方式中，一次性吸收制品包含由第一端部边缘和与第一端部边缘纵向隔开的第二端部限定的底盘，端部边缘部分限定前后腰区域，可在用户的腰部周围扣紧。制品还包括顶层、背面层以及放置在顶层和背面层之间的吸收复合物。顶层和背面层限定了底盘(chassis body)的纵向和横向边缘。吸收复合物包括第一织物和与第一织物结合的第二织物。此外，吸收颗粒在第一和第二织物之间粘合，其中第一织物间断性连接到第二织物以限定位于第一织物和第二织物之间并含有吸收颗粒的聚集体的多个容器。吸收复合物包含吸收颗粒聚集体的容器区，其包含具有第一尺寸的容器的主要区和具有多个与第一尺寸不同的第二尺寸的容器的次要区。

[0017] 本发明涉及一种吸收复合物(在一些实施方式中，其不需要吸收基质)和制备该吸收复合物的新方法。本发明还公开了整合吸收复合物的吸收制品。吸收复合物提供了可做得非常薄并柔软，同时保留足够的SAP以提供足够的吸收性和干燥及湿润完整性(均匀吸收性)的吸收制品。虽然描述了在尿布中使用吸收复合物，本领域技术人员将理解本发明的方法制成的吸收复合物可用于多种吸收产品。

[0018] 本发明还涉及整合吸收复合物的改进吸收制品。

[0019] 在一个实施例中，描述了一种用于生产复合物片的方法，该方法包括以下步骤：放置第一织物以接收颗粒、在第一织物上沉积颗粒、向第二织物施加粘合剂、相对于第一织物放置第二织物，以及形成在第一织物和第二织物之间延伸的结合位点。该方法还可包括一种制品，其中的颗粒包括SAP颗粒、皮肤护理颗粒、臭味吸收颗粒、粘合颗粒、离子交换颗粒及其组合。另外，该方法可包括用疏水性材料涂覆颗粒的步骤。

[0020] 该方法可包括使第一织物顺应表面。表面可包括凹陷，这些凹陷在第一织物顺应表面时在第一织物中形成袋或容器。SAP颗粒可被导入第一织物中形成的袋。可采用抽吸来使第一织物顺应表面。向第二织物施加的粘合剂可以足够固定有效量的干燥颗粒的浓度施加。该浓度一般是每平方米1至100克。更具体地，可以每平方米5至75克，或者甚至更优选的每平方米12至50克的浓度施加粘合剂。可以一定方式施加粘合剂，使得粘合剂接合的颗粒的总量为每平方米1至100克。本发明的方法还包括在颗粒沉积在第一织物上之前向的第一织物施加粘合剂的步骤。

[0021] 适用于所述方法的结合位点可以是结合线，其可以是连续或不连续的，并且可限定袋或其它形状和设计。或者，结合位点可以是结合点。结合点可相对于颗粒定位和/或排列以阻止超过2英寸的直线颗粒迁移。

[0022] 或者，该方法包括放置第一织物以接收颗粒，在第一织物上放置颗粒，将颗粒相对于第一织物放置，将第二织物放置在颗粒上，并形成连接第一织物和第二织物的结合位点。结合位点可以是间隔以阻止颗粒迁移的离散点。结合位点也可以是间隔以阻止颗粒迁移的结合线，或连接以形成单根结合线的结合线。可排列结合线以形成其中放置一些颗粒的袋。颗粒可以是SAP颗粒，皮肤护理颗粒、臭味吸收颗粒、粘合颗粒、离子交换颗粒及其组合。可将颗粒用粘合剂、热塑性材料或其组合固定到第一织物上。另外或或者，可将颗粒用粘合

剂、热塑性材料或其组合固定到第二织物上。此外，可在第一织物中形成形状以接收颗粒。

[0023] 本发明的一次性吸收制品可包含顶层、背面层和固定在其间的吸收芯，其中顶层、背面层和吸收芯之一的至少一部分。吸收芯是包含第一织物、与第一织物结合的第二织物、和第一织物和第二织物之间粘合的颗粒。颗粒可以是SAP颗粒，皮肤护理颗粒、臭味吸收颗粒、粘合颗粒、离子交换颗粒及其组合。

[0024] 替代地，可提供吸收层，其在背面层上得到支持，使得背面层一部分提供吸收复合物的第二织物。背面层还可包含第一背面层层，第二背面层层和位于之间的约20gsm浓度的SAP颗粒，并且第二背面层层是具有范围为约10gsm至60gsm的基础重量的SMS。吸收层可用每平方米1至100克的粘合浓度粘合在第一织物和第二织物之间。第一织物可在离散点上与第二织物连接，这些离散点可限定袋。此外，第一织物可沿着多条结合线与第二织物结合，这些结合线可限定袋。

[0025] 吸收芯还可包含第一织物、第二织物、第一织物和第二织物连接的结合位点；第一织物和第二织物之间结合的吸收颗粒层。颗粒可以是SAP颗粒和/或其它有益的颗粒。吸收层可在顶层的一部分之下得到支持，使得顶层的该部分提供吸收复合物的第二织物。吸收层可在背面层的一部分之下得到支持，使得背面层的该部分提供吸收复合物的第一织物。

[0026] 在一些实施方式中，一次性吸收制品可包括吸收层中浓度为每平方米约50至650克的SAP颗粒。也可用疏水性材料包被SAP颗粒以赋予吸收层中SAP颗粒初始接受液体。结合位点可限定多条连续线，其阻止吸收层SAP颗粒的移动。可使连续线成形以在第一织物和第二织物之间形成袋。结合位点可限定多条不连续线，其阻止吸收层SAP颗粒的移动。可使不连续线成形以在第一织物和第二织物之间形成袋。

[0027] 在另一个实施方式中，结合可沿着颗粒袋的外周。结合可形成图案，如人字形、砖形、圆形、三角形、点、虚线、矩形及其组合。另一个实施方式还可包括在第一和第二片之间的松散颗粒。

[0028] 前述内容相当宽泛地描述了本发明内容的特征和技术优点，使得能够更好地理解以下的详细说明。在下文中描述了其它特征和优势。应理解本文所述的具体实施方式可易于用作改进或设计用于进行相同目的的其它结构。应理解这种等价结构并不背离所附权利要求中所述的公开。被认为是本发明的特性的特征，对于其构建和方法的操作，还有其他对象和优点等，可以结合以下详细的说明和附图一起，得到更好的理解。但应理解，各附图仅仅是为了示意和说明，并不旨在对本发明进行限定。本发明的一次性吸收制品可包含顶层、背面层和置于其间的吸收芯。吸收芯是一种吸收复合物，其包含第一织物、与第二织物结合的第二织物和固定在第一织物和第二织物之间的颗粒。颗粒可以是SAP颗粒，皮肤护理颗粒、臭味吸收颗粒、粘合颗粒、离子交换颗粒及其组合，或在优选的实施方式中由SAP组成。

[0029] 替代地，可提供吸收层，其在背面层上得到支持，使得背面层一部分提供吸收复合物的第二织物。背面层还可包含第一背面层层，第二背面层层和位于之间的浓度为约20gsm的SAP颗粒，并且第二背面层层是具有范围为约10gsm至60gsm的基础重量的SMS。吸收层可用浓度为每平方米1至100克的粘合剂粘合在第一织物和第二织物之间。第一织物可在离散点上与第二织物连接，这些离散点可限定袋。此外，第一织物可沿着多条线与第二织物结合，这些结合线可限定袋。

[0030] 吸收芯还可包含第一织物、第二织物、第一织物和第二织物连接的结合位点；第一

织物和第二织物之间结合的吸收颗粒层。颗粒可以是SAP颗粒和/或其它有益的颗粒。吸收层可在顶层的一部分之下得到支持，使得顶层的该部分提供吸收复合物的第二织物。吸收层可在背面层的一部分之下得到支持，使得背面层的该部分提供吸收复合物的第一织物。

[0031] 在一些实施方式中，一次性吸收制备可包括吸收层中浓度为每平方米约50至650的SAP颗粒。也可用疏水性材料包被SAP颗粒以赋予吸收层中SAP颗粒初始接受液体。结合位点可限定多条连续线，其阻止吸收层SAP颗粒的移动。可使连续线成形以在第一织物和第二织物之间形成袋。结合位点可限定多条不连续线，其阻止吸收层SAP颗粒的移动。可使不连续线成形以在第一织物和第二织物之间形成袋。

[0032] 在另一个实施方式中，结合可沿着颗粒袋的外周。结合可形成图案，如人字形、砖形、圆形、三角形、点、虚线、矩形及其组合。另一个实施方式还可包括在第一和第二片之间的松散颗粒。

[0033] 前述内容相当宽泛地描述了本发明内容的特征和技术优点，使得能够更好地理解以下的详细说明。在下文中描述了其它特征和优势。应理解本文所述的具体实施方式可易于用作改进或设计用于进行相同目的的其它结构。应理解这种等价结构并不背离所附权利要求中所述的公开。被认为是本发明的特性的特征，对于其构建和方法的操作，还有其他对象和优点等，可以结合以下详细的说明和附图一起，得到更好的理解。但应理解，各附图仅仅是为了示意和说明，并不旨在对本发明进行限定。

[0034] 附图的简要说明

[0035] 为了更完整地理解本发明，下面结合附图提供以下说明，其中：

[0036] 图1是使用压延辊制备吸收复合物方法的一个实施方式的示意图；

[0037] 图2是使用压延辊制备吸收复合物方法的另一个实施方式的示意图；

[0038] 图3是用其它能源的图1所示方法的示意图；

[0039] 图4是使用超声波结合技术代替压延辊的图1所示方法的一个变体；

[0040] 图5是使用超声波结合技术代替压延辊的图2所示方法的一个变体；

[0041] 图6显示了可用于该方法和吸收制品的多种潜在结合图案；

[0042] 图7是由所述方法形成并用于吸收制品的袋的截面示意图；

[0043] 图8是体现吸收复合物的一次性吸收制品的透视图；

[0044] 图9是平放且展开条件下图8的一次性吸收制品的俯视平面图；

[0045] 图10是图8的一次性制品的剖视图；

[0046] 图11是利用吸收复合物并被吸收制品采用的吸收芯的部分截面图；

[0047] 图12是利用本发明吸收复合物的替代性实施方式并被替代性吸收制品采用的吸收芯的部分截面图；

[0048] 图13是在腿封套(cuff)中采用吸收复合物的吸收制品的截面图；

[0049] 图14是在腿封套中采用饱和吸收复合物的吸收制品的截面图；

[0050] 图15A-15D是本发明的吸收复合物的简化示意图，其具体关注复合物中吸收颗粒聚集体的排列；

[0051] 图16A是现有技术SAP夹心的简化示意图；

[0052] 图16B是本发明的SAP结构(夹心)的简化示意图；

[0053] 图17A-17D是按照本发明表征袋排列的袋和流体性质的截面的简化示意图；

[0054] 图18A是制备本发明的吸收复合物的方法的简化示意图；

[0055] 图18B-18C是图18A所述的方法的示例性部件的示意图或照片；

[0056] 图19是代表图18A的方法的吸收复合物的简化截面图；

[0057] 图20A是穿过采用按照本发明的优选实施方式的吸收芯层叠体的一次性吸收制品的横向中心线的简化截面图；

[0058] 图20B是穿过采用按照本发明的优选实施方式的吸收芯层叠体的一次性吸收制品的纵向中心线的简化截面图；

[0059] 图20C是图20A和20B的吸收芯层叠体中吸收复合物的简化截面图；

[0060] 图21是本发明的一个实施方式的吸收芯层叠体的剖视图；

[0061] 图22A-22C是制造图21的层叠体的各阶段的剖视图；

[0062] 图23是本发明的一个实施方式的凸起吸收芯层叠体的俯视立体图；

[0063] 图24是按照本发明的一个实施方式的采用结合点的示例性吸收芯层叠体的平面图；

[0064] 图25是本发明的另一个实施方式的吸收芯层叠体的平面图；

[0065] 图26是本发明的另一个实施方式的吸收芯层叠体的剖视图；

[0066] 图27是制造按照本发明的一个实施方式的吸收芯层叠体的阶段的简化示意图；

[0067] 图28是按照本发明的一个优选实施方式采用吸收芯层叠体的一次性吸收制品的平面图；

[0068] 图29是按照本发明的优选实施方式的吸收复合物的截面图的简化示意图；并且

[0069] 图30是在本发明的吸收复合物中结合的蓬松性无纺布层点的部分截面的简化示意图。

[0070] 发明详述

[0071] 在阅读本文提供的附图和详细说明之后，本领域普通技术人员应理解按照本发明制备的吸收复合物可用于一次性吸收制品，并且更具体地，用于一次性吸收制品，如尿布、训练裤或其它失禁产品。因此，本发明并不限于本文所述和所示的结构和方法，虽然以下说明具体涉及用于一次性尿布的吸收复合物。与本发明相关的术语“吸收制品”或“吸收服装”包括各种类型的一次性制品和服装，其针对或贴近穿着者的身体放置以吸收并容纳各种身体排泄物、体液或生物液体。

[0072] 可能是为了获得对本发明所带来的特定贡献或改进的更好理解，首先可参考早前公开的美国专利号8,148,598的改进。在图1-14中描述了这些早期改进。除了用作本领域的背景知识以外，其中的一些教导和启示转化成本发明的某些具体实施方式(在本发明的公开内容下，其将对于相关领域技术人员变得显而易见)。

[0073] 在图1中，织物125显示其与从辊120上被分配并沿着传送带100上的生产线运载。织物125可以是热塑性材料，其可以是纺布、无纺布、膜或其组合。织物125通过真空系统110固定在传送带100上。真空系统100用于使织物125顺应于传送带100。

[0074] 在一个实施方式中，传送带100存在凹陷部分，其在织物从传送带100的表面拉开时在织物125中形成杯。传送带100的表面并不限于形成织物中杯的结构，而是相反，可有多种不同表面形状和尺寸构成。示例包括脊、凸起形状和洞。另外，表面形状可在传送带的长度和宽度上均匀或不均匀分布。替代地，传送带100可以是平的。在传送带100具有洞或其它

类似构造的应用中，织物125中形成的袋的深度可根据真空系统100的作用力、织物125的弹性或其组合发生变化。另外，在织物从传送带100的表面上拉开时可采用加热来增加织物125的弹性。可通过加热的传送带或本领域已知的任意其它方式来对织物加热。可在传送带100的表面上均匀地或在选定的位置上施加真空110。例如，在传送带100的表面具有低陷的构造中，可仅在低陷处施加真空。

[0075] 然后通过SAP分散器130将SAP颗粒135沉积在织物125上。SAP分散器130可设置为将SAP颗粒放置在第一织物上的其所需位置上，或可配置为仅将SAP颗粒沉积在第一织物上，其中通过另一种方式放置SAP颗粒。本领域技术人员应理解可使用多个SAP分散器130。可通过风或其它已知方法将SAP颗粒135沉积、放置或沉积并放置在织物125上。替代地，图1所示的传送带可翻转使得真空系统110从上施加抽吸。在这种构造中，在SAP颗粒135的供应上运载织物125，并且SAP颗粒通过真空系统110保持在织物125的表面上。在其它实施方式中，SAP分散器130可包含皮肤护理颗粒，如离子交换树脂、除臭剂、抗微生物剂、粘合剂颗粒或其它有益颗粒。此外，虽然优选的实施方式涉及SAP颗粒，本文所述的方法可用于上述颗粒的任意组合，包括不包含SAP的组合。替代地，优选沿着生产线(未显示)放置的分开的分散器可用于沉积不同类型的颗粒，例如，皮肤护理颗粒。

[0076] 按照多个替代性方法，SAP颗粒135放置并集中在织物125上。在一个实施方式中，真空系统110和织物125可够造成使真空系统110将SAP颗粒从织物125的表面上均匀或在特定区域拉开。在另一个实施方式中，织物125的形状将SAP颗粒135导入位置中。例如，当织物125成形以形成袋时，SAP颗粒135由真空系统110、传送带的振动、风、传送带的角度或其组合而滚入袋中。替代地，SAP分散器130可被放置并控制以在织物125的表面上策略性分散SAP颗粒135，该策略性放置包括但不限于与机械方向对齐或不对齐、偏移或随机。此外，可放置SAP使得存在不含SAP的区域。另外，可使用粘合剂放置SAP颗粒，如通过向表面上的特定位置施加粘合剂，在表面上沉积SAP颗粒。另外，SAP颗粒可同时放置在两个织物125和155上。

[0077] 一旦SAP颗粒已经沉积并放置在织物125上，从辊150向生产线导入第二织物155。第二织物155可选自多种材料，包括纺粘热塑性材料或类似的纺布或无纺布材料、膜或其组合。

[0078] 以多种方式向SAP颗粒135施加粘合剂145。图1显示了向织物155施加的粘合剂145。替代地，可向织物125和SAP颗粒135，在SAP颗粒135沉积在织物125上之前向织物125，或在它们沉积在织物125上之前直接向SAP颗粒施加粘合剂145。在另一个实施方式中，在织物125和155接合在一起的点施加粘合剂145。在另一个实施方式中，施加多层粘合剂。例如，可在沉积SAP颗粒之前向织物125，或在已经放置之后向SAP颗粒135，向织物155施加粘合剂145，或其组合。替代地或除了上述实施方式以外，粘合剂颗粒还可与SAP颗粒135混合。另外，可均匀、随机或以特定图案施加粘合剂，这取决于完成的复合物的所需吸收性质。

[0079] 可按照本领域技术人员已知的多种技术施加粘合剂。例如，可向织物155的表面上喷洒、辊涂或纺上粘合剂。粘合剂可以是疏水性、亲水性、生物可降解、生物衍生的粘合剂或其组合优选的粘合剂的疏水性的。涂层中粘合剂的浓度是每平方米1至100克(“GSM”)。优选地，浓度为5至75GSM。在一个优选实施方式中，浓度是12至50GSM。另外，应施加足量的粘合剂以覆盖至少25％的目标区域。

[0080] 然后织物125和155结合在一起。图1显示了使用压延辊160和170的热结合系统。然而，可使用其它结合系统/方法。例如，可使用图4和5的超声结合系统。粘合剂145使SAP颗粒135在结合过程期间并在结合过程之后保持在对织物而言相对固定的位置上。结合图案可与SAP颗粒135的分布对齐。替代地，结合图案可不与SAP颗粒135的分布对齐。在这种实施方式中，结合设备可适用于在结合之前将SAP颗粒135推导一侧或结合到SAP颗粒135。这些实施方式消除了使结合点与SAP颗粒的分布同步的需要。

[0081] 织物155和125显示为两种材料。然而，本领域技术人员理解织物实际上可以是相同材料的部分。在这种构型中，折叠整体织物以覆盖SAP颗粒。替代地，可在使用第二织物155之前折叠织物125的边缘。在织物125和155分开的实施方式中，织物125和155可以是相同或不同的材料。另外，可裁剪织物155以覆盖织物125的特定区域，如中心区域。

[0082] 一旦织物已经结合在一起，在复卷机200上收集吸收复合物195。

[0083] 在图2所示的方法中，织物125沿着传送带100运输。在织物125沿着传送带100运输时，向织物125上施加粘合剂145的薄涂层。如图1的方法所示，可均匀、随机或以特定图案施加粘合剂，这取决于完成的复合物的所需吸收性质。虽然显示在SAP颗粒135沉积之前施加粘合剂145，但可考虑其它实施方式。例如，可按照图1所述的实施方式施加粘合剂。

[0084] 在施加粘合剂之后，在织物125上沉积并放置SAP颗粒135。SAP颗粒135可直接沉积在织物125上，如图2所示，或间接沉积在织物125上，如通过风将SAP颗粒吹到织物125上。SAP颗粒的重量有助于将织物125固定于传送带100。另外，SAP颗粒可以与图1所示相似的方式放置。

[0085] 然后从辊150向生产线进料第二织物155。放置第二织物以覆盖SAP颗粒135。粘合剂145阻止SAP颗粒在两个织物之间自由移动。然后将所得的夹心结构运输到用于热结合的压延辊上。如图1所述，结合图案可与SAP颗粒135对齐或不与之对齐。然后通过复卷机200收集吸收复合物195。如图1所示，织物125和155可以是单片的部分。另外，织物可以图1所述的方式折叠。在另一个实施方式中，可用粘合剂涂覆织物125并压制在SAP颗粒的供应上。

[0086] 图3与图1和图2相似，不同之处是沿组装线放置的能量源900，如烤箱或微波生成器。能量源施加热和/或辐射910，其可用于熔化热塑性粘结剂。也可调节热量以熔化特定类型的颗粒或纤维、纤维的特定部分或仅仅熔化颗粒/粘结剂的外层。

[0087] 图4和图5与图1和图2相似，不同之处是使用超声波结合将织物结合在一起。图4和图5显示了超声波结合系统(210a和210b)。易于理解图1-5显示了新方法的不同实施方式并且多个方面的方面可优选根据需要组合。然而，对于所有组合而言重要的是向SAP颗粒135施加的粘合剂145、粘结剂颗粒或其组合的量以及结合的强度。如图1所示，粘合剂的最优浓度是12至50GSM，虽然可接受其它浓度。在所有实施方式中，重要的是粘合剂145的浓度足够高以至于阻止SAP颗粒135的迁移。然而，浓度不应过高，以至于其覆盖SAP颗粒135并降低SAP溶胀。粘合剂应该仅阻止足量SAP颗粒135的迁移以确保均匀的吸收性。虽然未显示，但本领域技术人员应理解图3所示的能量源900也可应用于图2、4和5所示的构造中。

[0088] 图6(a)到(q)显示了该方法考虑的各种结合图案。结合图案可完全覆盖一个区域，部分覆盖一个区域，或提供局部结合区。线和点表示结合位点。实线表示结合线。结合线可形成开放形状或封闭形状，如示例(a)和(c)中发现的那样，其显示了完全封闭SAP颗粒135的袋的连续实线，或如示例(g)，将吸收复合物的不同区域分开。如示例(b)和(m)中发现的

那样，虚线是不连续结合图案，其不完全封闭SAP颗粒135的袋。在这些构造中，通过粘合剂和连续或不连续结合图案阻止干SAP颗粒的迁移。不连续结合图案可取代连续结合图案，反之亦然。另外，虽然图6显示了连续或不连续结合图案，可使用不连续和连续结合图案的组合。

[0089] 图7显示了吸收复合物195的部分截面。图7显示了结合192如何用于分离SAP颗粒135的袋。如结合图案所示，SAP颗粒135可在由结合图案限定的袋中被完全封闭，在结合图案限定的袋中部分封闭，或仅受到结合图案的阻止。本文中的阻止表示SAP颗粒135不能从芯的一个区域直接移动到另一个区域，但是相反，必须在结合位点周围移动。

[0090] 应注意，通过改变SAP颗粒的量、使用的织物的类型和数量、构成变量(如SAP与粘合剂的比例)、以及在制品的多个位置上施加粘合剂复合物在吸收复合物中得到多种功能或优选性质。可在本发明的结构设计和方法中加入这种制造和设计技术。

[0091] 另外，本领域技术人员理解用于构建上述单一吸收复合物的方法可经修饰以生产多重、层叠的吸收复合物。在包含多层的结构中，层可以是吸收复合物195的片，其层叠在一起形成单一结构，或者织物和SAP颗粒的交替层，其形成单一结构。本领域技术人员理解可通过向织物155的顶部施加粘合剂(图1)，施加第二层SAP颗粒135和第三织物(未显示)来实现交替层。类似地，可加入其它层，其仅受到适用于结合方法的最大厚度的限制。

[0092] 可用互溶的疏水性材料包被SAP颗粒135。涂层用作阻隔物或膜，其初始减缓液体摄取，从而节约SAP对其它或第二次排泄的容量。在这一方面，涂层使排泄之间的吸收率平均化。在图1-5所示的方法中，可在施加粘合剂145之前，在施加粘合剂145之后或同时施加涂层。替代地，粘合剂可与涂层材料混合。

[0093] 在一个实施例中，在SAP颗粒135上施加矿物油轻涂层。该涂层减缓SAP颗粒的初始摄取并使得液体有更多的事件在制品中散开。优选地，以约0.00001克/克SAP至约0.1克/克SAP的浓度施加矿物油(取决于特定产品设计)。替代地，可在特定目标区域中施加矿物油。通过这种方式，促使接收的液体在涂覆区域活化并开始溶胀之前初始分散到未涂覆的区域。

[0094] 通过上述方法制造的吸收复合物可用于一次性分散制品或用作一次性分散制品的一个或多个组件。吸收制品的组件包括背面层、顶层、吸收芯、容纳壁或封套(包括腿褶皱(leg gather))、背面层/吸收芯复合物、顶层/吸收复合物及其组合。下面开始更详细地描述这类构造。

[0095] 图8是尿布10形式的一次性吸收制品的透视图。尿布10包括顶层50、背面层60和吸收芯(未显示)。尿布还包括直立的阻隔封套34，其沿着尿布纵向延伸并有弹性以符合穿着者的臀。另外，尿布包括弹性带52和紧固元件26。使用中的元件26伸展并接合尿布的相应对侧端部以将尿布固定在穿着者上。

[0096] 图9显示了一般平放且未折叠的构造的图8的尿布10的复合网结构。如下文将详述，网结构随后经修整、折叠、密封、锻接和/或其它操作以形成成品或最终形式的尿布10。为了促进对尿布10的说明，参考纵向延伸轴AA、横向延伸中心轴BB、一对纵向延伸边缘90和一对端部边缘92(其在侧边缘90之间延伸)进行说明。沿着纵轴AA，尿布10包括第一端部区或前腰区12，第二端部区或后腰区14，以及设置在它们之间的胯部区16。前腰区12、后腰区14各自的特征在于一对耳区域或耳18，其位于中心体部分20的两侧并从侧边缘90横向延

伸。紧固结构26(例如,常规条状紧固器)沿着尿布10的后腰区14固定于各耳18。

[0097] 当尿布10戴在腰周围时,前腰区12相邻契合穿着者的前腰区域,后腰区14相邻契合后腰区域,并且胯部区16契合在胯部区域的周围和下方。为了将尿布10固定于穿着者,后腰区14的耳18在穿着者的腰周围并且向前并对齐前腰区12的耳18。固定表面可位于前腰区12的内表面或外表面上或由其提供。替代地,紧固器26可位于前腰区12的耳18上,并可固定于后腰区14的耳18。

[0098] 图10是图8和图9的尿布的剖视图。合适的尿布结构一般采用至少三层。这三层包括背面层60、吸收芯46和顶层50。尿布结构可能含有或不含从顶层50向上放置的一对容量壁或腿封套34,并优选至少装备一种或多种纵向间隔分开的弹性元件38。下文中将显示任意这些尿布元件或这些元件的组合将用吸收复合物195构建。另外,可加入采集层48以改善性能。

[0099] 背面层

[0100] 如上所述,尿布10采用背面层60,其覆盖芯46并优选在芯46之上向尿布10的侧边缘90和端部边缘92延伸。在本发明的一个方面中,从吸收复合物195的单层材料片构建背面层60。在这种构建中,织物125放置为背面层60的外表面。

[0101] 另外,可使用替代结构用于凝胶阻隔。对于使用凝胶阻隔的应用,本发明的一次性吸收制品的背面层较薄并提供改善的柔韧性。当干燥时,背面层是松软并透气的,但当润湿时,形成薄的凝胶阻隔层(即,在背面层的内表面上),这使得背面层基本不透液体。通过SAP颗粒135的溶胀形成凝胶阻隔层。

[0102] 顶层

[0103] 类似地,吸收复合物195可与吸收服装的顶层联用或用作吸收服装的顶层。顶层50优选是松软的、顺应的、显示良好通透性和降低的从之前的液体材料再润湿的趋势。当穿戴尿布10时,顶层50紧密靠近穿着者的皮肤。通过这种方式,这种顶层50使得身体排泄物快速透过以更快地流向芯46,但是不允许这种排泄流返回通过顶层50。顶层50可由广泛的液体和蒸汽可透性亲水性材料中的任一种构成。可用表面活性剂处理顶层的表面,以促进液体从中穿过,尤其是在位于芯上的顶层的中心区和芯的内表面。也可用具有防皮疹或减少皮疹性质的物质(例如,芦荟)涂覆顶层。

[0104] 在一个实施例中,由基本覆盖一次性吸收制品10的整个区域的吸收复合物195形成顶层50,包括基本全部的前腰区12、后腰区14和胯部区16。此外,由相同的单顶层材料形成内部区18的耳层,并且因此可与顶层50整体形成顶层材料的横向延伸。替代地,可从在顶层50的宽度上变化的多种不同材料形成顶层50。这种多片设计能够产生顶层的优选性质和不同区域。

[0105] 吸收芯

[0106] 另外或者作为上述实施例的替代,可由吸收复合物195构建一次性吸收制品的吸收芯,吸收复合物195的层叠层(未显示)或者多层SAP颗粒135和织物。图11和12显示了SAP颗粒135和织物的交替层的截面图,其分别形成多层吸收复合物700和900。如这些附图所示,芯46可由SAP颗粒135的不同层组成(710和910)。这些层可以是均匀或不均匀的,取决于计划应用。在不均匀多层吸收复合物900中,SAP颗粒135的浓度可在给定层内,层间或其组合中变化。

[0107] 图11显示了复合结构700，其中SAP颗粒层710和织物层720交替形成完整的复合物结构700。也可通过在制造过程期间将吸收复合物片结合在一起、折叠吸收复合物的整体片，或用多层来构建吸收复合物来构建层状设计。在折叠应用中，复合物折叠可以是C-型折叠、Z-型折叠、V-型折叠、W-型折叠或其组合。此外，折叠可以是开放、封闭或重叠的。

[0108] 图12显示了多层吸收复合物900。如图12所示，SAP颗粒910的高浓度区可策略性地放置以在特定区域如吸收制品的胯部中提供额外的吸收性。本领域技术人员理解高浓度区域可偏移以控制液体渗透的量和方向。另外，具有高浓度区域的层可与基本均匀层的层组合。替代地，可通过放置多层吸收芯来形成高SAP浓度区域。

[0109] 可设置芯以延伸一次性吸收制品的基本全部长度和/或宽度。然而，优选地，芯在制品的胯部区域沉积或集中。在多个实施方式中，芯延伸到制品的边缘并且SAP颗粒135在胯部区或制品的其它目标区域集中。在另一个实施方式中，制品可以是SAP颗粒、皮肤护理颗粒如离子交换树脂、除臭剂、抗微生物剂、粘结剂颗粒或其它有益颗粒的组合。

[0110] 容量壁(containment wall)

[0111] 现在参考图13和图14，一次性吸收制品10使用一对容量壁或封套34，其采用吸收复合物195。各容量壁34是纵向延伸的壁结构，优选放置在芯46的各侧并与纵向中心横向间隔。例如，壁34的纵向端部可连接至前腰区12和后腰区14的顶层中。优选地，容量壁34的端部是向内向下钉牢并通过粘合剂连接到网结构。这种结构有效向内偏置容量壁34并通常被认为使得容量壁34显示出改进的防漏性质。

[0112] 图13提供了尿布10的截面图。尿布10包括背面层60、吸收芯46、采集层48和顶层50。如图13所示，芯是吸收复合物195。尿布10也包括一对容量壁或封套34，其由折叠顶层50并将其缠绕在吸收复合物195的端部周围。替代地，封套34中的吸收复合物195可不同于吸收芯46。

[0113] 优选地，容量壁34配备弹性元件38，其基本沿着容量壁34的长度延伸。在常见应用中，弹性元件38置于容量壁34内，优选在容量壁34的顶部同时在拉伸的状态下至少在其端部胶粘到容量壁上。当被释放或允许放松时，弹性元件38向内缩回。当穿戴制品10时，弹性元件38的功能是在用户的大腿和臀周围以使得制品10、臀和大腿之间产生密封的方式收缩容量壁34。芯46可以是单片或多层吸收复合物195，如上所述。

[0114] 图13显示了松软和干燥时容量壁34的构造。图14在另一个方面显示了润湿之后的容量壁，其中吸收复合物已经溶胀以将容量壁34置于有弹性的直立位置上。与现有技术的常规腿封套不同，有弹性的直立容量壁34抗压平(例如，当穿着者坐下时)，从而确保防漏(尤其是炸裂)、液化内部运动和尿液的快速排泄。

[0115] 任选的层

[0116] 一次性吸收制品可能采用其它层，包括采集层或缓冲层48，优选位于顶层和芯之间(例如，图10)。这种采集层的一个功能是将铺开或分散液体流，使得液体在芯表面上更均匀地分布。这用于延缓流，使得液体有足够的之间被芯吸附。采集层也用于防止芯局部饱和同时芯的大量剩余部分没有吸收任何液体。

[0117] 带

[0118] 一次性吸收制品必需固定于穿着者。这对尿布而言是最重要的，因为尿布不是像训练裤或失禁短内裤那样由穿着者向上拉，而是必须系紧在穿着者周围。固定元件通过在

穿着者和腰带以及腿封套之间产生准密封的效果来顺应弹性元件，使得液体容纳在制品内然后被吸收；换言之，使得其不会通过穿着者和制品的边缘之间的间隙泄漏。固定元件可以是粘合剂，机械紧固钩和环结构，或可以想象到的绳子，即将制品的一个端部固定到纵向反向端部的任何物体。固定元件也可以是共粘合，使得它们互相粘合但不与其它材料粘合。

[0119] 在附图所示的示例中(参见例如图10)，制品10通过带紧固器26固定到穿着者上，其然后永久性地固定到(例如，直接缝到)背面层60。带紧固器26与从背面层延伸的横向相对耳22接触，其中它们由于施加到紧固器26的粘合剂而保持固定。替代地，制品10可以是训练裤、套穿尿布等。在该构造中，制品10可具有或不具有带紧固器26。

[0120] 腰带

[0121] 采用弹性元件52的腰带沿着制品10的横向部分防止，使得当穿着时，腰带位于穿着者的腰部。一般而言，腰带优选对腰部产生准密封(横向弹性元件52)，使得液体废物不会从腰部弹性元件和穿着者的腰部之间的区域泄漏。准密封是重要的，因为虽然液体可能最终被填充材料吸收，穿着者的液体冲击可能超过填充材料的吸收速度能力。因此，腰带在吸收时容纳液体。第二，腰带可能具有吸收液体的能力(参见例如，美国专利号5,601,544，其通过引用纳入本文)。

[0122] 无绒吸收复合物的聚集体(和压纹)图案和材料选择

[0123] 图15A-15D的简化示意图显示了按照本发明具有吸收颗粒聚集体512的特别优选排列的吸收复合物510(用类似编号表示类似元件)。首先参考图15A，由图案中的菱形封闭物514类表示吸收复合物510上的各聚集体。在优选的实施方式中，SAP用作聚集体中的吸收颗粒。此外，图15A-15D各自中的SAP聚集体优选保持在位置上并由通过第一织物与第二织物的接合提供的物理包封或容器稳定化，该第一织物一般沉积在SAP聚积体之上而该第二织物一般沉积在SAP聚集体之下。因此，如上所述，在图15A的其它视图中，菱形单元表示容器或袋的轮廓，在特定实施方式中，反映了顶部织物与底部织物的接合。

[0124] 如上所述，SAP的吸收性能可能受到容器尺寸和结构的影响。随着SAP变得越来越饱和，其透过性降低。由于在SAP颗粒内已经含有的高水平的水，水不能通过SAP颗粒，并且最终SAP可完全停止其它流体通过。这被称为凝胶阻隔。同样，随着SAP变得越来越饱和，其溶胀并且其体积增大。通过将SAP限定在固定体积的小容器中，可能限制SAP的溶胀，防止其达到最高的饱和水平(并且最终，使SAP停止达到最低水平的透过性)。SAP颗粒受限的程度取决于多种因素，包括：容器的性质和尺寸、容器中任意断裂的尺寸和频率(例如，沿着侧壁)、容器内沉积的SAP的量、和SAP吸收的流体的量。此外，SAP的性能性质受到其饱和度的影响。具体地，在SAP从干燥变为完全饱和时，吸收复合物性质，如透过性、吸收速率、毛细管压力(从复合物中的间隙空间产生)会明显变化。按照本发明的方法，可通过改变容器的尺寸和/或SAP浓度以在物理上约束SAP的溶胀并显示SAP的最大饱和点来实现SAP的目标或最优性能。通过纳入这些物理特征，可能在吸收芯的目标区域内实现透过性的优选水平或优选的吸收性质。因此，通过控制袋尺寸和袋中SAP的量的2个变量，可“设定”容器或袋的最小透过性。可能防止尿布的一些区域中的袋出现凝胶阻隔并且该区域的芯的透过性可能优化。也可以建立袋尺寸的梯度以得到最大流和吸收芯的利用。这一梯度可能从目标区域辐射到尿布的端部或侧面。

[0125] 容器或袋的各种排列也促进了SAP和芯的利用并阻止流体绕过容器。理想地，流体

应在SAP到达最大饱和水平(其通过SAP的性质或袋膨胀的体积设定)时在容器之间泄漏或流动。申请人考虑,在前述的复合物或袋排列中的一些中(参见图6),可能存在使流体在袋之间泄漏的趋势。这是通过流体沿着由压印线形成的通道运行并且不进入芯。为了减轻这种趋势,容器的排列或图案优选是最小化或消除流体流从芯中心到芯侧缘(端部边缘)的短直路径的那些(如可沿着压印线建立)。为了说明,菱形的容器或袋优于方形或矩形的容器,因为菱形容器形成的对角线或通道是更长且更迂回。如果以不显示快速流向边缘的通道的方式包装,圆形也是有效的。在更优选的排列中,在流到尿布侧边之前,流体流被一次或多次强制改变方向。

[0126] 要求用于婴儿尿布或成人失禁产品的吸收芯快速吸收流体,在芯的解剖学对齐的区域中,在没有泄漏到产品的侧或边的情况下吸收所有流体并且保有该流体而不润湿用户的皮肤,尤其是在由用户的体重产生的压力下。本发明通过提供具有由保持SAP的容器尺寸以及容器的排列限定的不同性能参数的芯区域来完成。因此,可将芯设计为通过改变袋的尺寸和/或袋内SAP的浓度来达到优化的性能特性。

[0127] 在本文显示的某些排列中,组合设计特征以提供不太可能泄漏、快速吸收潮湿并向用户提供干燥舒适感觉的芯。在芯的胯部区,优化容器尺寸和SAP负荷以提供开放结构,其具有高透过性,导致快速采集或分布流体离开失效点和用户皮肤。由于限制进一步溶胀的容器的物理约束,甚至当SAP溶胀时也能保持透过性。这使得流体向区域中更高效地铺开,进一步原理目标区域(胯部区)并导致吸收芯的更好性能和利用。在远离胯部区的区域处,这种区域靠近并超过芯的外周,降低透过性以延缓流体。通过更大的袋增加吸收能力,更大的袋使得SAP溶胀更完全并容纳更多的流体。

[0128] 在图15A中,在解剖上与失效点对齐的区域中存在吸收颗粒聚集体522的大的菱形容器或袋514。这些容器随后朝芯510的侧边和前后缘或边缘逐渐减小尺寸。存在三个不同的容器区。在胯部区“A”,提供了大菱形袋。相邻并包围胯部区的是中间区“B”,其袋的尺寸小于胯部区(A)中的那些。除此以外,这种中间区(B)的较小袋的存在打破了SAP聚集体周围并沿着压印线的潜在流体流。如上所述,这种对流体直接逃逸流向侧缘的阻隔的存在防漏并促进SAP聚集体的利用。最后,袋的第三区“C“存在于靠近芯510的各端部边缘,其中存在更小尺寸的SAP聚集体袋。

[0129] 图15B显示了SAP聚集体522和袋514的第二示例性排列。在该实施例中,小的菱形袋522沉积在解剖上与流体失效点对齐的区域中。然后在朝向芯的侧边和前后边缘的区域中,袋的尺寸逐渐增加。两种排列(图15A和图15B)提供了构造流动梯度以及液体失效控制的替代方式。图15A中的袋排列和吸收复合物可提供初始具有更大容量的中心区域,但是其随着时间将在其空穴体积中再分布流体,或从随后的流体失效处再分布到更小的相邻袋或室中。对于图15B的图案,中心区可初始装备更小的容量,其将导致液体运向更大的室。还可以生成表面几何形貌,其方式尿布侧和端部的泄漏,即将产生拦截并吸收表面流的“坝”。

[0130] 图15C和15D提供了替代性排列,其中采用SAP聚集体的圆形袋。在图15C中,在解剖上与失效点对齐的区域中存在圆形袋。袋534的尺寸朝芯530的侧边和前后缘逐渐降低。图案与图15A中所采用的相似,但是具有圆形袋而不是菱形袋。许多图15A中的排列特征转化到图15C的设计中。

[0131] 然而,与菱形袋不同,不可能产生圆形袋的完美紧密堆积的图案并且圆形袋之间

的所得间隔可以多种方式设置。考虑圆形袋之间的间隔可以是完全凸起的(即,袋之间具有大凸起的热结合区域)、部分凸起的或不凸起的。间隔也可含有SAP或不含SAP。

[0132] 图15D显示了本发明的另一个实施方式,其具有类似于图15B中发现的图案。在该实施例中,小的圆形袋544设置在解剖上与流体失效点对齐的区域中。在朝向芯的侧和前后边缘的区域中,袋544的尺寸逐渐增加。同样,可以上述多种方式利用袋544之间的间隔。

[0133] 应注意,排列和凸起图案并不限于采用菱形袋或圆形袋。可考虑其它形状。一些排列甚至可在相同图案中采用不同袋形状。

[0134] 下表总结了不同袋尺寸的特性,假设SAP浓度在芯中保持均匀。

[0135] 表1.产品尺寸和SAP饱和度的性能总结

[0136]

SAP 饱和	小	中等袋尺寸	大
干燥 (0%)		非常高的透过性 中等吸收速率 高剩余容量	
低 (10-20%)	高透过性 高吸收速率 低剩余容量	高透过性 高吸收速率 中等剩余容量	高透过性 高吸收速率 高剩余容量
中等	高透过性	高透过性	高透过性

[0137]

(20-60%)	没有进一步吸收	低吸收速率 低剩余容量	高吸收速率 中等剩余容量
高 (60%+)	-	中等透过性 没有进一步吸收	低透过性 低吸收速率 低剩余容量

[0138] 吸收颗粒构建和/或稳定化的结构、方法和系统

[0139] 在提供本发明的吸收复合物的其它变体中,用更开放的结构代替之前实施例中采用的一种或多种无纺布网。这类无纺布的示例包括,梳理的PET网、空气穿透结合无纺布、树脂结合无纺布和非吸收气流成网结构。已知作为采集和分布层(ADL)的材料包括在这一合适材料列表中。所得的结构提供了容纳吸收颗粒的替代手段,更具体地在纤维网路内但不用纤维的吸收基质(即,不用浆料)容纳吸收颗粒。这种结构促进了SAP在由无纺布网层提供的纤维网路内的分布。除此以外,SAP颗粒在更开放的网中的分布提供了简单通过将颗粒缠结在纤维网络内来在无纺布内进一步稳定SAP的机制。

[0140] 图16A显示了上述的复合物结构。复合物采用无纺布作为底层(NW1)和顶层(NW2)以夹心SAP材料层(SAP)。图16B显示了替代性结构,其中蓬松性无纺布(“蓬松性”NW1)用作基层。蓬松性无纺布层NW1提供了向外伸展并缠结SAP颗粒的纤维。这种在更开放材料中与

纤维的缠结导致SAP在吸收复合物内的稳定化。在制造过程中，可控制施用于蓬松性无纺布的片或网的SAP颗粒以促进向更开放无纺布网的纤维网络的渗透。SAP颗粒防止在网上时，重力对颗粒的最用可能足够促进所需的渗透。可使用如真空或振荡的技术以进一步强化SAP颗粒渗透到开放的纤维网络中。

[0141] SAP的稳定化阻止材料在加工、储存和使用期间移动。在示例性实施方式中，如上所述，除了使用粘合剂和SAP聚集体的容器或袋以外，吸收复合物或芯可采用“蓬松性无纺布”结构(如图16B)以稳定SAP。

[0142] 还应注意，更开放的无纺布材料可提供其它性能特征。这些特征包括更快采集流体和对用户而言的改善干燥度(再润湿)。同样，吸收基质将比“平”无纺布网感觉更松软(更海绵状)并且将提供更柔软的复合物。这导致对用户的更大舒适性和在用户身体轮廓周围的更好契合，导致泄漏机会减少。

[0143] 现在参考图17A-17B的说明，示例性吸收复合物优选提供“蓬松性”无纺布的顶层。所示被认为是图15A中复合物的简化截面图。由于用于容纳SAP的基材是开放结构的无纺布，其特征是大孔(约2000微米)。压印将设定并稳定蓬松性弹性纤维网基材的局部孔结构。压印图案小(采用小容器)的区域(图17A)产生了与具有较大压印团(图17B)的区域(其产生更大的毛细孔(图17B))相比更小的孔(图17A)。换而言之，特征在于较小图案的较小纤维内距离产生较高的密度和较大的毛细作用。较小的图案提供了较大的纤维间距离，其导致低密度和低毛细作用。在芯中这种袋的组合的结果是优化的芯吸结构，如图17C所示。位于目标区域的较大孔和远离失效点的较小孔产生流体流的有效管道。可采用这种管道来更高效地抵抗重力运输液体。(参见图17C中的液体运动示意)。可通过对压印图案的合适选择在无纺布基材中产生这种优选结构，从而使得液体进一步铺开，增强芯的利用和摄入。

[0144] 在其它实施方式中，并参考图17C和图17D，作为SAP溶胀的结果，可在使用期间(液体摄取)形成3-D图案或轮廓。如图17C和17D所示，不同尺寸的袋提供了溶胀能力的差异，其转而导致差异化溶胀。在一个方面中，可通过具有更大溶胀的袋(例如，更大的枕)来产生坝。这种结构结果有助于减少测漏和腰部泄漏。在大多数示例中，不受控制的液体(聚积在产品表面上的液体)导致产品泄漏。由压印图案尺寸/频率限定SAP溶胀时产生的3-D形貌。可自生成表面形貌的吸收芯可阻止交叉表面流(以防止测漏)或阻碍腰部区(芯的纵向端部)处的泄漏。图15A中袋的排列和结构应正好适于在吸收芯中实现这些性质。

[0145] 采用SAP制备吸收复合物的其它示例性方法和系统

[0146] 在称为压型的方法中，改变SAP的给予速率以产生带轮廓的芯。参见例如用于带轮廓芯设计的美国专利申请号12/925,765，该文件通过引用纳入本文并作为本发明的一部分。带轮廓的芯结构通过在需要的芯区域中提供更多吸收材料来改进尿布性能。也可通过层叠多层吸收复合物，但以不同长度(例如，短顶部芯，全长底部芯)来实现轮廓。更高效的解决方案可以是在施加SAP期间改变SAP给予速率并且在芯在尿布线中转化时将高SAP给予区域与尿布的胯部区域对齐。这种方法在采用比叠置的芯更少的无纺布材料时可能是更高效的。其也可以是成本有效的。

[0147] 在一个实施方式中，粉末化的热熔粘合剂与SAP混合以提供额外结合。SAP和粘合剂混合物在2个无纺布网之间分布并且通过将复合物通过加热装置来“活化”热熔粘合剂。合适的装置包括加热的辊、红外加热器等。粘合剂熔化并将SAP和无纺布结合在一起。这也

可与带图案压印/超声过程组合以产生如上所述的袋图案。一般而言，以10至100重量份SAP与1重量份粘合剂的比例混合粘合剂/SAP(1-10重量％粘合剂)。太多的粘合剂将限制SAP的吸收性能，而太少的粘合剂将牺牲结构完整性。优选地，以每个SAP颗粒约1至2个粘合剂颗粒的比例施用粘合剂。如果SAP和粘合剂的平均粒度和密度已知，可计算出精确的比例。

[0148] 所述的吸收复合物因此还正好适于在线下和先上制造过程中制造。在线下过程中，芯机器与任意其它过程分开放置并产花彩装饰材料的生辊、线轴或盒，其然后递送到尿布转化线上。一般而言，但不必需，如上所述与图6-7的产品相关的机器将产生吸收复合物的宽片。然后将产物分裂以产生多个用于尿布转化线的材料辊，即，1.5m宽的机器将产生100mm宽度的15个材料辊。在线下(offline)过程中，线下机器一般在比尿布转化线低得多的速度下运行。在线上(online)过程中，芯机器是尿布转化线的一部分并且芯成为尿布转化方法的一部分。芯机器的输出速度必须匹配尿布转化线的速度并且芯的宽度将匹配产品中芯的宽度。

[0149] 在图18A所示的线下过程中，形成SAP夹心，其具有基材A、第二基材B和放置在两个基材之间的SAP涂层。在一个实施方式中，SAP通过将两个基材结合在一起来固定以在两层之间容纳离散平面体积的SAP。可采用用于SAP稳定化的以下方法的一种或组合。在第一过程中，采用热压印或超声波结合来将基材层融合成限定图案。在第二过程中，向基材内表面的一侧或两侧施加粘合剂。然后将两个基材按照优选的压印图案策略性地结合在一起。第三，热粘结剂，如低熔粘合剂颗粒可与SAP颗粒混合。然后向复合物施用外部加热以活化或熔化粘合剂，从而将颗粒结合到基材或互相结合。因此，可施用带图案压印步骤以增强层叠质量，同时保持用于强化液体摄取的更开放SAP层结构。如果不需要图案，也可采用光滑的压延辊(不带图案)以将覆盖层与SAP层结合以产生夹心结构。

[0150] 在线上过程中，芯形成过程直接与尿布转化过程偶联。按照上述第一和第二过程，在3-4倍的线下过程速度下形成SAP夹心结构。第三种方法可能不适用于更快的线上过程，由于加热和活化与SAP混合的热粘结剂所需的短停留时间。设计线下过程以较低的速度产生宽材料。然后将材料输出物分成更窄的宽度以提供多条尿布线。相反，设计线上过程以较高速度产生窄(1-宽度)材料并同时供应仅用于一个尿布机器的芯材料。

[0151] 因此，在按照上述第三种方法的线下方法的优选实施方式中，混合少量(10％或更少)的热熔颗粒与SAP。该颗粒混合物均匀沉积在基材A上，然后经过辐射IR加热以熔化粘合剂颗粒。然后在顶部放置第二基材B，同时材料仍然是热的。使用由带图案辊/光滑砧压印系统的热压印将层立即层叠在一起。下表2总结了该过程并提供了优选实施方式的某些参数。

[0152] 表2.使用热熔粘合剂制造的示例性线下过程

[0153]

芯结构	基材A	SAP BW，gsm	热熔	激活	基材B	结合图案
A	20-80 gsm ADL网	150 - 750	Abifor 1605，5-10%	IR加热	棉质	菱形，22 x 50mm

[0154] 在瑞士由Santex、Tobel制造的涂覆线可提供SAP散射技术，IR加热和网处理。参见例如，图18B。如图18B所示，散射单元采用料斗和标准旋转针式辊来混合并向网施加混合物。按照其对应用的适用性来选择SAP材料，但一般而言，优选在负荷下具有高保留能力和高吸收性的SAP，例如，20-40g/g的离心保留能力(CRC)，超过100g/g的压力吸收性指数(PAI)。示例性SAP是由日本触媒公司(Nippon Shokubai)生产的M-151。合适的热熔粘合剂是低熔EVA聚合物Abifor 1605(0-200微米粒度级)，其目前可购自瑞士的Abifor能源技术公司(Abifor Powder Technology)。如图18详细描述，易得的散射单元在混合和将混合物施加到网上时采用针式辊。该实施方式的具体结合图案是具有50mm的MD方向取向的长轴长度和22mm的短轴长度的拉长菱形。参见例如，图18C。

[0155] 图19显示了吸收复合物910，其通过上述图18A-18C所述的方法和系统产生。优选地，复合物910包括为蓬松性无纺布的底基材A，顶层或基材B，和位于两层之间并间插热熔粘合剂颗粒HM(如上所述)的超吸收颗粒S。更优选地，通过本领域可购得并理解的棉质材料提供顶部基材B。或者，可通过第二蓬松性无纺布层或SMS或纺粘(“非蓬松性”)无纺布层来提供顶部基材B。

[0156] 如上所述，可在线上或线下制造吸收复合物910的层叠体。可修饰层叠体以包含如上所述的其它或不同的SAP加载(即，带轮廓的芯)。在线下过程中，可以宽片的形式递送复合物，该片经切割并分成单独的芯复合物部分。

[0157] 图20A和20B是包含吸收芯层叠体812或吸收复合物810的一次性吸收制品812的截面图(平放)。为了描述附图的方面，延长以提供一次性吸收制品的吸收芯的完整吸收复合物可以指吸收芯层叠体，而吸收复合物可用于描述层叠体的部分的组件。另外，包括权利要求中，可互换使用术语。吸收芯层叠体812的特征是具有容纳其中的SAP(超吸收颗粒(S))聚集体816的间隔分布的袋814。图20C提供了这些袋814之一的详细截面俯视图。图20C也显示了优选的吸收复合物810的组件。

[0158] 现在参考图28，按照本发明，显示了基本一次性吸收制品862(平放状态)包含吸收芯层叠体812作为吸收芯。吸收芯层叠体860被顶层864完全覆盖，但是为了方便起见，顶层864显示为透明的。在宽背面层866上用侧缘868支持吸收芯层叠体860。各侧缘868设置有在吸收芯层叠体860的各侧显示凹面形状的切口。如一般所知，凹面切口将在用户的大腿周围与腿洞契合或对应。

[0159] 参考图20C，在优选的结构中，无纺布材料提供了复合物的基层或底层818(在吸收制品产品的制造期间)。在产品使用期间，基层818可描述为远离身体放置，与位于直接接收摄入的吸收复合物810的体侧相反。此外，在该实施方式中，无纺布层818具有施用其上的粘合剂层822。粘合剂层822优选以连续珠的形式递送，在基底无纺布818上并且有优选的开放图案中，如下所示。

[0160] 吸收复合物也包含位于粘合剂层822之上的以及底无纺布818和顶无纺布层826之间的SAP层806。在该实施方式中，SAP层824仅由SAP颗粒S组成，而没有任何形式的粘结剂材料或基质。其也可描述为无绒或无浆。优选通过具有延伸并横向缠结SAP层806的顶面上或其附近的一些SAP的纤维的蓬松性无纺布材料来提供顶部无纺布层826。顶部无纺布826优选通过压印并且更优选地通过点连接来结合底无纺布818。结合点828限定了袋814的外周并且还在袋外周上压制弹性蓬松性无纺布826以显示全部气泡或半球形截面(如图20C所

示)。图29的简化说明提供了吸收复合物810(和更具体的复合物组件)的替代视图,而没有显示袋814外周周围的点结合和压制。

[0161] 在这种优选的结构中,蓬松性无纺布层826接触并覆盖SAP层824,从而限制SAP颗粒S的运动。在制造和产品处理期间,蓬松性无纺布层826也优选放置为顶层,从而在使用前限制SAP颗粒的运动或迁移。在吸收制品使用期间,蓬松性无纺布826还优选放置在体侧上以接收并分布摄入物到SAP层。

[0162] 在该优选结构中,SAP组织成离散的、间隔分开的SAP聚集体或簇816,如上所述,其各自保持在袋或容器814中。2个无纺布层818、826结合在结合位点处,或者,更具体地,在离散、间隔分开的结合位点828的排列处。因此,蓬松性无纺布826是多重并间断性固定在SAP聚集体816上,并有助于将SAP聚集体816保持在位置上。下文中描述了通过使用蓬松性无纺布施加在吸收复合物和吸收芯层叠体上的独特功能和性质。

[0163] 图21的剖视图揭示了按照优选实施方式的吸收复合物810或吸收层叠体812及其相关位置的各种组件或层。图22提供了通过显示复合物的组件合并到一起的顺序显示制备复合物的基本过程或步骤。也应该参考之前对制备吸收复合物或采用复合物的吸收制品的描述,包括图1-5和与之相关的说明。本文所述的许多过程步骤和过程组件可应用或适用于制备图19-29所述的吸收复合物。

[0164] 在优选方法的初始步骤中,以常规方式运输无纺布818网,并且然后在粘合剂施涂器边通过。喷洒粘合剂施涂器优选以开放粘合剂图案向无纺布818上递送连续珠(参见图22A)。通过这种方式,无纺布材料818的表面上提供粘合剂822a的环,其特征是或限定不含粘合剂的开放区域(而不是均匀的层或膜)。示例性实施方式中的环822a小于之前所述的袋814(即,宽度或直径更小),直径一般是1mm至25mm。

[0165] 图22B显示了通过本文所述或本领域已知的方法向由具有粘合剂层822或开放图案施涂其上的粘合剂层的基底无纺布层818组成的基材递送SAP聚集体816。具体地,通过空气流并且通过使用常规真空系统或抽吸机制,如本文之前所述或本领域已知的那些来递送SAP。向无纺布818网之上或之下施加的抽吸将SAP拉向无纺布818并将SAP组织成需要的SAP的聚集体或簇816的预排列(如图22B所示)。真空系统可采用筛选或网格界面以更好地接合无纺布的底部并限定SAP聚集体的目标几何形状。因此,界面显示与SAP聚集体816的所需袋形状相对应的抽吸图案。真空系统优选将SAP直接在网上从气流中拉出并在上述抽吸机制下形成网上的离散簇或聚集体。某些区域,包括沿着侧边和端部的区域称为无SAP(也无添加剂)区域并且会目的性地保持不含SAP。

[0166] SAP一般直接落入所需的排列中,与受限在网上分布然后在网周围运动之后在网上形成更紧密的浓度(如替代性实施方式所示)相反。SAP一般不必在网上的粘合剂上移动以形成目标的多个SAP聚集体816。因此,所得的网由其上具有开放粘合剂图案822的无纺布基层818和离散的、间隔分离的SAP聚集体816的排列或层806组成。SAP的簇一般放置并接触粘合剂,但是粘合剂的开放图案所占据的明显小于SAP聚集体接触的底层。然而,应注意到,一般可固定接触粘合剂的SAP颗粒。与这种固定SAP颗粒相邻放置并接触的另一种SAP颗粒进而可通过该SAP颗粒(和/或其它相邻SAP颗粒)限制(移动)或至少部分由其固定。这种磨擦机制至少阻碍SAP颗粒的水平移动。

[0167] 随着无纺布-SAP的网向前移动并从真空系统中移去,粘合剂图案822用作维持SAP

聚集体816的所需排列和位置。在后续步骤中，第二无纺布826的网向前运输然后施用于无纺布-SAP层叠体上。参见22C。如上所述，优选的顶部无纺布826层是蓬松性无纺布。对于SAP聚集体816在制备吸收制品如尿布或训练裤的过程中的其它加工和运动，额外的无纺布826提供了额外的覆盖并作用是使SAP聚集体816保持在所需图案中。除了在完成的产品中和使用期间提供优选的功能以外，蓬松性无纺布816缠结顶层的SAP颗粒S，如图29所示，从而进一步使SAP聚集体816固定(在产生制造和之后的制造后产品处理期间)。SAP与蓬松性无纺布的缠结限制了SAP在SAP聚集体816的顶部附近的横向和垂直移动，和阻碍了其下面的SAP的直接移动。如本文所述，考虑缠结和渗透的所需程度，限定和选择SAP和蓬松性无纺布。

[0168] 接着，两个无纺布网和其间的SAP聚集体在啮合并压制网的压延辊上通过。如上所述，压延辊具有表面雕刻，其具有对应于网上袋图案的图案。图23显示了使用不连续点接合的一般结合的吸收复合物层叠体812。点反映了压印后蓬松性无纺布826的压痕。点也是袋814的结合点828(也参见图20A-20C的截面图)。将2个无纺布在SAP聚集体816周围固定在一起提供了保持SAP聚集体816和所得的吸收层叠体812的排列的另一种机制。如本文所述，结合点的排列提供了几何网格830，其定位并限定SAP聚集体816的袋814。

[0169] 因此，在该示例性实施方式中，在吸收制品产品制造和制造后处理期间，优选的SAP层叠体结构提取自若干结构特征以阻止SAP颗粒从SAP聚集体的所需排列上移动。首先，在基底无纺布层上提供粘合剂并在粘合剂上放置SAP聚集体。然而，以封闭环的开放图案递送任选的粘合剂层，该环仅接触某些底层SAP颗粒但阻止在这些接触的SAP颗粒之上的SAP颗粒的移动。在SAP聚集体上施加顶部无纺布层增加了最小施加的粘合剂以进一步限制SAP的移动。优选地，递送到基底无纺布的SAP层是不含浆料并且不含基质或粘结剂的，其优化了复合物的吸收和流体控制性质。除了底层粘合剂以外，也不含粘合剂。因此，SAP层中的许多部分(尤其是SAP层的中间部分)由SAP组成，但在替代性实施方式中，可包含其它材料以赋予有益性质。如上所述，主要仅由SAP组成产生更薄的、更松的，更柔软的SAP结构。同时，仅SAP组成的大部分提供了改进的吸收性质和流体处理特性，其充分保持在位置上(阻止SAP颗粒迁移)。

[0170] 作为另一个增强，优选的SAP层叠体结构采用离散或间断性结合点与图22所示的层叠体结构的结合排列。参见图23。提供间断性或间隔分开的结合点的压印图案通过采用图20-22的SAP层叠体结构和/或使用蓬松性无纺布层作为吸收层叠体的顶层或体侧层提供了协同效果(反之亦然)。结合点之间提供的间隙允许流体在SAP聚集体之间通过，包括来自SAP层叠体的仅SAP中间部分的流体流通过。蓬松性无纺布和/或粘合剂的提供降低了完全或连续结合线的需求。类似地，蓬松性无纺布和/或点结合的位置减少了SAP稳定化所需的粘合剂的量。

[0171] 此外，通过使用压印点而不是更长的结合点或固体结合线对蓬松性无纺布层的减少的收缩使得弹性蓬松性纺布膨胀并优选接收并分布流体摄入物。通过压印施加的压力在图20C所示的结合点处压制蓬松性无纺布，但是弹性蓬松性无纺布从结合点上“弹起”。也可参见图30。这导致了具有良好流体处理功能的更开放的亚结构。此外，仅SAP组成的功能是接收并吸收流体摄入物，并且如果需要，将流体摄入物通结合之间的间隙通到相邻SAP袋。在一个方面中，存在来自相对开放的蓬松性无纺布层的定表面上的流体，通过蓬松性无纺布层并进入仅SAP体，并从仅SAP体的中间层由侧边通向结合点之间的间隙，然后进入优选

的另一个基本上仅SAP聚集体的通道。

[0172] 图24的平面图显示了由离散结合点828互相固定的结合的吸收芯层叠体812。图24显示了按照该示例性实施方式的SAP袋814的优选图案。层叠体812延长至具有一定的横向宽度尺寸和纵向长度尺寸。这一阶段中的层叠体812的形状一般是矩形的。如上所述，压印过程优选采用间断性结合图案以在袋之间增强流体流。所选的袋图案使用菱形压印以产生菱形袋814。使用菱形袋和相应网格的一个优势在于，使用直接互连的线，更易于设计并匹配压印辊上的雕刻图案和真空系统的界面。

[0173] 优选地，排列菱形使得结合点系列或压印线不与芯的侧缘重合。对齐可存在于层叠体812表面上的结合点的直线(SL)优选取向为相对于侧缘低于90度角，并且更优选约60度和30度之间。通过这种方式，可提供潜在流体通路(即，在表面上和袋814中并沿着线)的互相连接的结合线(SL)的长度不超过与侧缘834的垂直线(其可表示另一种图案)。这解决了向侧缘834的可能流体泄漏并且促使流体路径分入下游的不饱和袋。

[0174] 吸收芯层叠体812的特征还在于靠近侧缘834和靠近端部缘836的无SAP的线路838。对在底部无纺布层上递送SAP并组织SAP聚集体的步骤进行设计以使这些区域没有SAP以最小化SAP的使用。之后密封该区域并在侧缘的情况中，可从吸收芯层叠体812中切下弯曲部分以适应腿部切口和/或产生沙漏形的芯。这些区域中没有SAP可制成更柔软和可折叠的材料层。这也避免了制造过程中可能需要的必须在较硬的，更有刚性的SAP材料中切割(或密封)，从而促进更干净和更精确的切割(和密封)。可能更为重要的是，这避免了制造装置额外戴上切割刀及维护和停工时间。

[0175] 图25的平面图显示了采用替代性袋图案和结合图案的替代性吸收芯层叠体840。与间断性结合不同，结合图案采用产生固定网格的连续结合线842。如之前所述的实施方式，使用菱形的袋844。除此以外，通过连接结合线产生的潜在流体通路涉及偏离侧缘的角度(即，45度)，从而稍稍减轻了直接流到侧缘的风险。

[0176] 如本文所用，菱形的袋表示具有四条侧边并具有优选互相对齐纵向的2个角和对齐横向的其它2个角的袋。袋优选并不取向成符合层叠体的横向和纵向中心线的矩形，其中结合线组成通向侧缘的“直接”直线路径。如本文所用，术语“网格”表示通过沿着结合位点或压印线交叉线来建立几何形状。此外，如本文用于袋的排列或几何形状，“直接”直线路径表示连接以组成从靠近纵向中心线到侧缘的连续和通常(非“中断”)路径的一条或多条结合线，其中该路径一般与侧缘垂直。这种直接直线路径组成通向侧缘的最短流体通路。为了清楚起见，这种偏离垂直超过30度的直线路径应称为间接直线路径而不是直接直线路径。没有如此偏差的直线路径被认为是“直接直”线路径。

[0177] 应注意到可采用其它“网格”和其它袋形状和袋排列。一些采用的袋形状不会显示出通向侧缘的任意的直接或任意直线路径。这包括上文所述的一些排列，包括圆形或椭圆形袋的排列。

[0178] 带轮廓的芯复合物

[0179] 在这一优选实施方式中，制造吸收芯的方法包括递送带轮廓的芯结构的步骤。该方法是前述方法的其它版本，并且在一个优选的方法中，包括前述方法的所有步骤。例如，虽然之前的方法可采用单个SAP施涂器，但本发明的方法可采用第二SAP施涂器以增加第一SAP施涂器的SAP递送。第二SAP施涂器可位于第一施涂器的上游(前面)或下游。在第一施涂

器的喷嘴可经裁剪以覆盖目标芯的宽度的情况中，第二施涂器可经裁剪以覆盖芯的变窄部分。另外，可对第二施涂器进行编程以递送持续特定时间段，其是第一施涂器的递送时间段的一部分。例如，可对第一施涂器进行编程以向SAP芯的几乎整个宽度连续递送(除了侧缘处的窄且不含SAP的通道)。第二施涂器可经裁剪和编程以将SAP递送到更窄的中心区域和/或持续间断性时间段，其对应于芯的中心区域。在示例性实施方式中，第二SAP施涂器位于第一SAP施涂器的下游，从而在首先沉积在无纺布网上的SAP上递送第二剂量或加载量的SAP。因此，来源于第二施涂器(以及第一施涂器)的SAP聚集体的排列比其它仅来源于第一施涂器的SAP聚集体有更高的SAP加载量。

[0180] 如上所述，优选的过程采用抽吸机制，并且筛选以在网上组织SAP袋。递送后，SAP加载物被快速拉成SAP聚集体形成。来源于2个SAP施涂器的SAP聚集体提供了具有比并非如此来源的袋更厚和更大SAP层的袋。

[0181] 在优选的排列中，双SAP加载袋位于中心区域，其中出现最多的摄入物。在其它实施方式中，2个SAP加载物的组成可能变化以实现所需的混合物或所需的吸收或流体处理性质。在其它实施方式中，其它SAP施涂器可采用并策略性地放置以产生所需的SAP袋图案和功能。

[0182] 蓬松性无纺布的用途

[0183] “蓬松性”在本文中是指，并提供开放的纤维网络或疏水性但非吸收性纤维的网。此外，如本文所述，蓬松性无纺布是具有100μm至10000μm(优选1000μm至5000μm)的厚度，15g/m^2至200g/m^2(优选20g/m^2至80g/m^2)的基重，和0.01g/cc至0.3g/cc(优选0.01-0.08g/cc)的密度的纤维网材料。此外，蓬松性无纺布将具有300μm至2000μm的有效孔直径。一般而言，所选的SAP的颗粒将具有约300μm的平均粒度，其确保在SAP和所选蓬松性无纺布之间的一些渗透或缠结。下表3和4可用于进一步限定蓬松性无纺布并显示关键性质之间的相互关系。(表中的阴影区域指本发明的蓬松性无纺布材料)。按照Dunstan和White，J.Colloid Interface Sci，111(1986)，60的方法由网密度、纤维直径和纤维密度值估计有效孔直径，其中有效孔直径＝4*(1-固体体积分数)/(固体体积分数*固体密度*固体比表面积)。

[0184] 合适的纤维包括聚丙烯(PP)、聚乙烯(PE)、聚对苯二甲酸乙二酯(PET)、聚乳酸(PLA)、聚烯烃、其共聚合或其任意组合，包括生物组分纤维。通常用表面活性试剂，表面活性剂来处理纤维以修饰纤维的表面张力使得他们是亲水性的。

[0185] 表3.

[0186] 网厚度(以微米计)对比基重和密度

[0187]

基重	网密度												
	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.1	0.15	0.2	0.3
15	1500	750	500	375	300	250	214	188	167	150	100	75	50
20	2000	1000	667	500	400	333	286	250	222	200	133	100	67
30	3000	1500	1000	750	600	500	429	375	333	300	200	150	100
40	4000	2000	1333	1000	800	667	571	500	444	400	267	200	133
50	5000	2500	1667	1250	1000	833	714	625	556	500	333	250	167
60	6000	3000	2000	1500	1200	1000	857	750	667	600	400	300	200
70	7000	3500	2333	1750	1400	1167	1000	875	778	700	467	350	233
80	8000	4000	2667	2000	1600	1333	1143	1000	889	800	533	400	267
90	9000	4500	3000	2250	1800	1500	1286	1125	1000	900	600	450	300
100	10000	5000	3333	2500	2000	1667	1429	1250	1111	1000	667	500	333
110	11000	5500	3667	2750	2200	1833	1571	1375	1222	1100	733	550	367
120	12000	6000	4000	3000	2400	2000	1714	1500	1333	1200	800	600	400
130	13000	6500	4333	3250	2600	2167	1857	1625	1444	1300	867	650	433
140	14000	7000	4667	3500	2800	2333	2000	1750	1556	1400	933	700	467
150	15000	7500	5000	3750	3000	2500	2143	1875	1667	1500	1000	750	500
160	16000	8000	5333	4000	3200	2667	2286	2000	1778	1600	1067	800	533
170	17000	8500	5667	4250	3400	2833	2429	2125	1889	1700	1133	850	567
180	18000	9000	6000	4500	3600	3000	2571	2250	2000	1800	1200	900	600
190	19000	9500	6333	4750	3800	3167	2714	2375	2111	1900	1267	950	633
200	20000	10000	6667	5000	4000	3333	2857	2500	2222	2000	1333	1000	667

[0188] 表4.

[0189] 孔直径(以微米计)对比给定纤维尺寸和纤维密度下的密度

[0190]

纤维类型	纤维		网密度												
	旦尼尔	密度	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.1	0.15	0.2	0.3
聚烯烃 (PP 或 PE)	1.5	0.91	1374	680	448	332	263	216	183	158	139	124	77	54	31
	3	0.91	1944	961	633	470	371	306	259	224	197	175	109	77	44
	6	0.91	2749	1359	896	664	525	433	366	317	278	247	155	108	62
	12	0.91	3887	1922	1267	939	743	612	518	448	394	350	219	153	88
	20	0.91	5018	2481	1636	1213	959	790	669	579	508	452	283	198	113
聚酯 (PET, PLA)	1.5	1.3	1648	818	541	402	319	264	224	195	172	153	98	70	43
	3	1.3	2331	1156	765	569	452	373	317	276	243	217	139	99	60
	6	1.3	3296	1635	1082	805	639	528	449	390	344	307	196	141	85
	12	1.3	4662	2313	1530	1138	903	747	635	551	486	434	277	199	120
	20	1.3	6018	2986	1975	1470	1166	964	820	711	627	560	358	257	156

[0191]

PET/PE 双组分	1.5	1.1	1514	750	495	368	292	241	204	177	156	139	88	63	37
	3	1.1	2141	1061	701	521	412	340	289	250	220	196	124	88	52
	6	1.1	3028	1500	991	736	583	481	409	354	312	278	176	125	74
	12	1.1	4282	2121	1401	1041	825	681	578	501	441	393	249	177	105
	20	1.1	5528	2739	1809	1344	1065	879	746	647	569	507	321	228	135
纤维素 (Rayon)	1.5	1.5	1772	880	583	434	345	285	243	211	186	167	107	77	48
	3	1.5	2506	1245	824	614	488	404	344	299	264	235	151	109	67
	6	1.5	3544	1760	1166	868	690	571	486	422	373	333	214	155	95
	12	1.5	5013	2489	1648	1228	976	807	687	597	527	471	303	219	135
	20	1.5	6471	3214	2128	1585	1260	1042	887	771	680	608	391	282	174

[0192] 参考图16和17,如上所述,存在从采用蓬松性无纺布作为吸收复合物中的织物产

生的流体处理益处。此外，具有位于体侧上的蓬松性无纺布的吸收复合物的取向是特别优选的，由于其增强了吸收复合物采集和分布流体摄入物的能力。蓬松性无纺布具有高空穴体积和透过性，并且允许复合物快速捕获并有效将流体从无效点上分布开。

[0193] 另外，具有所述的压印图案的蓬松性无纺布也具有以下特征：

[0194] 由蓬松性无纺布提供作为体侧层的“枕头”结构(参见例如图20C、图29和图30)产生了可压缩和有弹性的结构，其增强了松软感觉。

[0195] 在袋区域中，存在孔尺寸梯度(参见例如图20C和图30)其促使液体从脊(具有更大纤维间距离I的更开放区域)上移到结合区域(具有更小纤维间间隔的更紧密区域)。这示于图30，其显示了展示出向结合点828的更小纤维间距离I的蓬松性无纺布826。由于毛细作用与密度负相关，更紧密区域的毛细作用高于更开放区域，因此织物内的液体会倾向于流向更紧密区域。这对于干燥感觉而言特别重要，因为这使得任何脊上的剩余液体流向结合区域并进一步流到下面的SAP结构中，其中液体被紧紧地保持。因此，产生了相对不含液体的顶表面，其有助于干燥感觉。这种孔梯度也阻止流体流回表面。

[0196] 不连续结合图案也通过产生更柔软的复合物有助于松软感觉。

[0197] 喷洒粘合剂

[0198] 可使用粘合剂来提供复合物的额外结合并可用于辅助将SAP固定在无纺布上。这在复合物的制造、包含复合物的一次性吸收制品的进一步加工和吸收制品中复合物的储存和最后使用期间需要。理想地，向复合物的无纺布网中的至少一个施加粘合剂，或者可向上无纺布网和下无纺布网同时施加粘合剂。

[0199] 合适的粘合剂包括热熔粘合剂，其通过狭缝涂布或喷涂施涂器(如由Nordson公司提供的那些)来试用。在优选的实施方式中，通过喷洒方法来施用粘合剂，其中通过空气流将热熔粘合你的连续珠导成图案，如螺旋图案或更随机的图案。图22显示了一个这种图案。螺旋的直径范围是1mm至25mm。这种喷洒图案的优势在于，无纺布网上的粘合剂覆盖不均匀，并且存在基本不含粘合剂的开放区域。这些开放区域向流体提供了不受限制的通道通过无纺布网并进入超吸收层，其中均匀的涂层可延缓或降低通过网的流体流。

[0200] 在粘合剂的其它和多个实施方式中，优选的粘合剂是亲水性的。此外，涂层中粘合剂的浓度是每平方米0.5至100克。最优地，浓度为1至25GSM。在一个优选实施方式中，浓度是2至10GSM。

[0201] 为了显示优选实施方式的可能变化，图26提供了替代性实施方式的吸收芯层叠体850的剖视图。如上所述，吸收芯层叠体850采用具有预先施加其上的粘合剂图案822的基底无纺布层818。层叠体850还提供了间隔分开的SAP聚集体的第一层816，这些聚集体基本占据了层叠体850的横向和纵向区域。可如上所述施加粘合剂图案822和SAP聚集体，通过SAP施涂器递送SAP并在常规真空系统等的辅助下组织成所需的袋图案，如上所述。在这种变化中，第二SAP施涂器可位于第一SAP施涂器的下游以将SAP沉积到具有其上已经有第一层SAP聚集体816的网的选择区域上。选择接收额外SAP组分或可能的具有与第一次递送的SAP不同性质的吸收材料的区域一般是在使用一次性吸收制品时对应于胯部区的中心区。在层叠体850的机器方向与横向方向重合的过程中，可用喷嘴或窄于第一SAP施涂器的喷洒面积配置SAP施涂器。因此，递送SAP的区域将窄于SAP层816。如果机器方向与纵向方向重合，可对第二SAP施涂器编程以仅在中心区的移动在第二SAP施涂器下对齐的时间段中递送SAP。

[0202] 参考图20A和20B，中心区854中的袋814含有的浓度或SAP聚集体超过靠近吸收芯层叠体812的纵向端部区856附近的袋814中的SAP浓度。在这些区域和中心区的中间，存在含有浓度多少处于中间的SAP的袋857。可通过第二SAP施涂器的程度和可能的相邻袋之间均分过量SAP来确定这些袋857中的SAP浓度。如本文所述，这些袋857可用作SAP的高低容量和吸收及溶胀性质之间的梯度转化，并且可产生有益的流体流(在吸收芯中)。

[0203] 再次参考图26，该实施方式也装备了第二粘合剂图案862以辅助在袋中固定SAP。粘合剂图案862可与底部无纺布上优选施用的开放图案822相同，并且将在将顶部无纺布826导入所得的层叠体850之前在顶部无纺布826上预先施用。在所得的结构中，这种第二粘合剂图案862有助于固定接触或接近接触顶部无纺布826的SAP聚集体的颗粒。如果采用蓬松性无纺布作为顶部无纺布826，粘合剂有助于SAP聚集体中顶部层区域中的SAP与蓬松性无纺布纤维的固定，包括促进SAP缠结。当在层叠体设计中采用2种粘合剂图案时(如图26的层叠体)，各图案中施用的粘合剂的总量(例如，珠的厚度、环的尺寸)可能减少。此外，也可降低结合点的数量或频率。用于将SAP固定在袋814中的各种机制可能对SAP有不同的影响并来自不同的角度，但是一起发挥作用以实现共同的目的。

[0204] 图27显示了制备吸收芯层叠体和/或一次性吸收制品的示例性过程中的后续阶段。可分离的吸收芯层叠体872的网870显示以与机器方向重合的横向方向传送。层叠体872显示制备成沙漏形。提供了SAP向基底无纺布的递送，使得无SAP区域874靠近或沿着个体吸收芯层叠体的最终侧缘876。此外，如图27所示，在制备切口以容纳腿洞和/或简单地产生优选的沙漏形状中，该形状有助于在胯部区更容易地契合或容纳用户，靠近侧缘876的中心的较宽区域878也没有SAP。通过这种方式，可减少SAP的使用并降低材料成本。

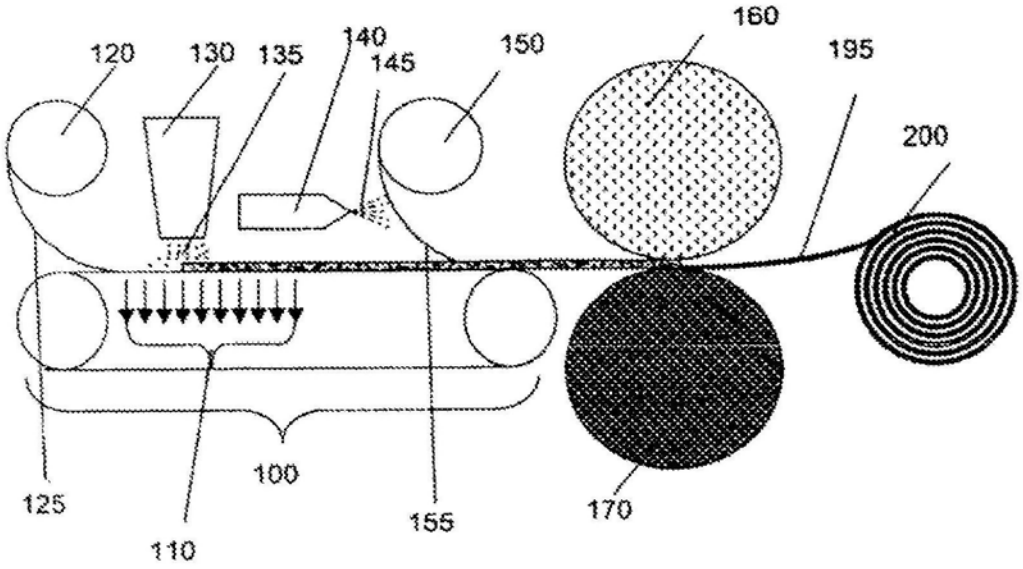
[0205] 在任何事件中，SAP聚集体的窄区域护层852都沉积在第一层816上和选择的中心区中。可再次采用真空系统以引导SAP沉积到目标区域。通过这种方式，可生成更高浓度的SAP聚集体。

[0206] 一般而言，用一对纵向间隔分开的端部区域856和之间的中心区854来延长吸收芯层叠体812。吸收芯层叠体位于顶层和背面层之间，其称为“芯封套”880。也参见截面图20A和20B。图20A可描述为芯封套880横向截面图(即，穿过横向中心线XX)，而图20B是芯封套880的纵向截面图(即，穿过纵向中性线YY)。吸收芯层叠体812也描述为具有在端部区域856之间延伸的侧缘。SAP聚集体816的袋814的排列设定在侧缘812之间。如附图所示，排列限定了吸收芯层叠体812上的图案或网格。在中心区854周围，侧缘856内的一对切口882向一般矩形的层叠体812提供了凹度，这降低了中心区854中袋814的群。这种凹度使吸收芯层叠体812形成一般呈沙漏的形状。由于中心区854一般对应于一次性吸收制品862的胯部区，吸收芯812的凹度和一般没有较硬(比顶层和背面层材料)的芯材料促进了使用期间吸收制品862在胯部区变形，并有助于适应用户的轮廓。

[0207] 因此，本发明非常适于进行上述目的并达到了上述的终点和优势，以及其它固有性质。虽然已经描述了优选的实施方式(尿布形式)，可对制品部分或组件的结构、排列，以及方法的步骤的细节做出多种改变。例如，可在制品的其它部分或除了尿布以外的其它制品中采用各种顶层、背面层、吸收芯、容量壁和其它吸收复合物结构。本领域技术人员将易于提出这类改变并且包括在本发明的精神和所附权利要求的范围内。

[0208] 尽管已经详细描述了本发明和其优势，但是应当理解，可对本文进行各种变化、替

代和改变而不背离所附权利要求所定义的本发明。此外，本申请的范围不是旨在限制于本说明书所述的形式、手段、方法和步骤的过程、机器、制造、组合物的具体实施方式。通过本公开可容易理解，现存或后续开发的与本文所述相应实施方式实施基本相同功能或实现基本相同结果的形式、手段、方法、或步骤的过程、机器、制造、组合物均可使用。因此，所附权利要求旨在将形式、手段、方法、或步骤的过程、机器、制造、组合物包括在其范围内。


120
130
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195
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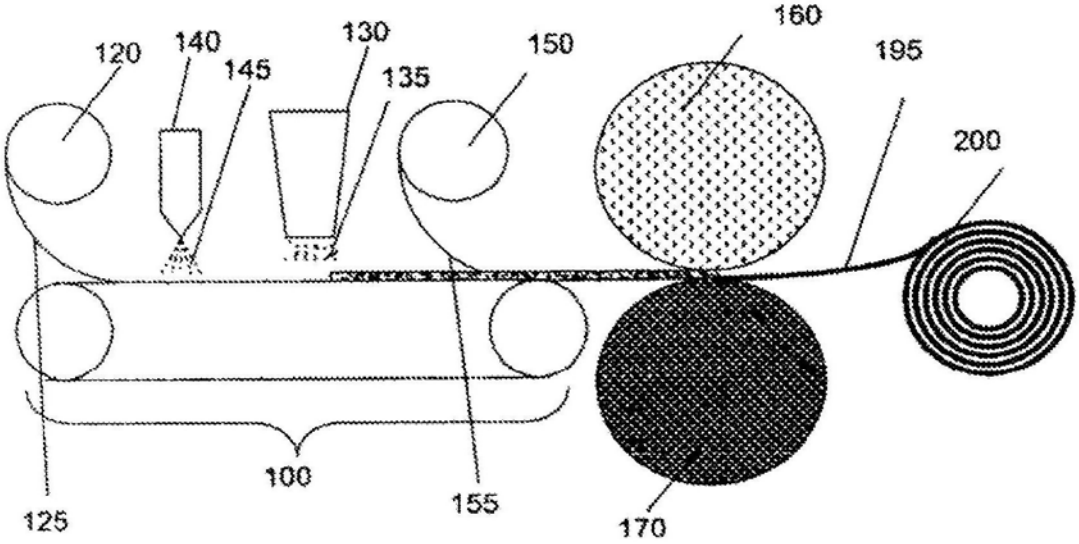
110
100
155
170

图1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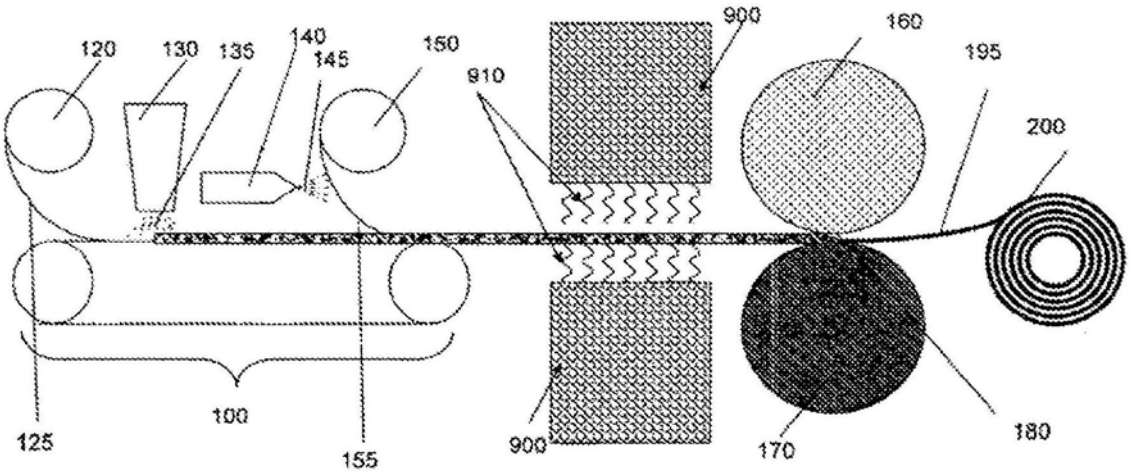
155
170

图2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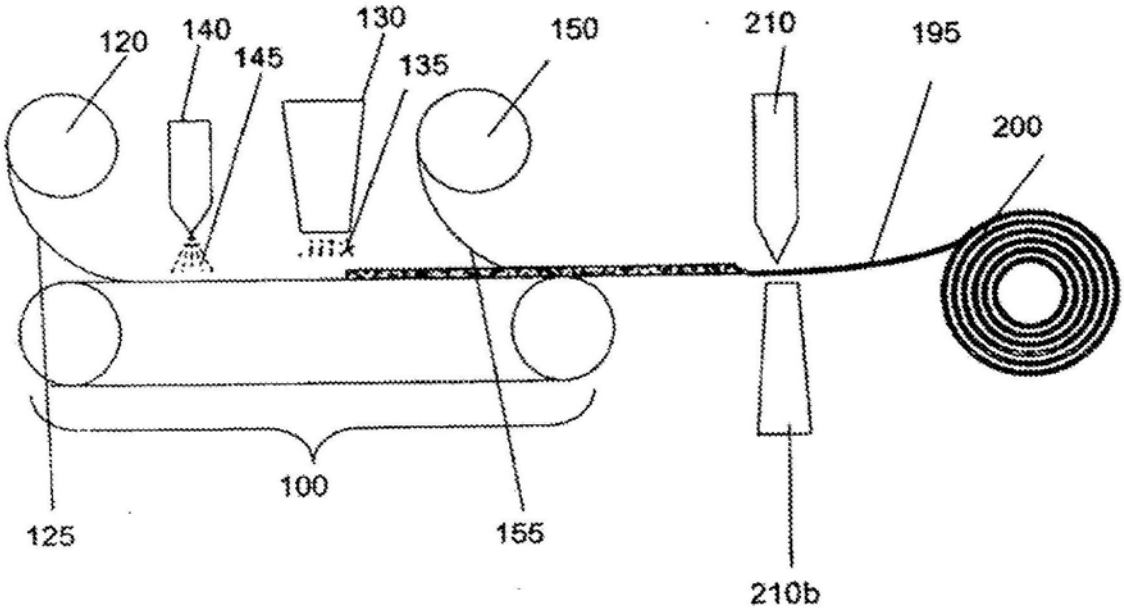
900
170
180

图3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200
100
125
155
210b

图4

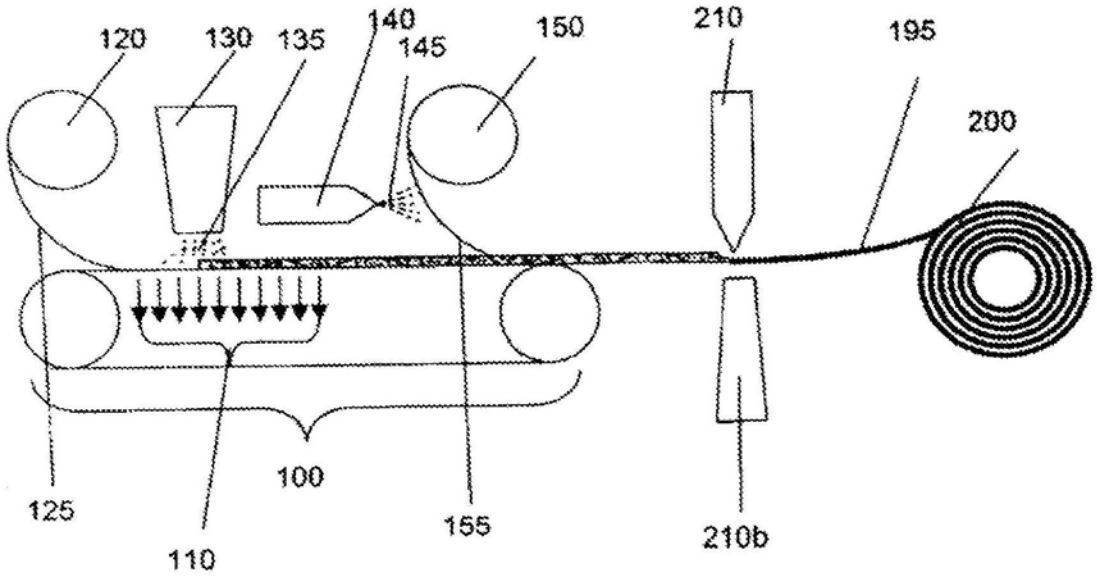

图5

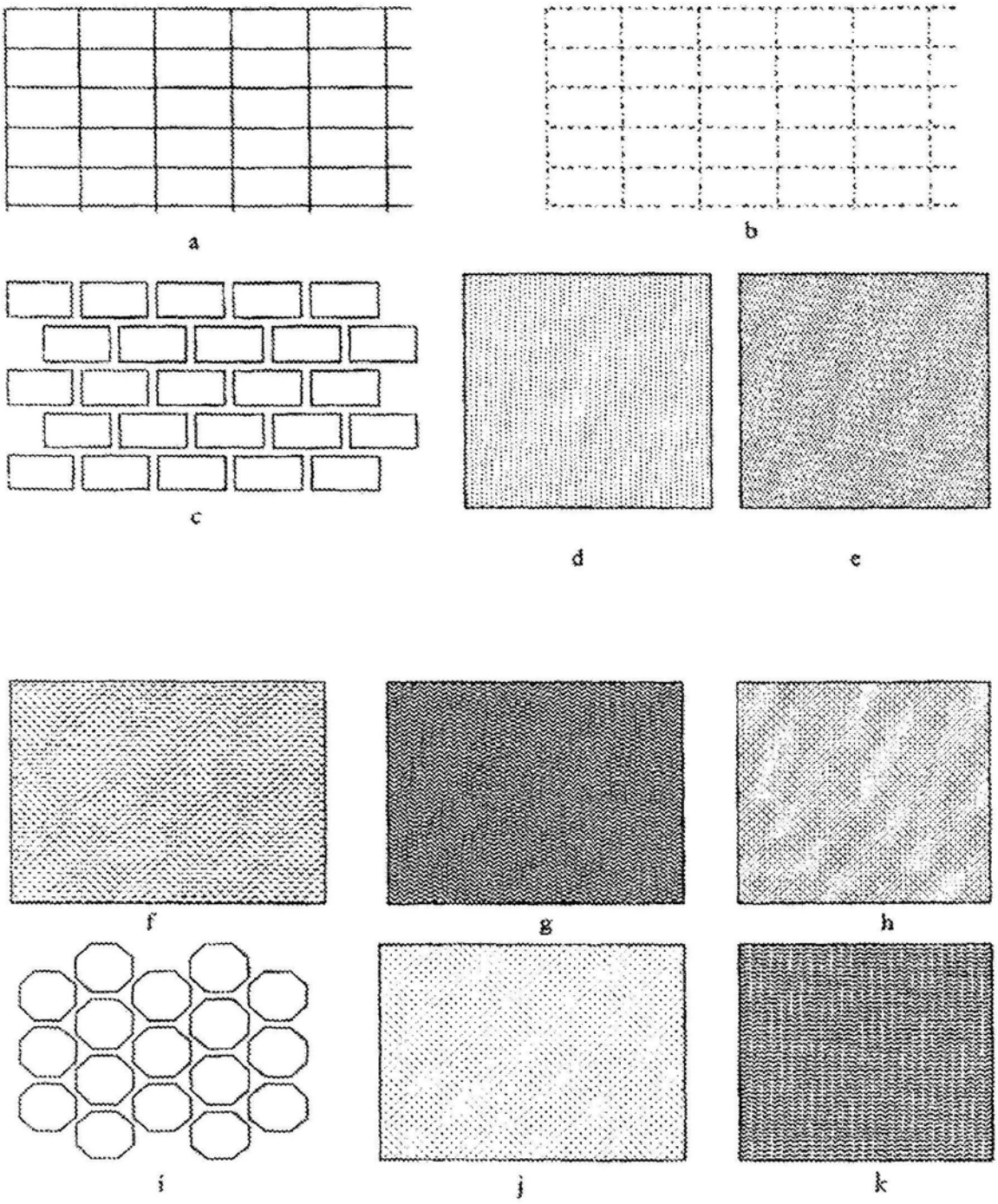

图6

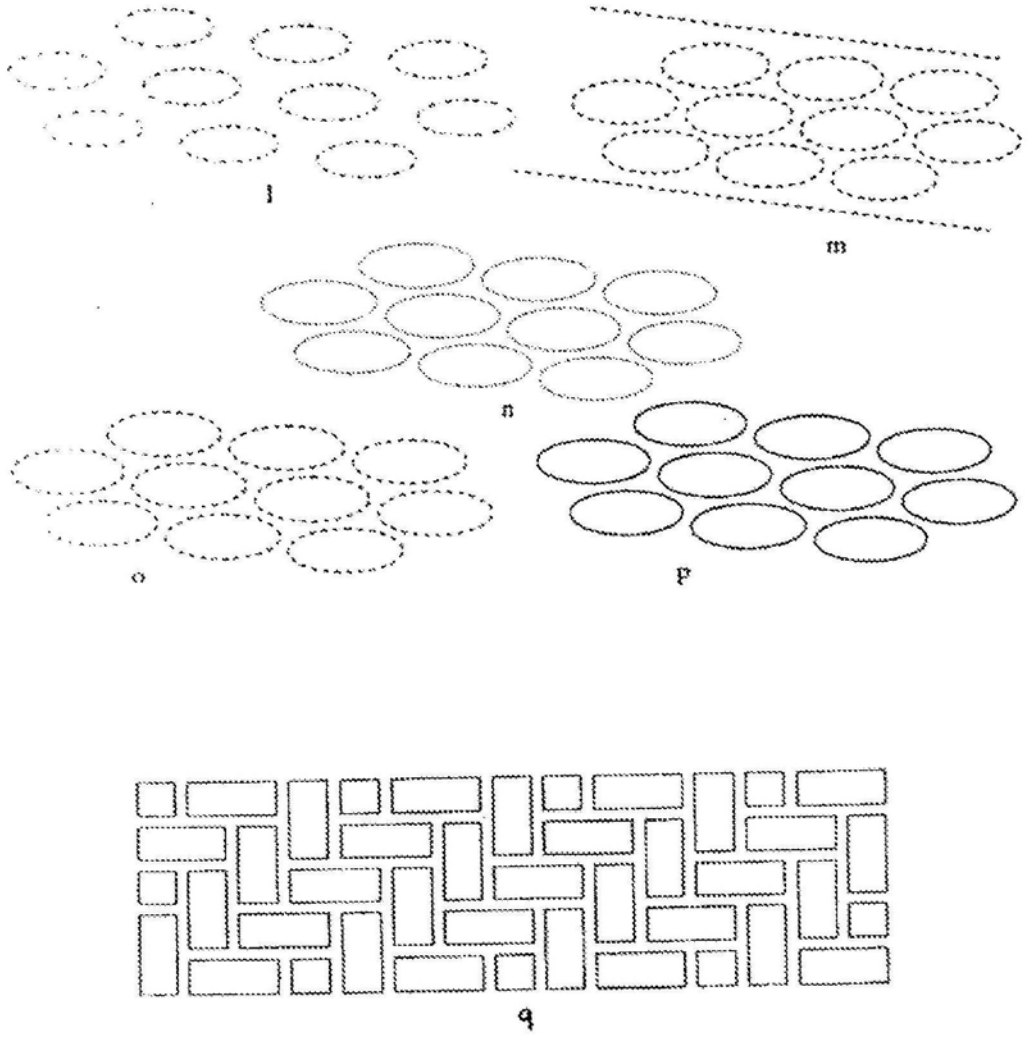

图6(续)

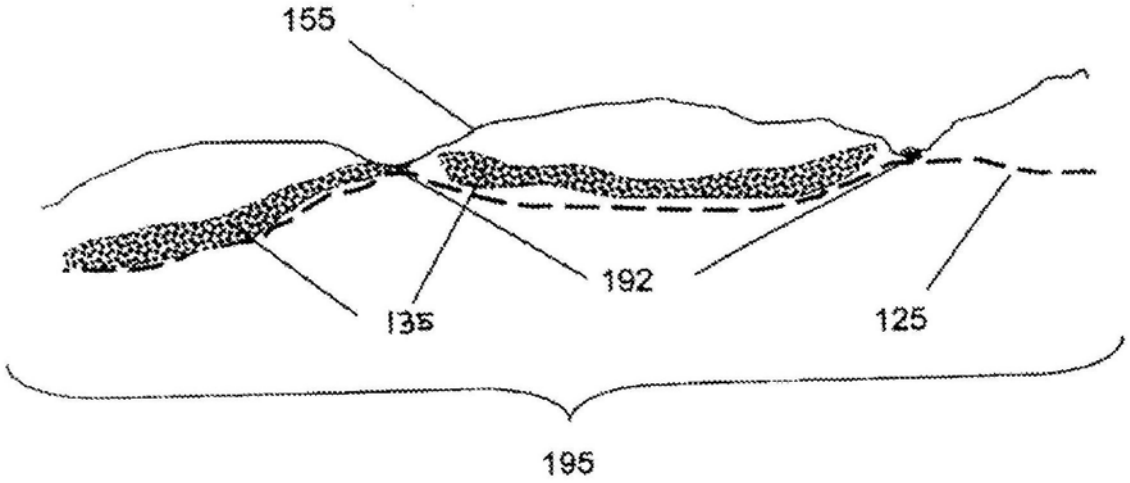

图7

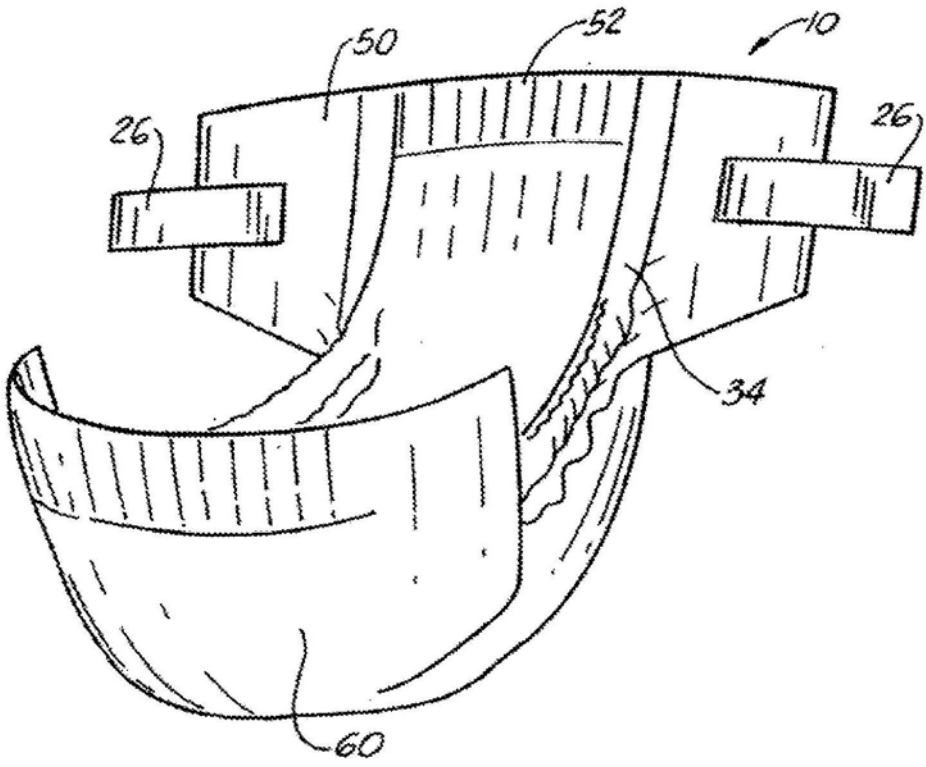

图8

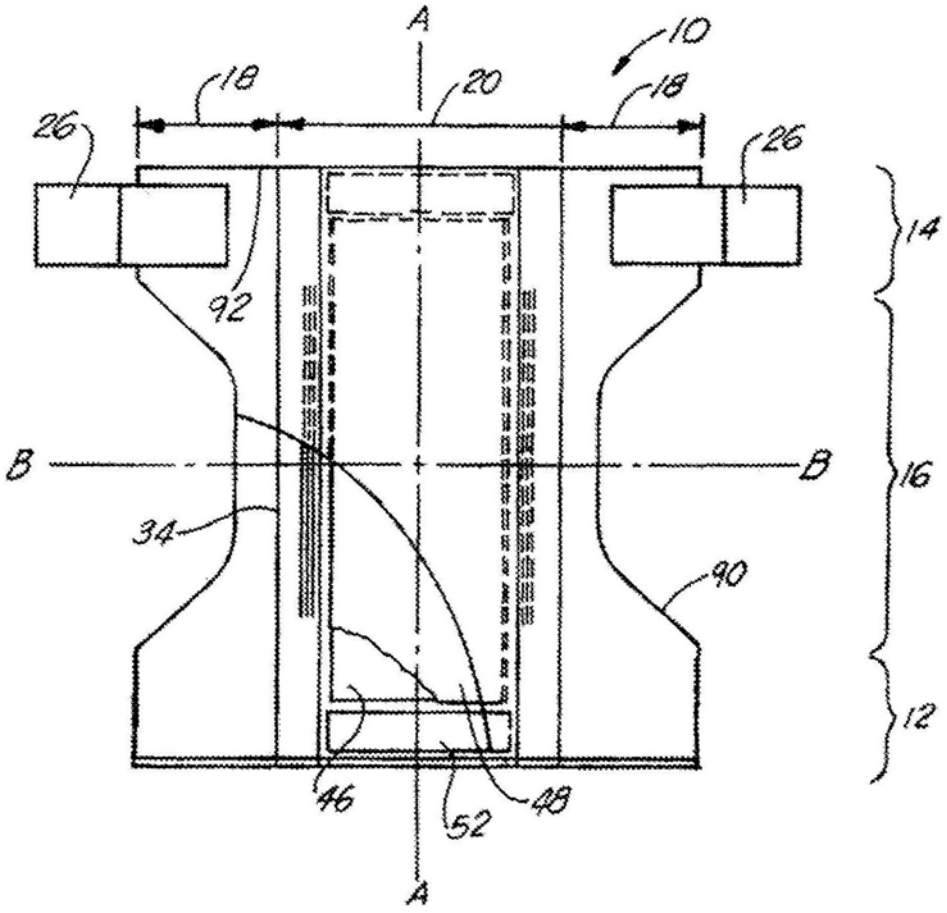

图9

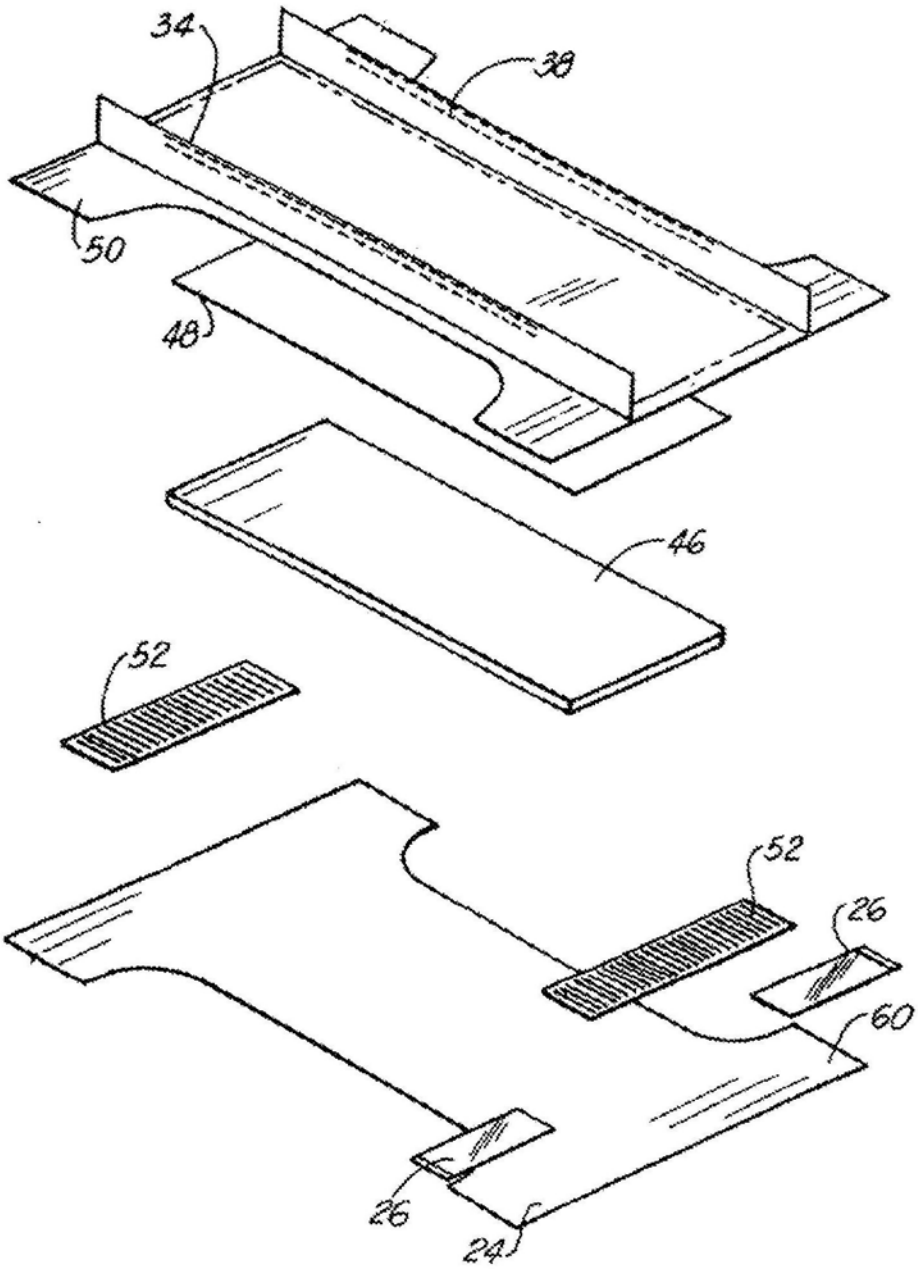

图10

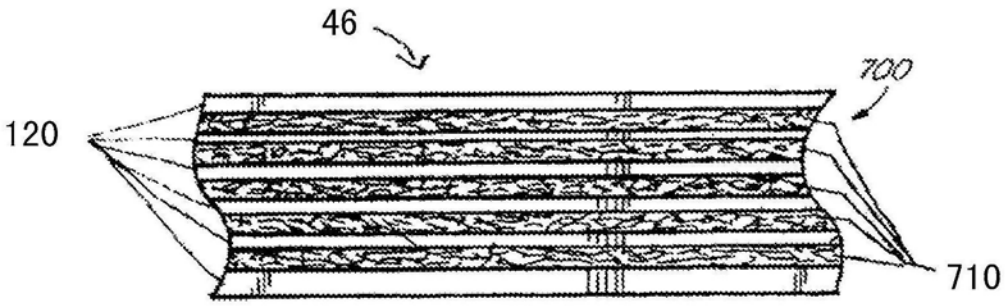

图11

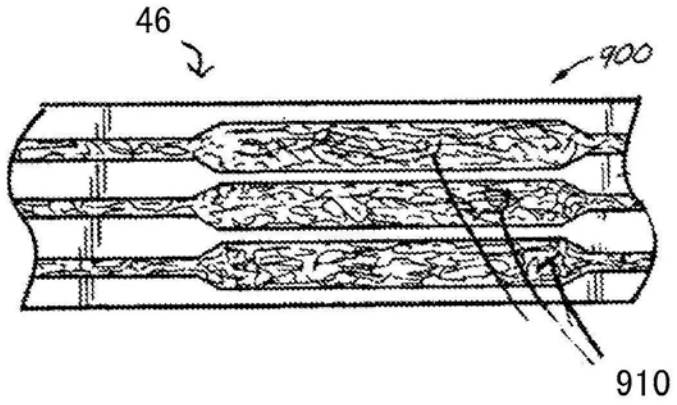

图12

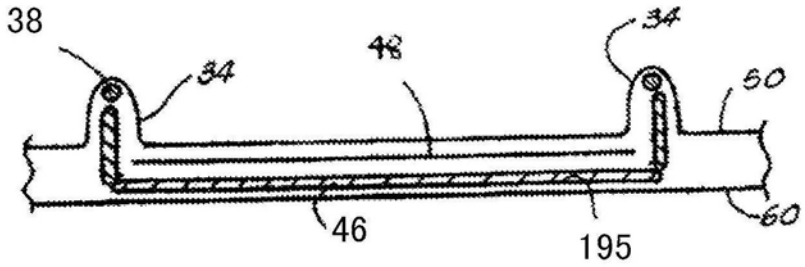

图13

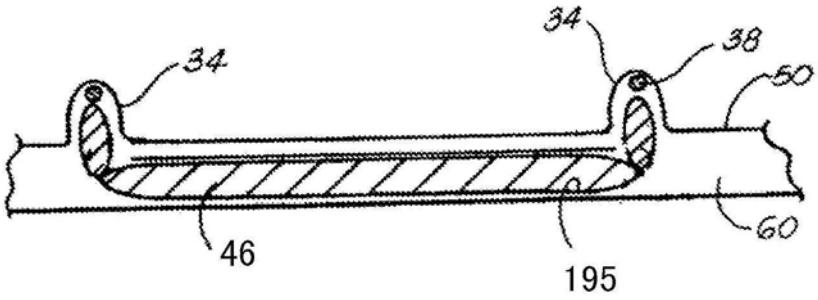

图14

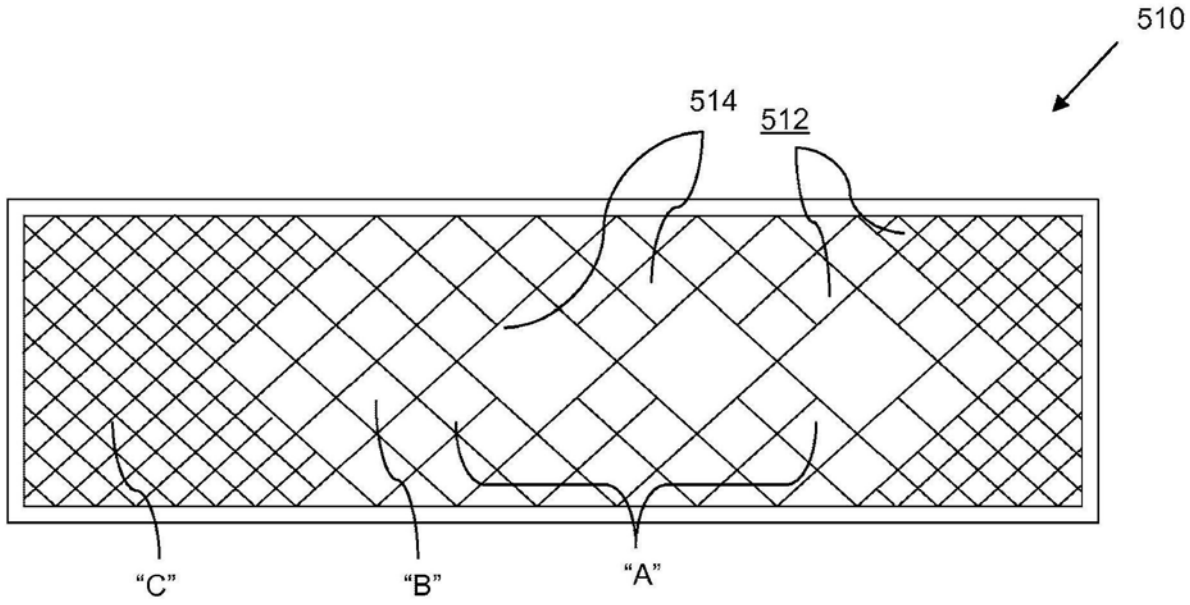

图15A

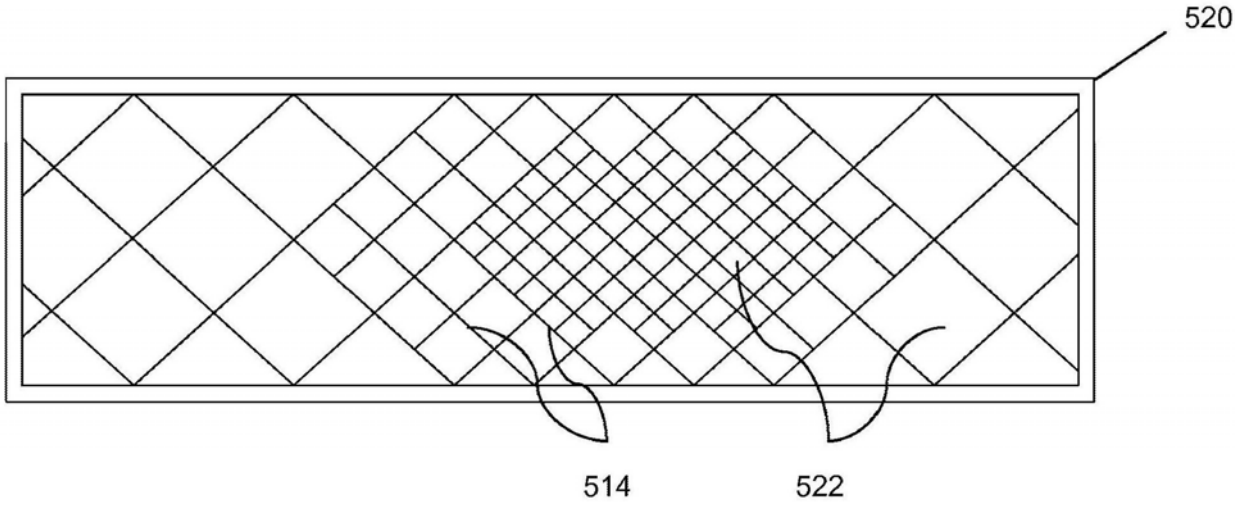

图15B

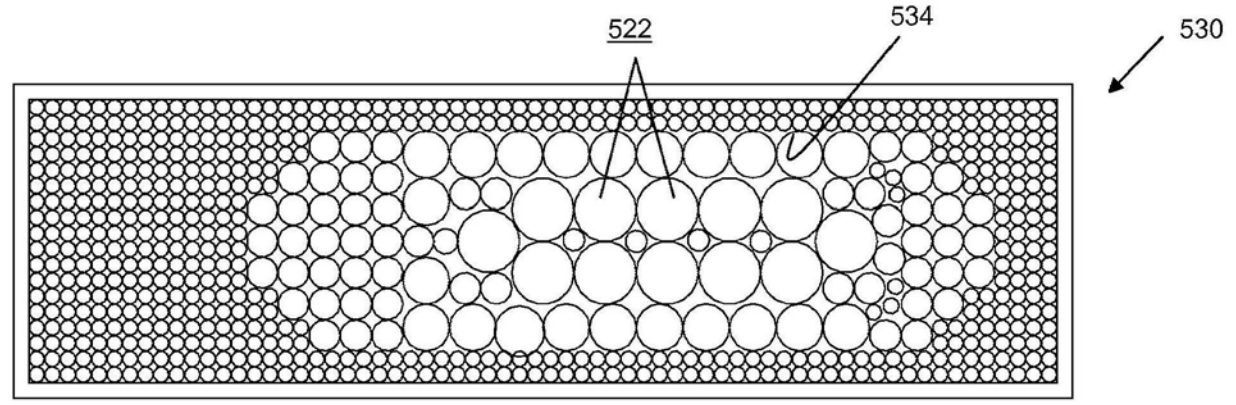

图15C

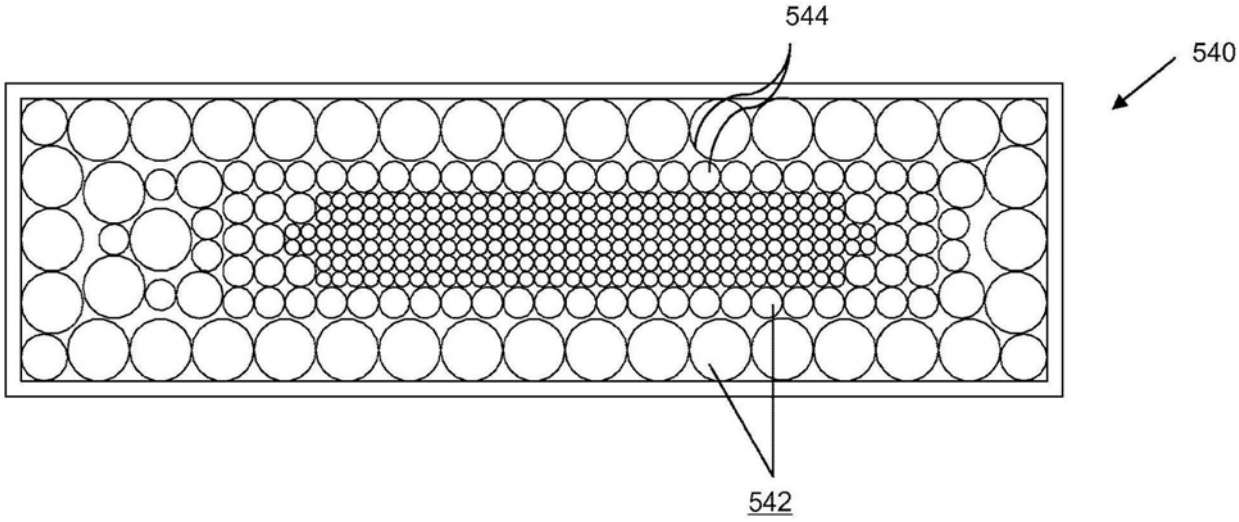

图15D

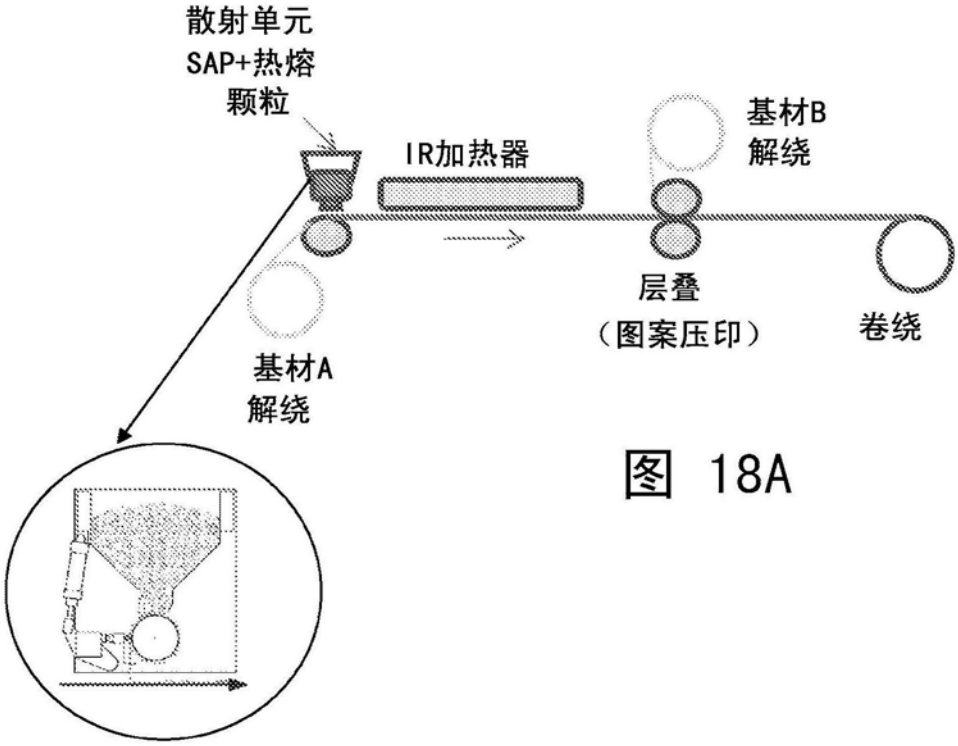

图 18A

图 18B

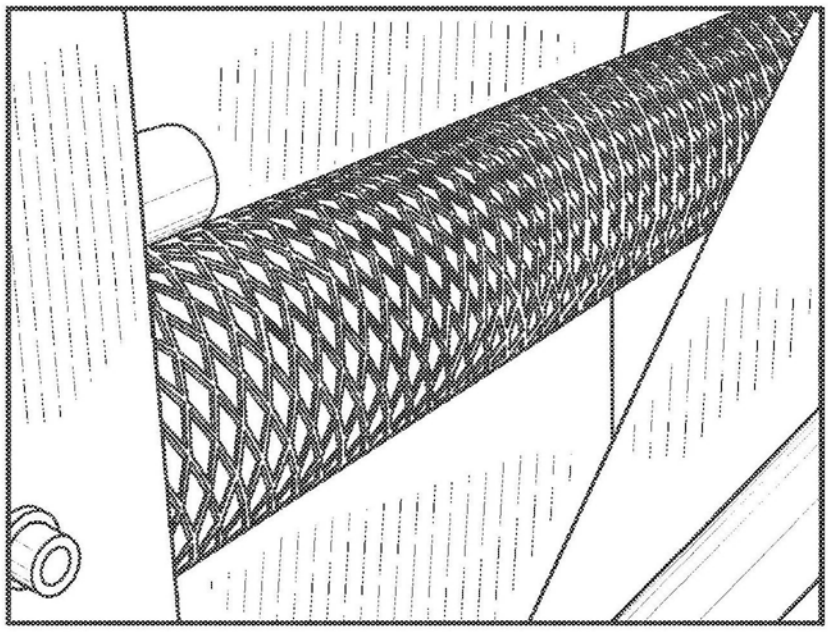

图18C

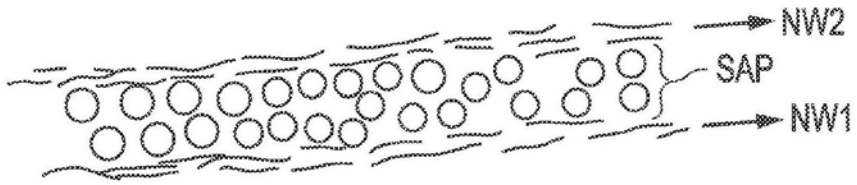

图16A

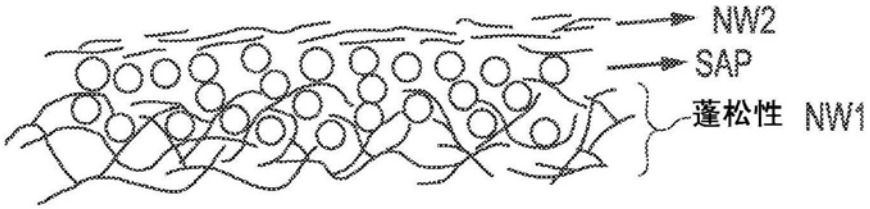

图16B

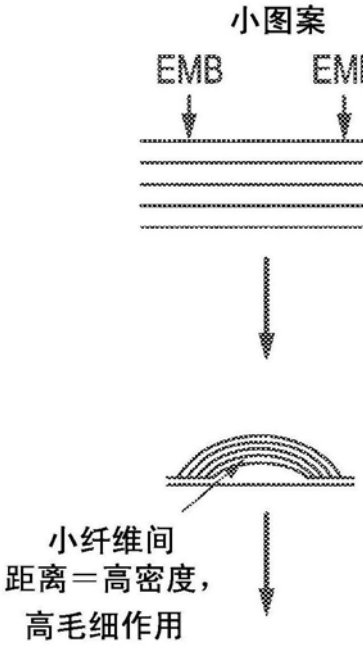

图17A

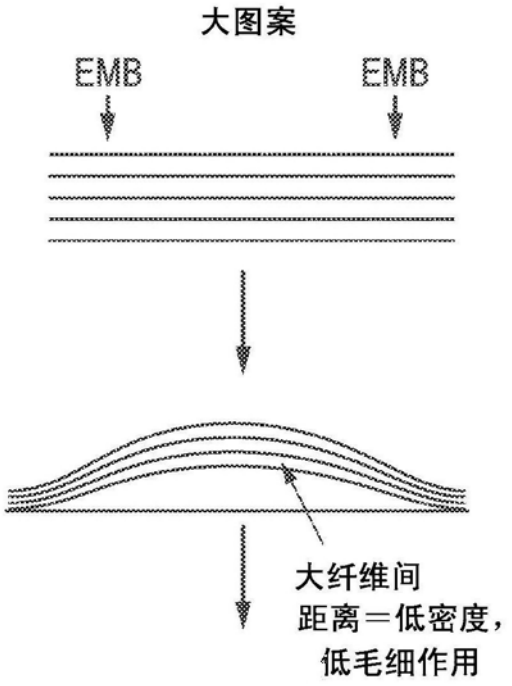

图17B

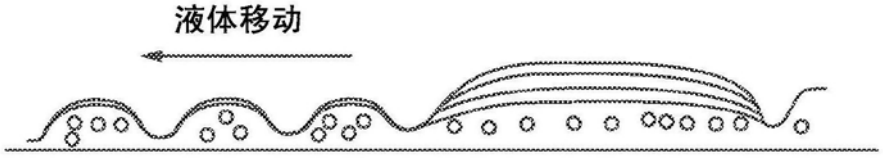

图17C

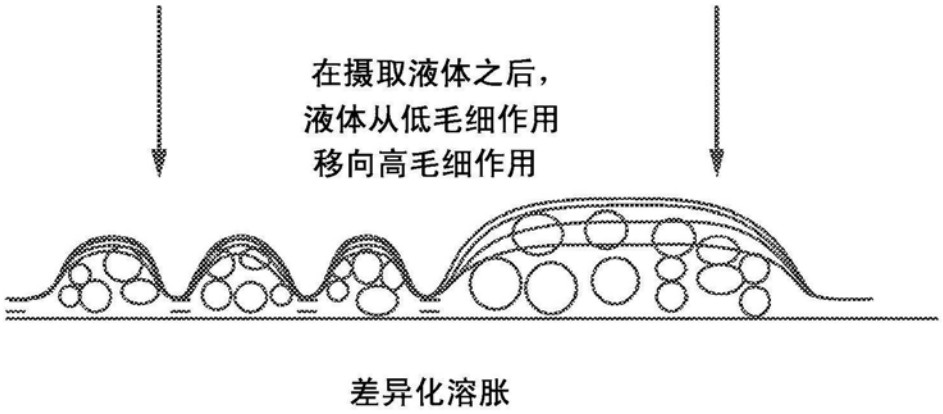

图17D

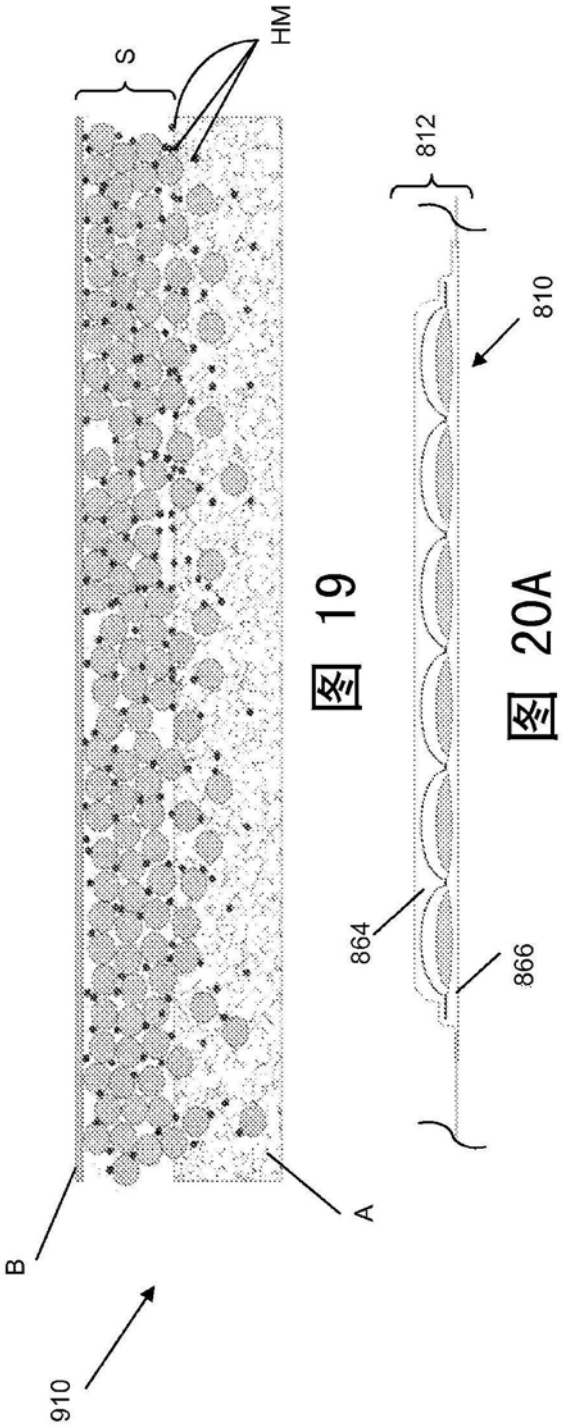

图 19

图 20A

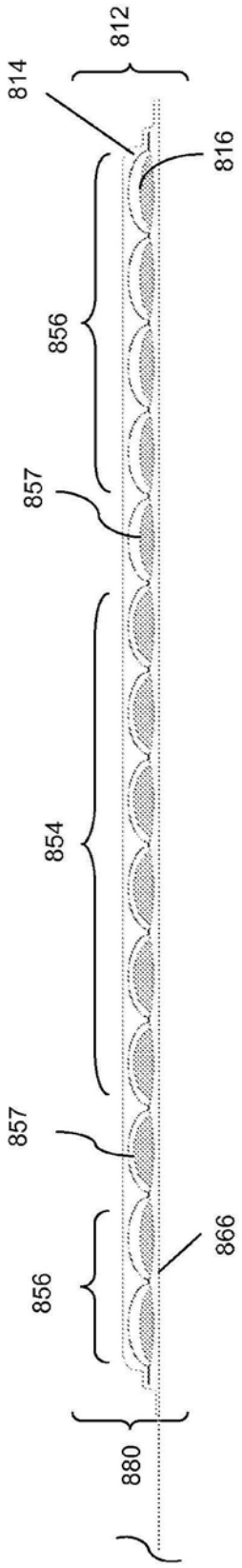

图20B

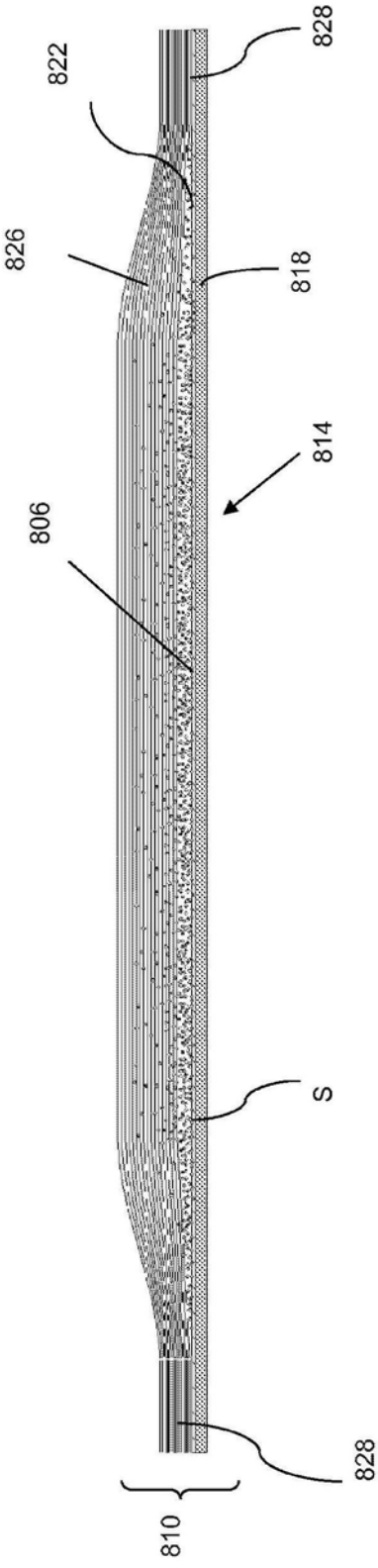

图20C

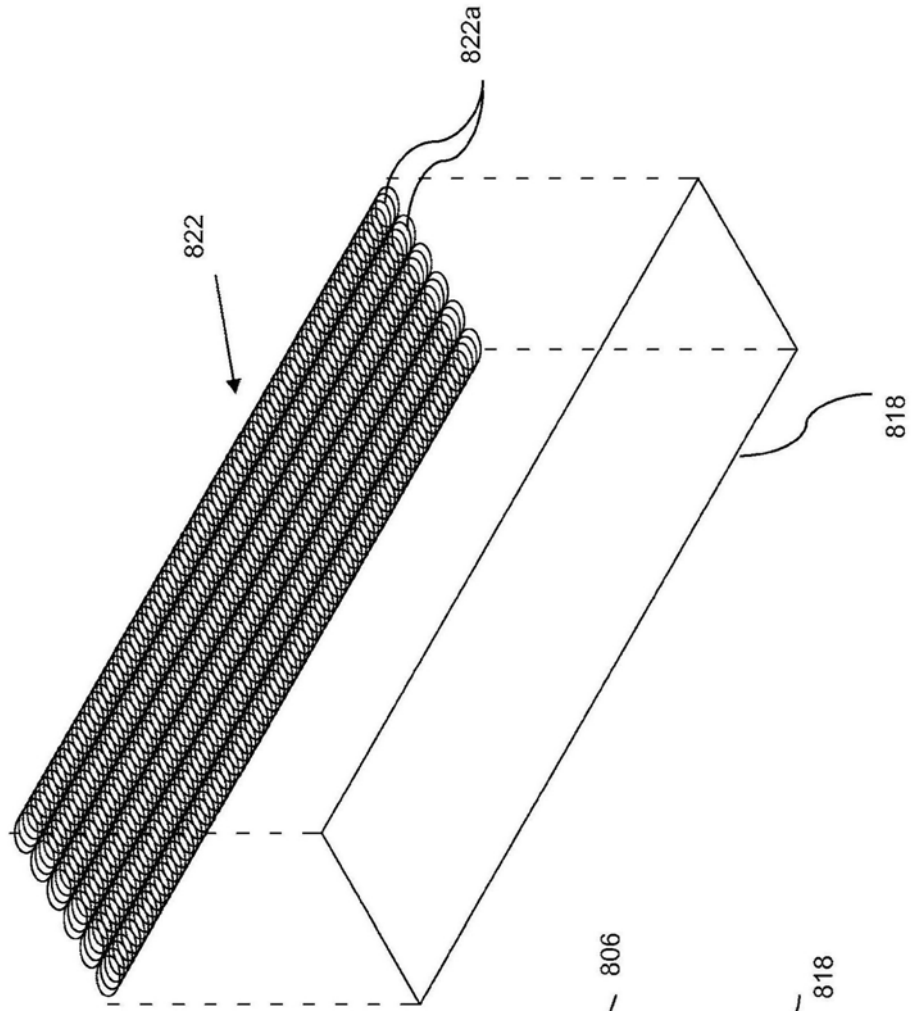

图 22A

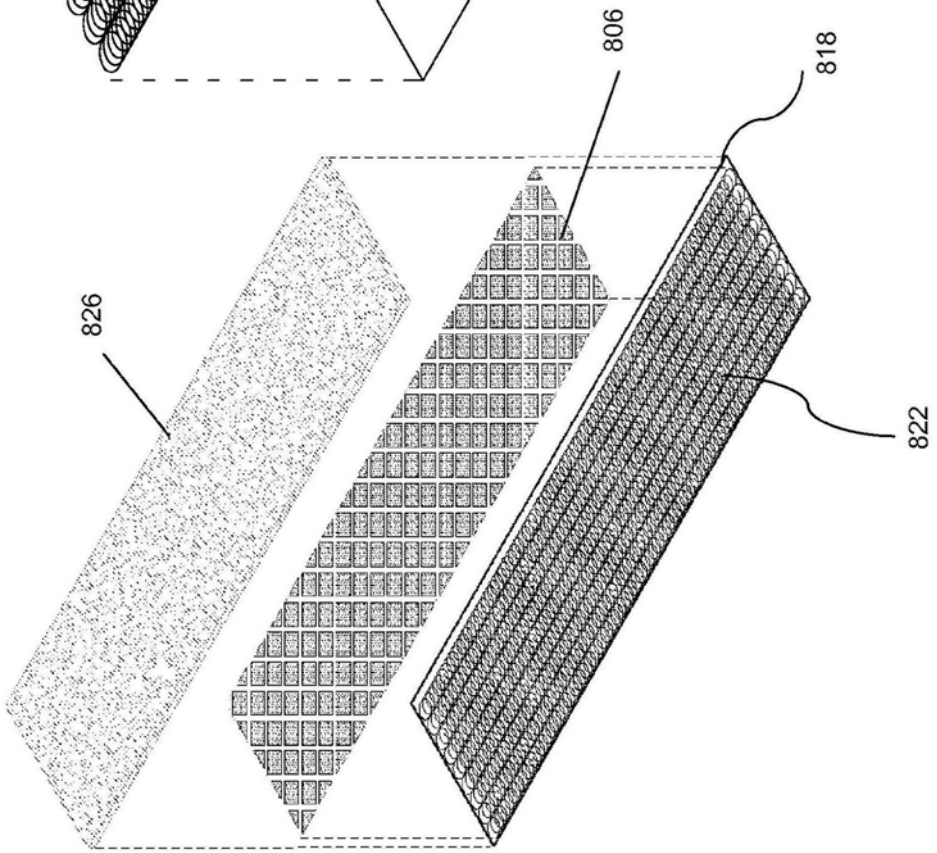

图 21

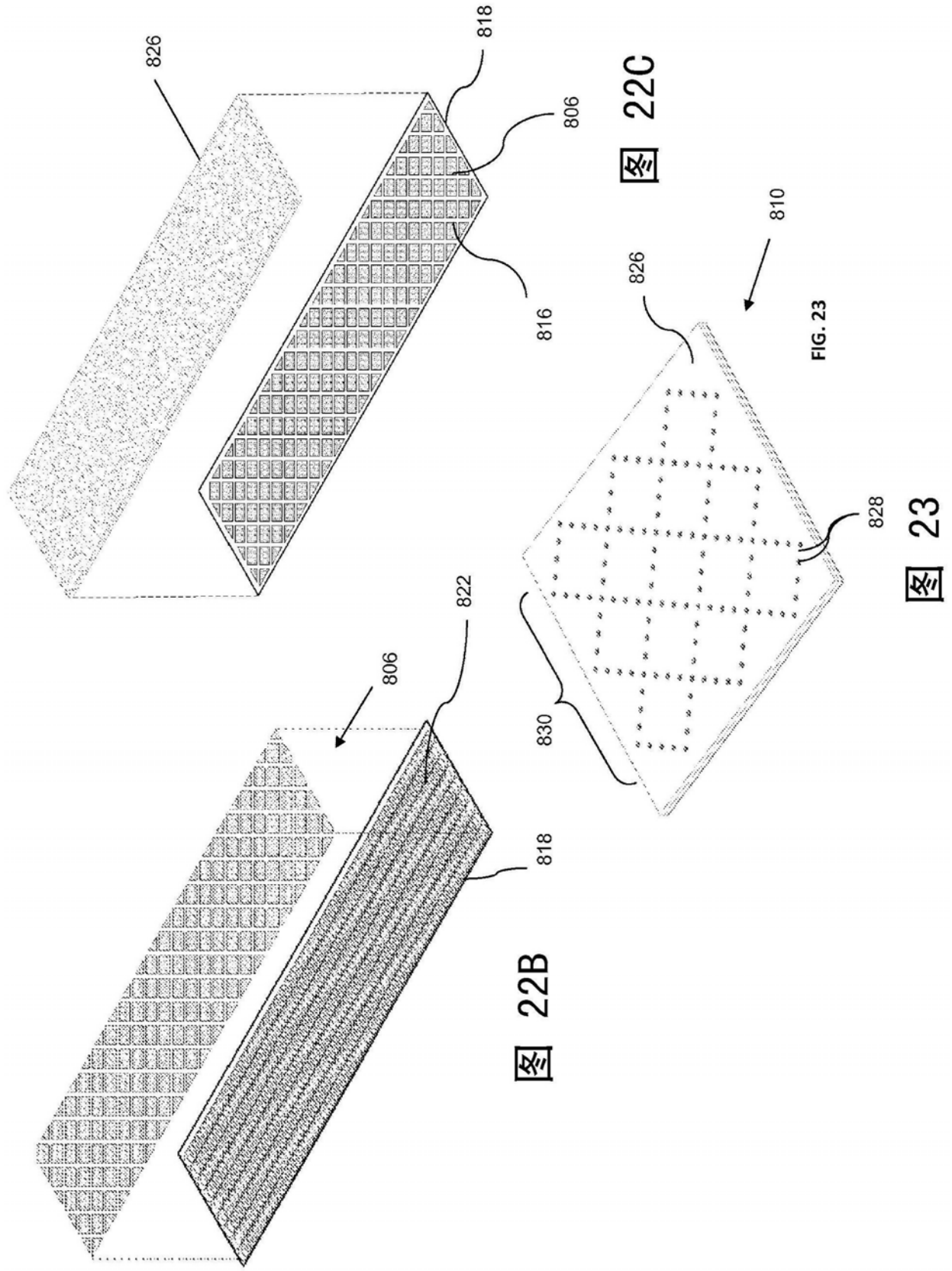

图 22C

图 22B

FIG. 23

图 23

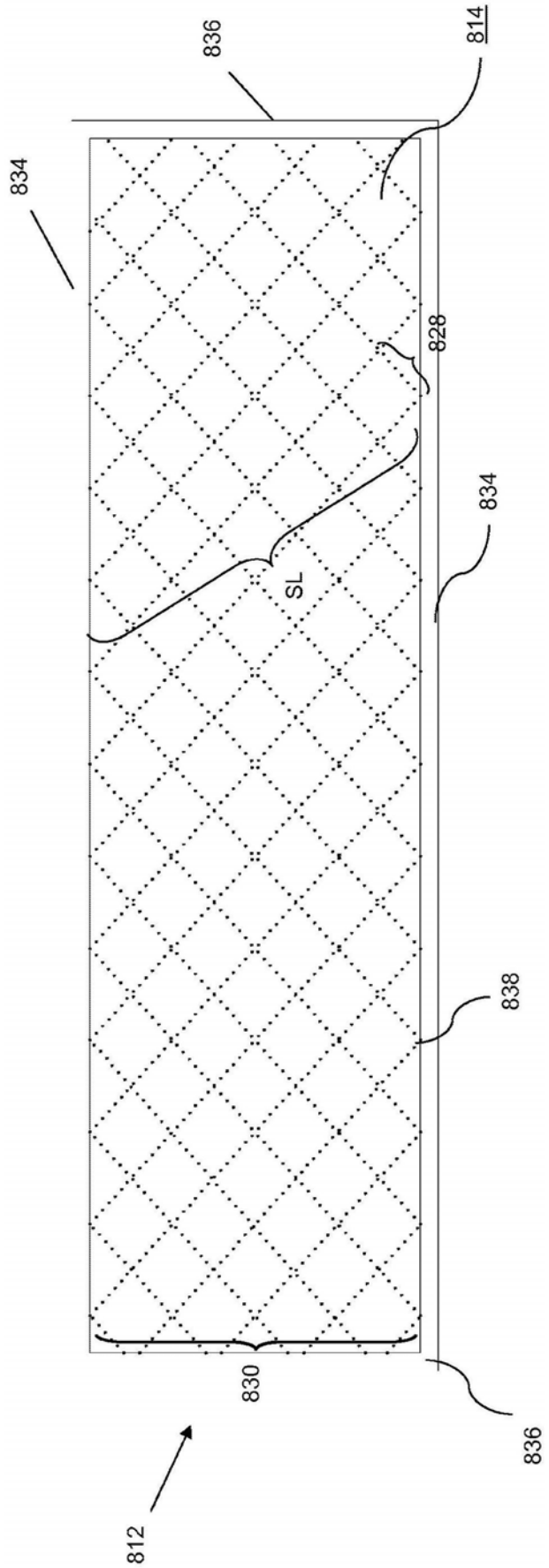

图24

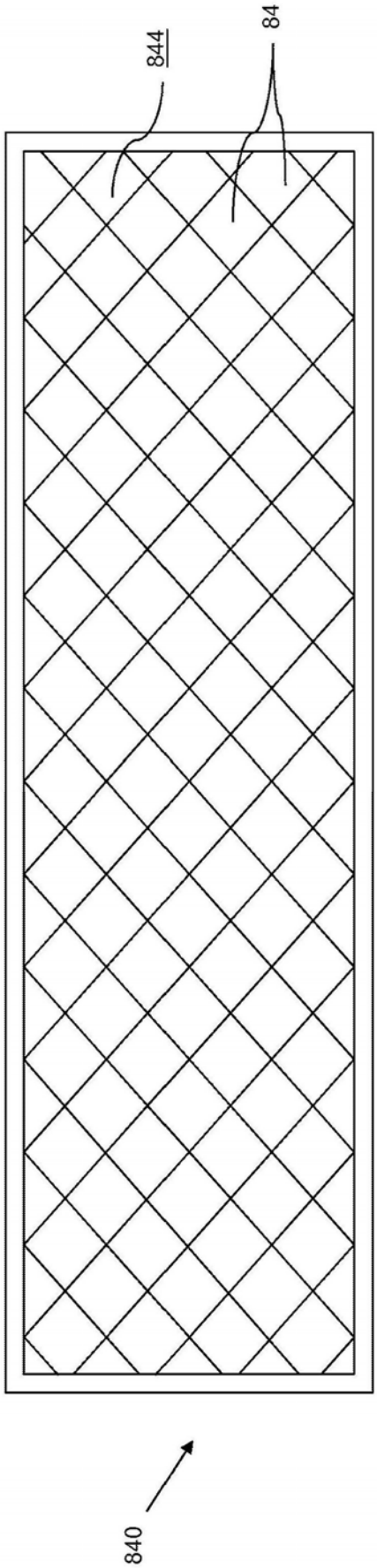

图25

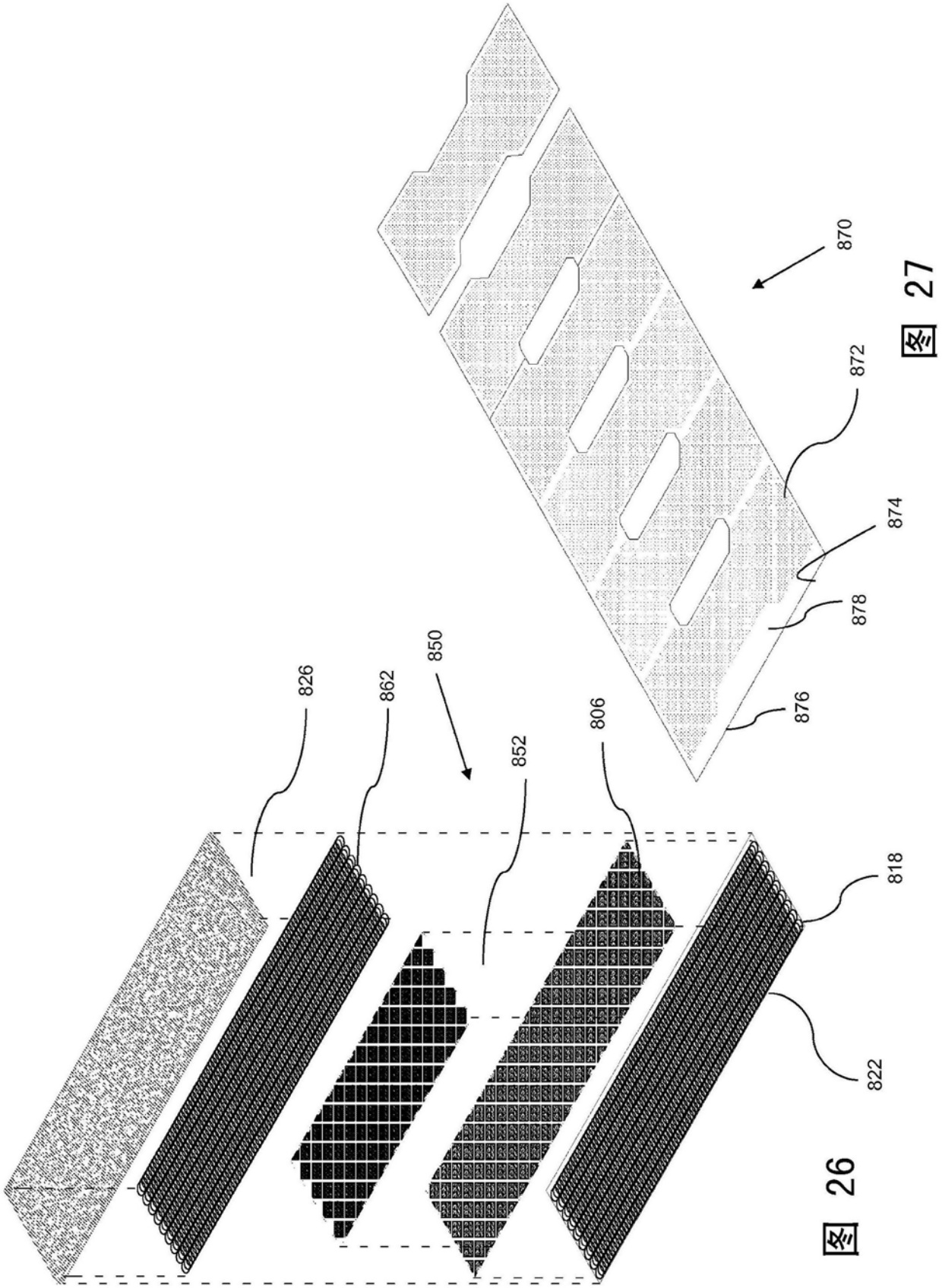

图 26

图 27

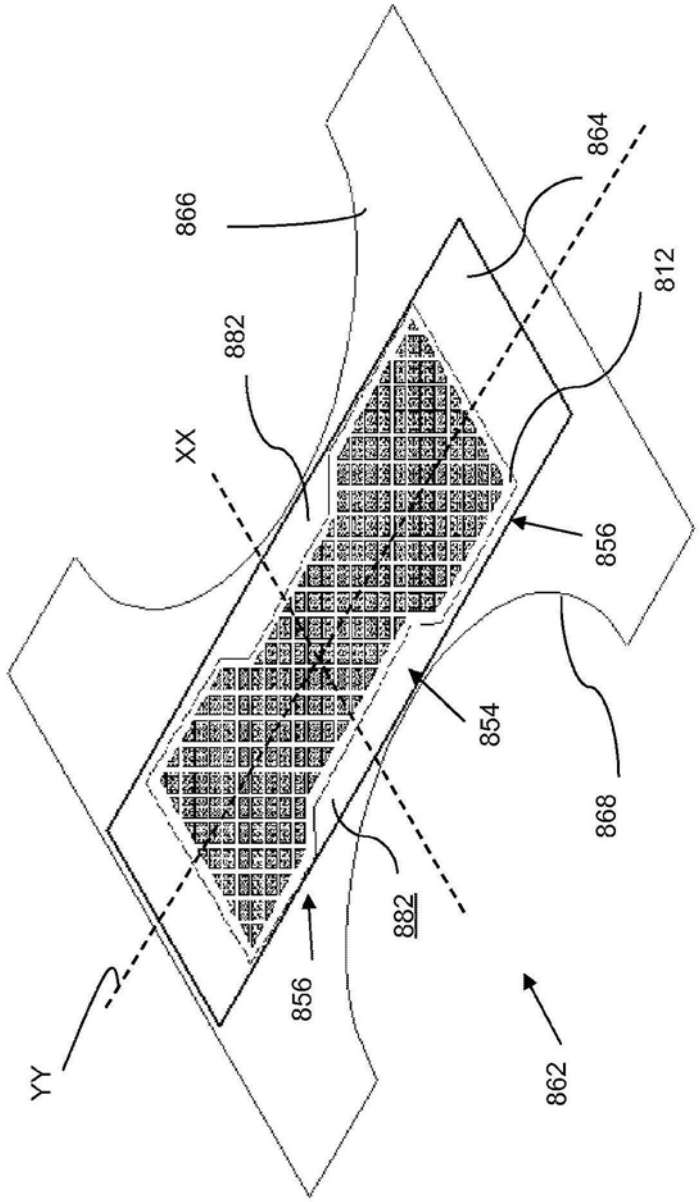

图28

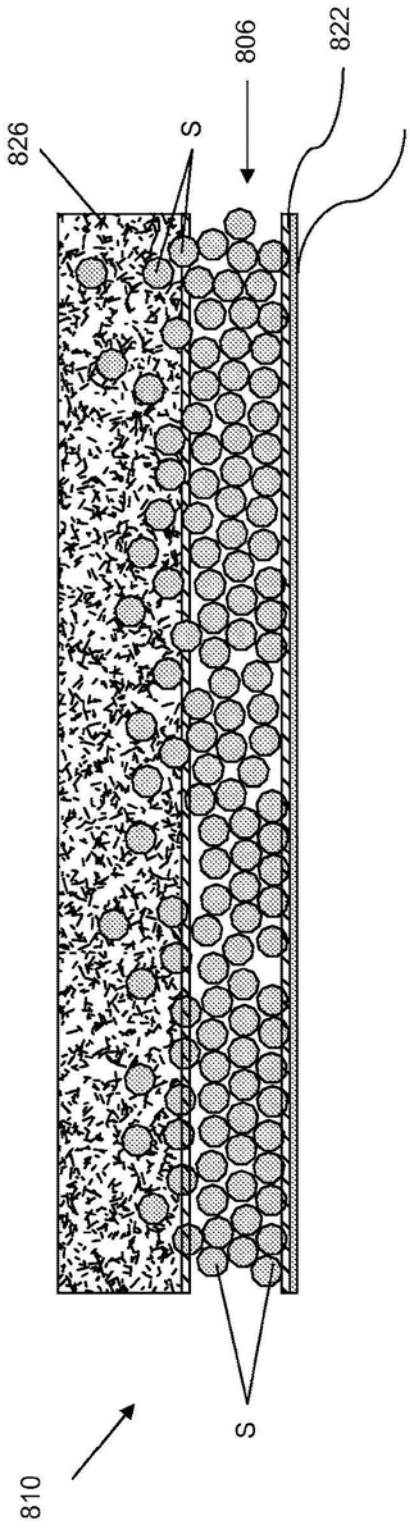

图29

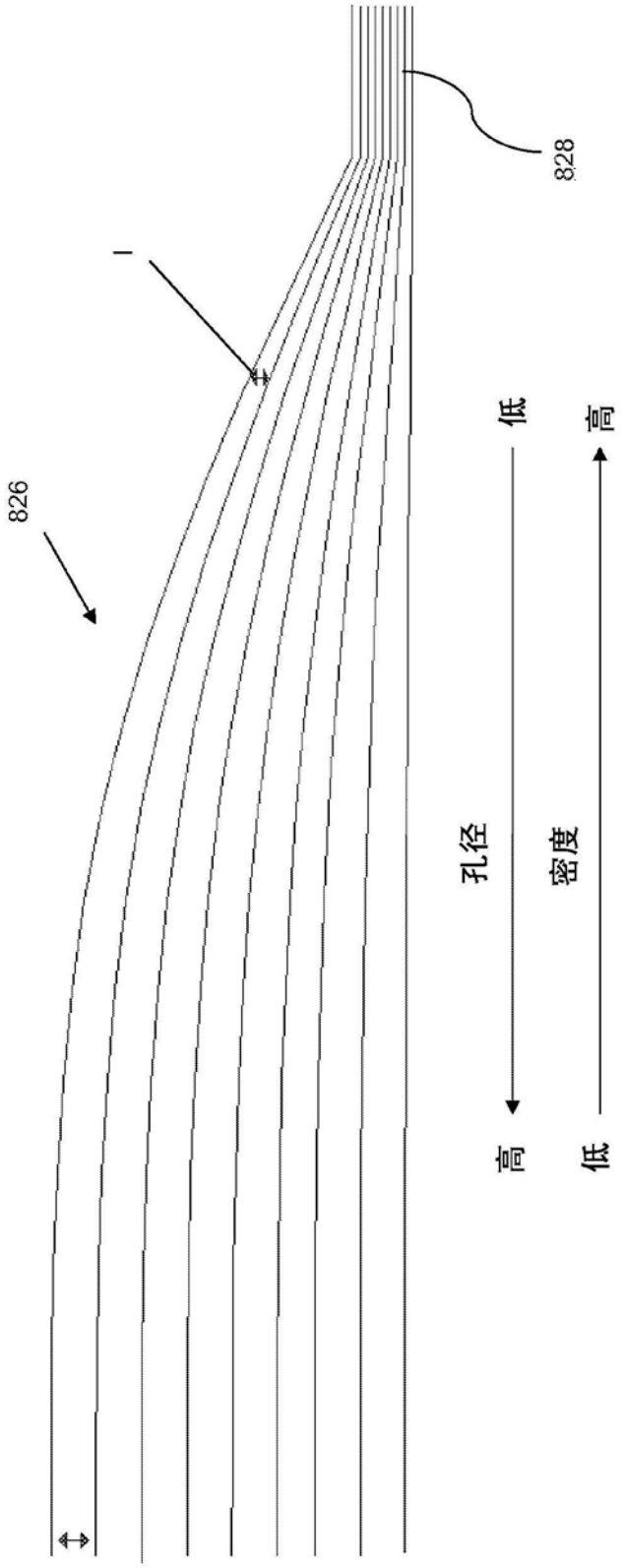

图30

1.一种用于一次性吸收制品的吸收芯复合物,所述复合物包含:

第一织物;

体侧第二织物;和

位于所述第一和第二织物之间的多个超吸收颗粒(SAP)聚集体;

其中,在所述多个SAP聚集体各自周围,间隔分开的结合位点的排列将所述第二织物固定到所述第一织物上并形成袋,所述SAP聚集体在袋中固定在所述第一织物和第二织物之间;

所述SAP聚集体周围的间隔分开的结合位点提供了结合位点之间的间隙,其使所述袋之一与相邻的袋连通;

所述体侧第二织物是蓬松性无纺布,包括在所述SAP聚集体中缠结至少一些颗粒的纤维;并且

所述蓬松性无纺布第二织物的厚度为1000μm至5000μm,密度为0.02g/cc至0.07g/cc,基重为20g/m^2至80g/m^2,密度为0.01g/cc至0.08g/cc,并且有效孔直径超过300μm。

2.如权利要求1所述的吸收芯复合物,其特征在于,各所述SAP聚集体不含吸收基质。

3.如权利要求1所述的吸收芯复合物,其特征在于,所述SAP聚集体由超吸收颗粒组成。

4.如权利要求1所述的吸收芯复合物,其特征在于,所述第二织物包含在顶部超吸收颗粒层处透过所述SAP聚集体的纤维,所述SAP聚集体不含吸收基质。

5.如权利要求1所述的吸收芯复合物,其特征在于,所述复合物还包含:

施加在所述第一织物上并粘合接触所述SAP聚集体的超吸收颗粒的粘合剂图案,所述超吸收颗粒位于所述第一织物相邻的所述SAP聚集体的底层颗粒中,以至少部分固定所述SAP聚集体的超吸收颗粒。

6.如权利要求5所述的吸收芯复合物,其特征在于,施加在所述第一织物上的所述粘合剂图案含有多个互连环,其限定了不含粘合剂的开放区域。

7.如权利要求1所述的吸收芯复合物,其特征在于,所述不含粘合剂的开放区域的宽度或直径一般小于位于所述粘合剂图案上的所述袋的宽度或直径。

8.如权利要求1所述的吸收复合物,其特征在于,所述蓬松性无纺布包括选自下组的纤维:聚丙烯(PP)、聚乙烯(PE)、聚对苯二甲酸乙二酯(PET)、聚乳酸(PLA);聚烯烃、其共聚物,及其组合;并且所述纤维是亲水性的经处理纤维。

9.如权利要求1所述的吸收复合物,其特征在于,所述第一织物是无纺布材料,并且所述第一和第二织物至少部分限定具有一定横向宽度、一定纵向宽度和一定中心区域的长形层叠体,所述中心区域位于所述长形层叠体的横向中心线和纵向中心线的交叉处周围。

10.如权利要求9所述的吸收复合物,其特征在于,所述结合位点形成多条交叉线,所述交叉线限定菱形袋的网格。

11.如权利要求9所述的吸收复合物,其特征在于,所述结合位点形成多条交叉线,所述交叉线限定成形状袋的网格,其中由一系列从所述层叠体的纵向中心轴向侧缘延伸的袋限定的所有直线都取向为偏离所述纵向中心轴不到60度的角度。

12.如权利要求9所述的吸收复合物,其特征在于,所述多个袋包括具有不同溶胀能力的袋,其赋予所述层叠体展示对液体摄取敏感的表面形貌的性质。

13.如权利要求9所述的吸收复合物,其特征在于,所述多个袋包括具有不同溶胀能力

的袋，其中中心区域的袋的溶胀能力比所述中心区域外的袋低。

14.如权利要求9所述的吸收复合物，其特征在于，所述多个中心区域中的袋小于所述中心区域外的袋。

15.如权利要求1所述的吸收复合物，其特征在于，所述结合位点是间断性结合位点。

16.如权利要求1所述的吸收复合物，其特征在于，各所述织物预先施加有粘合剂图案，所述粘合剂图案具有限定无粘合剂开放区域的环；并且

所述SAP聚集体是无浆料并不含吸收基质。

17.一种制造用于一次性吸收制品的吸收复合物层叠体的方法，所述方法包括：

将第一织物传送到接收超吸收颗粒(SAP)的位置上；

在所述第一织物上沉积SAP以提供SAP的离散聚集体；

传送蓬松性无纺布的第二织物；

相对于所述第一织物放置所述第二织物，使得所述蓬松性无纺布的纤维缠结所述SAP聚集体顶部颗粒层中的颗粒，从而至少部分固定其间的所述SAP聚集体；

在成网络的结合位点处结合所述第一和第二织物以形成具有多个SAP聚集体袋的长形层叠体，从而使各袋由位于SAP聚集体周围的结合位点限定，并将所述第二织物固定到所述第一织物上；

传送所述长形层叠体，从而所述蓬松性无纺布和所述袋抑制SAP颗粒从所述袋中迁移；并且

所述蓬松性无纺布第二织物的厚度为1000μm至5000μm，密度为0.02g/cc至0.07g/cc，基重为20g/m^2至80g/m^2，密度为0.01g/cc至0.08g/cc，并且有效孔直径超过300μm。

18.如权利要求17所述的方法，其特征在于，所述沉积的SAP不含吸收基质，使得所述SAP聚集体不含吸收基质。

19.如权利要求17所述的方法，其特征在于，在所述第一织物上施加粘合剂图案之后传送所述织物，使得在所述第一织物上沉积超吸收颗粒包括向具有预先施加其上的粘合剂图案的所述第一织物递送多个SAP聚集体。

20.如权利要求19所述的方法，其特征在于，所述施加粘合剂包括以连续开放图案施加粘合剂，所述连续开放图案具有不含粘合剂的封闭开放区域。

21.如权利要求20所述的方法，其特征在于，所述开放区域的平均宽度小于所述袋的平均宽度。

22.如权利要求17所述的方法，其特征在于，所述方法还包括在相对于所述第一织物放置所述第二织物之前，向所述第二织物施加粘合剂图案。

23.如权利要求17所述的方法，其特征在于，所述结合包括使用在所述SAP聚集体周围的不连续结合位点的排列结合所述织物以产生由间隔分开的结合位点结合的袋，所述间隔分开的结合位点在之间具有间隙用于流体通过。

24.如权利要求23所述的方法，其特征在于，所述结合位点的排列形成网格，所述网格的特征在于直线结合线，所述直线结合线的方向一般是在横向上与所述层叠体的侧缘呈一定角度，所述角度相对于所述长形层叠体的纵向中心线的垂直线偏离超过15度。

25.如权利要求24所述的方法，其特征在于，所述结合位点的排列形成菱形袋。

26.如权利要求23所述的方法，其特征在于，所述结合包括提供对应于所述第一织物上

的SAP聚集体排列的压印图案，所述压印图案在结合期间提供SAP聚集体周围的不连续结合位点的排列。

27.如权利要求26所述的方法，其特征在于，所述图案中的网格不含任何直接通向所述侧缘的直线路径。

28.如权利要求17所述的方法，其特征在于，所述蓬松性无纺布第二织物的有效孔直径超过300μm，并且SAP颗粒的平均尺寸为约300μm。

29.如权利要求17所述的方法，其特征在于，所述蓬松性无纺布包括选自下组的纤维：聚丙烯(PP)、聚乙烯(PE)、聚对苯二甲酸乙二酯(PET)、聚乳酸(PLA)；聚烯烃、其共聚物，及其组合；并且其中所述纤维是亲水性的经处理纤维。

30.如权利要求17所述的方法，其特征在于，所述方法还包括，独立于在所述第一织物上沉积超吸收颗粒，还在所述第一织物的选择区域中沉积超吸收颗粒，使得所述第一和第二织物结合之后在所述选择区域中形成的SAP聚集体的袋中的SAP聚集体浓度高于所述选择区域外的袋。

31.如权利要求17所述的方法，其特征在于，所述结合位点是间隔分开的结合点，所述结合点限定了其间和相邻袋之间的流体间隙。

32.一种制备一次性吸收制品的方法，所述方法包括：

将第一织物传送到接收超吸收颗粒(SAP)的位置上；

在所述第一织物上沉积超吸收颗粒以提供不含吸收基质的SAP离散聚集体；

传送蓬松性无纺布的第二织物；

相对于所述第一织物放置所述第二织物，使得所述蓬松性无纺布的纤维缠结所述SAP聚集体的顶部颗粒层，从而至少部分固定所述SAP聚集体；并且

在结合位点网络处结合所述第一和第二织物以形成具有多个SAP聚集体袋的长形吸收芯层叠体，从而使各袋由位于SAP聚集体周围的结合位点限定，并将所述第二织物固定到所述第一织物上；

传送所述长形层叠体，从而所述蓬松性无纺布和所述袋抑制SAP颗粒从所述袋中迁移；

在所述顶层和背面层之间放置长形芯层叠体，从而形成所述顶层、背面层和吸收芯层叠体的芯封套，所述顶层和背面层还提供支承所述吸收芯层叠体的底盘；

在所述底盘中形成腿洞；

结合所述底盘的端部区域以形成一次性吸收制品，从而所述蓬松性无纺布和所述袋阻止SAP颗粒从所述袋迁移；并且

所述蓬松性无纺布第二织物的厚度为1000μm至5000μm，密度为0.02g/cc至0.07g/cc，基重为20g/m^2至80g/m^2，密度为0.01g/cc至0.08g/cc，并且有效孔直径超过300μm。

33.如权利要求32所述的方法，其特征在于，向所述第一织物上施加粘合剂图案在传送所述织物之后。

34.如权利要求33所述的方法，其特征在于，所述施加粘合剂包括以连续开放图案施加粘合剂，所述连续开放图案具有不含粘合剂的封闭的开放区域，并且所述开放区域的平均宽度小于所述袋的平均宽度。

35.如权利要求32所述的方法，其特征在于，所述结合包括使用在所述SAP聚集体周围的结合位点的排列结合所述织物以产生由间隔分开的结合位点结合的袋，所述间隔分开的

结合位点在其间具有间隙用于流体通过。

36.如权利要求32所述的方法，其特征在于，所述结合位点的排列形成网格，所述网格的特征在于通过结合点的线，所述线的方向一般在横向上与所述长形层叠体的侧缘呈一定角度，所述角度相对于所述层叠体的纵向中心线的垂直线偏离小于90度。

37.一种一次性吸收制品，其包括：

由第一端部边缘和与第一端部边缘纵向隔开的第二端部边缘限定的底盘，所述端部边缘部分限定前后腰区域，其可在用户的腰部周围扣紧；

顶层；

背面层；和

在所述顶层和被面层之间沉积的吸收复合物，所述吸收复合物包含

第一织物；

与所述第一织物结合的第二织物；和

固定在所述第一和第二织物之间的吸收颗粒；并且

所述第一织物间断性连接到所述第二织物以限定位于所述第一织物和所述第二织物之间并且容纳超吸收颗粒(SAP)的聚集体的多个袋；并且

其中不连续和间隔分开的结合位点将第一织物与第二织物固定；

所述第二织物是位于所述吸收复合物体侧上和所述SAP聚集体上的蓬松性无纺布材料，使得所述蓬松性无纺布的纤维缠结超吸收颗粒；

所述SAP聚集体在所述蓬松性无纺布材料下铺展的中间部分中不含吸收基质；并且

所述蓬松性无纺布第二织物的厚度为1000μm至5000μm，密度为0.02g/cc至0.07g/cc，基重为20g/m^2至80g/m^2，密度为0.01g/cc至0.08g/cc，并且有效孔直径超过300μm。

38.如权利要求37所述的一次性吸收颗粒，其特征在于，所述SAP聚集体由SAP组成。

39.如权利要求37所述的一次性吸收颗粒，其特征在于，所述吸收复合物包含预先施加在所述第一织物上的粘合剂图案。

40.如权利要求37所述的一次性吸收制品，其特征在于，所述第一织物是无纺布材料，并且所述第一和第二织物至少部分限定具有一定横向宽度、一定纵向宽度和一定中心区域的长形层叠体，所述中心区域位于所述长形层叠体的横向中心线和纵向中心线的交叉处周围，并且所述多个袋包含位于所述中心区域的袋，所述位于所述中心区域的袋的超吸收颗粒浓度超过靠近纵向端部区的袋，所述纵向端部区在与所述层叠体纵向端相邻。

41.如权利要求37所述的一次性吸收制品，其特征在于，所述结合位点形成多条交叉线，所述交叉线限定菱形袋的网格。

42.如权利要求37所述的一次性吸收制品，其特征在于，所述结合位点形成多条交叉线，所述交叉线限定有形袋的网格，其中，通过从所述层叠体的纵向中心轴向侧缘延伸的一系列袋的结合位点的所有直线都取向为偏离所述纵向中心轴不到60度的角度。

43.如权利要求37所述的一次性吸收制品，其特征在于，所述吸收复合物包含沿各所述侧缘的凹形部分，使得所述吸收复合物具有沙漏形状。

44.一种吸收复合物，所述复合物包含：

蓬松性无纺布基材；

与所述蓬松性无纺布基材结合的顶部织物；和

固定在其间的超吸收颗粒(SAP)层,包括散布有所述SAP颗粒、使所述SAP与所述蓬松性无纺布基材和所述顶部织物固定且固定于其中的热熔粘合剂颗粒。

45.如权利要求44所述的吸收复合物,其特征在于,所述蓬松性无纺布的厚度为1000μm至5000μm,密度为0.02g/cc至0.08g/cc,基重为20g/m^2至80g/m^2,密度为0.01g/cc至0.08g/cc,并且有效孔直径超过300μm。

46.如权利要求44所述的吸收复合物,其特征在于,所述顶部织物是棉纸层。

47.如权利要求44所述的吸收复合物,其特征在于,所述SAP沿着所述蓬松性无纺织基材和所述顶部织物之间的平面沉积。

48.如权利要求44所述的吸收复合物,其特征在于,所述蓬松性无纺布基材和所述顶部织物之间的结合限定了SAP周围几何包围的结合图案。

49.一种制造吸收复合物的方法,所述方法包括:

传送无纺布材料的第一基材;

向所述传送的第一基材上递送热熔粘合剂颗粒和超吸收颗粒(SAP)的混合物;

在传送具有所述混合物的第一基材时,对所述第一基材加热,从而活化所述热熔粘合剂颗粒并将所述SAP与热熔颗粒和第一基材结合;

在所述第一基材和其上结合的SAP层上施加第二基材;并且

所述蓬松性无纺布材料的厚度为1000μm至5000μm,密度为0.2g/cc至0.07g/cc,基重为30g/m^2至80g/m^2,密度为0.02g/cc至0.07g/cc,并且有效孔直径超过300μm。

50.如权利要求49所述的方法,所述方法还包括:

结合所述第一基材与所述第二基材以产生吸收复合物层叠体。

51.如权利要求50所述的方法,所述结合包括使用热压印以在所述吸收复合物层叠体上产生结合图案。

52.如权利要求49所述的方法,其中,所述热熔颗粒和所述SAP以1至10重量%热熔粘合剂的比例混合。

53.一种一次性吸收制品,其包括:

由第一端部边缘和与第一端部边缘纵向隔开的第二端部限定的底盘,所述端部边缘部分限定前后腰区域,其可在用户的腰部周围扣紧;

顶层;

背面层;和

在所述顶层和被面层之间沉积的吸收复合物,所述吸收复合物包含

第一织物;

与所述第一织物结合的第二织物;和

粘合在所述第一和第二织物之间的吸收颗粒;并且

所述第一织物间断性连接所述第二织物以限定位于所述第一织物和所述第二织物之间并且容纳吸收颗粒聚集体的多个容器;并且

所述吸收复合物包含吸收颗粒聚集体的容器区,包括具有第一尺寸的容器的主要区和具有多个第二尺寸的容器的次要区,所述第二尺寸不同于所述第一尺寸;

所述顶层和被面层限定所述底盘的纵向和横向边缘;并且

所述容器均由第一织物与所述第二织物结合而形成以使所述容器位于同一第一织物

上。

54.如权利要求53所述的一次性吸收服装，其特征在于，所述主要区对应于所述制品的胯部区，所述胯部区位于所述底盘的纵向边缘之间的中心区，并且所述吸收颗粒是超吸收颗粒。

55.如权利要求54所述的一次性吸收服装，其特征在于，所述主要区的容器的周长超过所述次要区中容器的周长。

56.如权利要求55所述的一次性吸收服装，其特征在于，所述次要区的容器在所述主要区周围。

57.如权利要求56所述的一次性吸收服装，其特征在于，所述吸收复合物还包含端部区，所述端部区的容器的尺寸不同于所述次要区中容器的尺寸，并且所述次要区在所述主要区和所述端部区中间。

58.如权利要求57所述的一次性吸收服装，其特征在于，各所述端部区的容器的周长基本小于所述次要区中容器的周长。

59.如权利要求57所述的一次性吸收服装，其特征在于，所述端部区的容器的周长大于所述次要区中容器的周长。

60.如权利要求57所述的一次性吸收服装，其特征在于，所述主要区还包含第二类容器，所述第二类容器的周长基本小于第一类容器，并且所述第二类容器的定位填充相邻的所述第一类容器之间的空穴。

61.如权利要求60所述的一次性吸收服装，其特征在于，第一尺寸的容器的超吸收颗粒的浓度高于第二尺寸的容器。