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REPLACED SHEETS		SG
☒ Description	: paged 1 to paged 54	
☒ Claim(s)	: paged 65 to paged 68	
☒ Drawing(s)	: paged 1 to paged 7	
☒ Abstract	: paged 69 to paged -	

- 1 -

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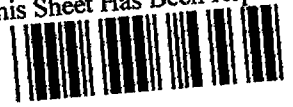
**A NOVEL LAMINATED COMPOSITE MATERIAL, A METHOD OF MAKING
AND PRODUCTS DERIVED THEREFROM**

10

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15

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untensioned stretch laminate web, is given in US Patent 2,075,189 issued to Galligan et al, where two superposed continuous plies of rubber, one of which is under tension and longitudinally stretched, are passed between a pair of pressure rolls traveling at the same peripheral speed. One of the rolls is provided with relatively small or narrow projections in a desired pattern, the projections cooperating with the second roll to press together, into adhesive contact, small portions of the two plies of rubber; so that relatively closely spaced small areas of the superposed plies will be united in a pattern similar to that of the projections on the pressure roll. Harwood in US Patent 3,025,199, describes an untensioned stretch laminate web, specifically suggested for use in toweling, wiping material and expendable garment material. Harwood describes the formation of a scrim comprised of intersecting sets of threads or filaments that are bonded to each other at their points of intersection to form a reticulated reinforcing network, the threads or filaments being preferably resilient. A pair of nonwoven layers are attached preferably to opposite sides of the reinforcing network scrim. The laminate of nonwovens and scrim is subsequent subjected to a stretching operation in one or more directions to permanently expand the nonwoven layers. When the tensile forces of the stretching operation are removed, the reinforcing network restores itself and the outermost nonwoven plies exhibit Z-direction bulking in the areas where the nonwovens are not bonded to the reinforcing network.

Sisson in US Patents 4,107,364 and 4,209,563 describes a



preferred embodiment, which is an untensioned stretch laminate comprised of at least one ply made substantially of relatively elastomeric synthetic polymeric filaments and at least one ply made of elongatable but relatively nonelastic synthetic polymeric filaments.

Ness in US Patent 4,525,407 discloses disposable diapers and surgical gowns incorporating untensioned stretch laminate composites comprised of an untensioned elastic member intermittently bonded to one or more unstretched less extensible substrates, the resulting laminate being rendered elastic by stretching. On stretching the laminate, the substrate undergoes permanent elongation and may become delaminated from any other substrate, but remains intermittently bonded to the elastic member. Upon release of the applied tensile forces, the elastic member causes puckering, i.e., Z-direction bulking, of the permanently elongated substrate between the bonding points.

US Patent 5,336,545 issued to Morman describes a composite material made by joining a nonelastic material which has been tensioned to neck it down to a narrower width and joined to an elastic sheet. The composite material is elastic in a direction parallel to the direction of neckdown and may be stretched in that direction to the breaking point of the necked material. Neither of the two materials comprising the composite become gathered.

Ruffled or gathered fabrics have also been disclosed, for example, in US Patent 4,720,415 issued to Taylor et al and by



Buell et al in US Patent 5,151,092 wherein a traditional elastic member is applied to a backsheet that is then prestrained by mechanical stretching to permanently elongate the backsheet and stretch the elastic member. The elastic member on being released yields a ruffled or gathered material. Materials such as these include an elastomeric material which forms a stretchable elastic layer. To at least one side of this material while in a stretched condition there is attached another gatherable layer. Once the two layers have been attached to one another, the elastic layer is allowed to retract thereby gathering up and puckering the nonelastic gatherable layer to form a three dimensional material. US 4,891,258 to Fahrenkrug describes a stretchable composite structure wherein the stretchable layer may comprise a pervious elastomeric film.

The prior art of composites that are stretchable or contain stretchable components, requires the presence of a reversibly elongatable component, that provides reversible restoring forces, to be bonded to a relatively inelastic less easily extendible component, thereby creating a gathering, ruffling or puckering of the inelastic component; the gathering of the inelastic component being orthogonal to the direction in which the laminate or the elastic component is extended, i.e., in a direction cross to the direction of stretch. Additionally, the gathering is obtained only in the inelastic component, the elastic component remaining relatively ungathered. Where gathering may be achieved in both layers of a layered composite, as in some stretchable cuffs and waistbands of disposable products of sanitary



napkins and diapers, the gathers of one layer are parallel to those of the other layer, both gathers being orthogonal to the direction of stretch.

5

SUMMARY OF THE INVENTION

10 It is an object of this invention to provide a gathered, ruffled or puckered layered composite material, having a plurality of layers, wherein at least two of the component layers of the composite are gathered, and wherein the direction of gathering of at least one of the gathered component layers is aparallel to the direction of gathering of an at least one other component layer.

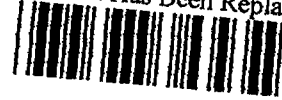
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20 It is a further object of this invention to provide a gathered, layered composite material, having a plurality of layers, wherein the material is a flexible, elastic or relatively nonelastic, fabric, film, foam or combination thereof, wherein at least one of the component layers is reversibly elongatable and thereby tensionable, i.e., stretchable, and is concomitantly reversibly narrowable across its major surface in a direction orthogonal to the direction of tensioning.

25

It is a further object of this invention to provide a method of making the gathered, layered composite materials of this invention.

30 It is a further object to provide novel absorbent products



- 7 -

derived from the gathered, layered composite materials of this invention.

5 In accordance with the present invention, there has been provided a novel, multi-layered composite material, comprised of at least two layers of a fabric, film, foam or combination thereof, wherein the first layer is a flexible, reversibly elongatable, tensionable material, and which is bonded at spaced apart positions to at least one additional layer of a flexible sheet material, wherein both layers are gathered, 10 the gathers of one layer being aparallel to the gathers of the other layer.

Also provided in accordance with the present invention is a method of forming a gathered, multi-layered composite material, having gathers, ruffles or puckers, comprising the steps of:

20 first tensioning a first layer of a flexible, reversibly elongatable, tensionable, material such as for example a fabric, film, foam or combination thereof in an amount that is effective to stretch, i.e increase its length beyond its original relaxed untensioned length in the direction of tensioning, and to also results in a narrowing of the width of the first layer to less than 25 its original relaxed, nontensioned width in a direction approximately coplanarly orthogonal to the direction of tensioning;

30 while in a tensioned state, adhering or otherwise



5 securing the first layer, at discrete spaced apart positions along at least a portion of the first layer, to at least one additional layer of a flexible nontensioned material such for example a fabric, film, foam or combination thereof to form a layered composite material;

10 and then releasing the tension on the first layer of the composite material to form a gathered, layered composite material; the gathers comprising raised portions of material extending above and below the surface of the composite material, and appearing on both the first layer and the at least one additional layer, the gathers of one layer being aparallel to the gathers of the other
15 layer.

Also provided in accordance with the present invention are novel absorbent products which incorporate the layered composites of this invention, as component parts of these
20 products, including but not limited to diapers, sanitary napkins, incontinence products, as well as bandages, wound dressings, surgical dressings, cushioning and bandages for the treatment of stasis ulcers, surgical drapes, underpads and the like.

25

BRIEF DESCRIPTION OF THE DRAWINGS

30 The above mentioned and other features and objects of this invention, and the manner of attaining them, will become more



apparent and the invention itself will be better understood by reference to the following description of embodiments of the invention taken in conjunction with the accompanying drawings, wherein:

5

Figure 1A is a schematic view of an apparatus for forming the layered composite material of this invention.

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Figure 1B is a schematic view of an alternative version of the apparatus shown in Figure 1A for forming the layered composite material of this invention.

15

Figure 2A is a schematic view of another apparatus for forming the layered composite material of this invention.

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Figure 2B is an enlarged plan view of a configuration of bonding stage components used in the apparatus shown in Figure 2A for forming the layered composite material of this invention.

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Figure 2C is an enlarged plan view of a alternative configuration of bonding stage components used in the apparatus shown in Figure 2A for forming the layered composite material of this invention.

30

Figure 2D is a schematic view of an alternative version of the apparatus shown in Figure 2A for forming the layered composite material of this invention.

Figure 2E is an enlarged plan view of a configuration of



bonding stage components used in the apparatus shown in Figure 2D for forming the layered composite material of this invention.

- 5 Figure 2F is an enlarged plan view of a alternative configuration of bonding stage components used in the apparatus shown in Figure 2D for forming the layered composite material of this invention.
- 10 Figure 3 is a plan view, before elongation, and concomitant narrowing orthogonal to the direction of elongation, of a flexible elongatable material used to form the layered composite material of this invention.
- 15 Figure 4 is plan view of an elongatable material, after the elongatable material shown in Figure 3 has been elongated and concomitantly narrowed orthogonal to the direction of elongation, intermediate to forming the layered composite material of this invention.
- 20 Figure 5 is a plan view of a flexible material used to form the at least one additional layer before it is bonded to the first layer to form the layered composite material of this invention.
- 25 Figure 6 is a perspective view of a layered composite material of this invention comprised of the elongatable material, shown in Figure 4, after it has been elongated and concomitantly narrowed orthogonal to the direction of elongation, attached to an at least one additional layer and
- 30



- 11 -

untensioned to form the layered composite material of this invention.

5 Figure 7 is a perspective view of another layered composite material of this invention.

Figure 8 is a partial cross section of a perspective view of yet another layered composite material of this invention.

10 Figure 9 is a perspective view of sanitary napkin made with the layered composite material of this invention.

15 Figure 10 is a perspective view of another sanitary napkin made with the layered composite material of this invention.

Figure 11 is a perspective view of yet another sanitary napkin made with the layered composite material of this invention.

20 Figure 12 is a partial cross section of a perspective view of a sanitary napkin comprised of an insert made of the layered composite material of this invention.

25 **DETAILED DESCRIPTION OF THE INVENTION**

The present invention is directed to a novel gathered, layered composite material; and more particularly to a gathered, layered composite material which is comprised of at
30 least two layers of for example a fabric, film, foam or



combination thereof, each of the at least two layers being gathered, the gathers of one layer being aparallel to the gathers of the other layer. It is considered an important feature of the present invention that the gathers appear on
5 both the first layer and the at least one additional layer, the gathers of one layer being aparallel to the gathers of the other layer, wherein the aparallel relationship of the gathers of each layer with each other is described as follows:

10

Each layer is roughly planarly parallel to each other layer. The gathers of each layer have an alignment directionality with each other, in that they are aligned substantially parallel, i.e., in the same direction with
15 each other. The angle of alignment directionality, that the gathers of one layer makes with the alignment directionality of the gathers of the other layer, is preferably greater than 0° , and is most preferably about 90° .

20

To be noted, is that alignment directionality of the gathers of each layer exists on relatively narrow pieces of the composite material, as may be used, e.g., on a cuff of a sanitary napkin or the waistband of a diaper,
25 as well as on relatively wide pieces of the composite material, as may be used, e.g., on the top layer or the bottom layer of a sanitary napkin. It should also be noted, that alignment directionality is best perceived, without recourse to magnification, on large areas of
30 material , e.g., about one square inch, than on small



5 areas, such as narrow strips. Such larger areas are particularly useful when one needs to see the alignment directionality of the gathers when the gathers are in the form of, e.g., quilted puckers rather than, e.g., parallel gathers, where the alignment directionality is more readily apparent.

The present invention is also directed to a novel method of making a layered composite material comprising:

10

15 Tensioning a first layer, having a length and width, of a flexible material comprised at least in part of a reversibly elongatable, tensionable material such as for example a fabric, film, foam or combination thereof; the tensioning being an amount that is effective to stretch, in approximately the direction of tensioning, the first layer beyond its original relaxed, nontensioned length dimension, and to also cause a narrowing of the first layer, in a direction approximately coplanarly
20 orthogonal to the direction of tensioning, beyond its original relaxed, nontensioned width dimension.

25 Reversibly elongatable is meant to describe the property of an elongatable material, after being tensioned to stretch the material and the tensioning being relaxed, wherein the material returns to within at least about 86% of its prestretched dimension.

30 While in a tensioned state, the first layer is adhered or otherwise secured, by bonding means that are at least



- 14 -

partially separated from one another, at discrete spaced
apart positions along at least a portion of the first layer,
to an at least one additional layer of a nontensioned
flexible material comprised for example of such materials as
5 a fabric, film, foam or combination thereof, to form a
layered composite material comprised of for example a fabric,
film, foam or combination thereof. The tension on the first
layer of the composite material is then released to form a
gathered, layered composite material.

10 To be further noted, is that the at least one additional
layer may undergo some tensioning and concomitant narrowing
in the process of forming the composite material of this
invention. This tensioning and concomitant narrowing may be
15 tolerated as long as it is insufficient to negate the
formation of gathers in the both the first layer and the at
least one additional layer, the gathers of one layer being
aparallel to the gathers of the other layer.

20 To be yet further noted, that an important feature of this
invention is that the tensioning of the first layer be
accompanied by a narrowing of the first layer, in a direction
approximately coplanarly orthogonal to the direction of
tensioning. This in contrast to the common practice in the
25 art where steps are specifically taken to prevent a narrowing
of the material in a direction coplanarly orthogonal to the
direction of stretch, when processing an elongatable material
that is either purposely placed under tension to stretch the
material or is coincidentally under some tension due to
30 differentials in tensions and speeds to which the material is



subjected as it is transported and processed from one part of a process another part of the process. Such conventional manufacturing steps include spreading, tensioning and holding the material in a stretched, non-narrowable condition in the orthogonal direction by means such as tenting with pins, clips or belts; and by pulling the material in the orthogonal direction with a ridged cylindrical spreader roll or with a bowed cylindrical roll. The cylindrical spreader roll may for example have the ridges not connected to each other, or connected as in a continuous spiral around the cylindrical spreader roll, or combinations thereof. The ridges or spiral preferably have high friction surfaces, e.g., of soft rubber. The ridges also are preferably disposed, at acute angles, with respect to either side of the side of center and the direction of rotation of the cylindrical spreader roll. The surface of the bowed cylindrical roll, over which the material to be maintained in a non-narrowable condition passes, is preferably convex. The surface of the bowed cylindrical roll is also preferably made of a high friction material, e.g., of soft rubber. Additionally the material may be held in a non-narrowable condition by means of pinch or nip rolls that are applied to the material as it travels over the various cylindrical rolls described above.

Materials useful for the both the first layer and the at least one additional layer of this invention are required to be flexible in that they are capable of bending or folding so as to gatherable. Fabrics, films, foams or combinations thereof useful for both layers of this invention may also include laminates of these materials.



The first layer of this invention may be chosen from materials such as: elastic reversibly elongatable or partially reversibly elongatable, tensionable fabrics, films, foams or combinations thereof; and nonelastic reversibly
5 elongatable or partially reversibly elongatable, tensionable fabrics, films, foams or combinations thereof. All the materials from which the first layer of this invention may be made, on being tensioned and thereby elongated, should be selected from those being concomitantly capable of undergoing
10 a reversible narrowing in a direction approximately coplanarly orthogonal to the direction of tensioning. Therefore, the first layer of this invention must be elongated to such an extent and concomitantly narrowed orthogonal to the direction of tensioning to such an extent,
15 to enable the tensioning and the narrowing to effect gathering of both the at least one additional layer and the first layer, respectively.

The at least one additional layer may be chosen from flexible
20 materials such as: elastic or nonelastic reversibly elongatable or partially reversibly elongatable, tensionable fabrics, films, foams or combinations thereof; nonreversibly elongatable, tensionable fabrics, films, foams or combinations thereof; and nonelongatable fabrics, films,
25 foams or combinations thereof.

Elastic materials are those capable of rapidly returning to approximately their initial dimensions and shape after being substantially deformed by a deforming force, usually a weak
30 force, and removal of such force.

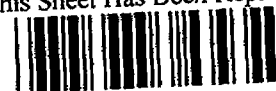


Nonelastic materials are those that are capable of being tensioned and thereby stretched without exceeding their yield point and then returning essentially to their original dimensions and shape when the tensioning force is removed.

5 Such preferred nonelastic films fabrics and foams are those capable of being tensioned, thereby being stretched, to at least 1% greater than their original length without reaching their yield point, the yield point being the first point on a stress-strain curve at which an increase in strain (here
10 the stretch or elongation), occurs without an increase in stress (here the tensioning force), i.e., where the material has been stretched but no longer returns to its original length. It is preferred that the nonelastic fabrics, films or foams be capable of being stretched, without reaching their
15 yield point, from 1% to at least about 60% greater than their original length and preferably between 5% to about 35% greater than their original length.

20 It should be noted that elastic or nonelastic materials which are only partially reversibly elongatable may be used in this invention, as long as sufficient elongation reversibility and shortening reversibility resides in the materials to create the gathers of this invention.

25 The ability of a fabric, film or foam to be elongated is required at least in one direction. The at least one direction may be in the machine direction, the cross machine direction and directions therebetween; with the proviso that the material be concomitantly narrowed in a direction
30 approximately coplanarly orthogonal to the direction in which



the material is elongated.

Fabrics, films and foams that are capable of being biaxially elongated are also useful in this invention. Thus, the reversibly elongatable, tensionable fabrics, films and foams useful in this invention may be capable of being tensioned in a single direction, in two directions, or in a plurality of directions, e.g., where the film or fabric is stretched in both the X and Y directions relative to its surface, as well as in its upward or Z direction, either in a specific zone area or over its entire surface. The foregoing notwithstanding, it is important in the practice of this invention, that biaxially elongatable materials be tensioned in a first direction, e.g., the machine direction, and also be allowed to narrow in a second direction, e.g., the crossmachine direction, that is coplanarly orthogonal to the first direction. If, however, biaxially elongatable materials are used and are also tensioned in the second orthogonal direction, it is required that they be tensioned in the second direction to a degree that can be surpassed by the potential of the material to recover by expanding; and thereby be capable of expanding coplanarly orthogonal to direction of tensioning, from the narrowing it experienced when it was in tension.

Reversibly elongatable, tensionable materials that are useful for the first layer and the at least one additional layer are well known in the art, and are represented either by elastic films, fabrics and foams and by nonelastic films, fabrics and foams that are capable of being tensioned and are able to

return at least in part to their original dimensions and shape when the tensioning force is removed. Materials useful for the at least one additional layer may also include nonelongatable films, fabrics or foams.

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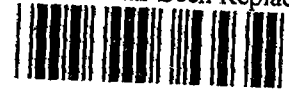
Suitable films useful for the first layer and the at least one additional layer of this invention may be chosen from those that are continuous, i.e., nonperforate, or from those that are perforate. The perforate films include those: 10 having apertures that are either essentially in the plane of the film; having apertures that are three dimensional in the sense that the defining walls of the apertures extend beyond the plane of the film; and perforate films having combinations of in the plane apertures and apertures that are 15 three dimensional. Films are also meant to include those that are embossed. The embossments include those that are large enough to be seen by eye or to be felt by touch; and also include those that are not easily detected by eye or by touch, e.g., microembossments that may lend a matte finish to 20 the film and may also lend a fabric feel to the film. Elasticity, elongability and the ability to be narrowed, for films, will generally, but not without exception, increase with reduced thickness, increased plasticization, increased number of apertures and increased area occupied by the 25 apertures. Of course, the chemical nature, molecular weight and degree of crosslinking, plasticizer concentration and other factors will also dictate the elasticity and elongatability of the film. Films that are approximately less than or equal to 10 millimeters thick are preferred; 30 with films that are approximately equal to or less than 3



- 20 -

millimeters thick being more preferred.

Suitable fabrics useful for the first layer and the at least one additional layer of this invention may include flexible paper products such as tissues and flexible fabrics that are woven, knitted or nonwoven. The tissues and woven and knitted fabrics may include those that are made by any of the several processes that are known in the arts of paper making, weaving and knitting, respectively, and yield the various tissue and fabric structures and designs that are known in these arts. Nonwovens, however, are particularly preferred for their low cost and the wide range of properties that can be imparted to them by the processes of forming and finishing and by the materials from which they are made. Suitable nonwoven fabrics, as defined by the processes by which they are made, may include wetlaid, airlaid, spunbond, meltblown, chemically bonded, thermally bonded, hydroentangled nonwoven fabrics and nonwoven fabrics resulting from combinations of such processes. Nonwovens are more likely to be elongatable if they are of low basis weight, bonded lightly or not at all, e.g., hydroentangled, meltblown, and lightly bonded spunbond, thermally bonded and chemically bonded nonwovens. Chemically bonded nonwovens are more likely to be elongatable if they contain elastic and elongatable fibers and contain elastic or frangible binders. The direction of the fibers, e.g., random as resulting from airlaying, or unidirectional, as resulting from carding, will also determine the direction in which the nonwoven will most easily elongate and the ease with which it will elongate in each direction. Fabrics of basis weight about equal to or less than 100 grams/square



meter are preferred; with fabrics of basis weight about equal to or less than 20 grams/square meter being more preferred.

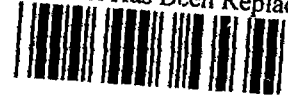
5 Suitable foams useful for the first layer and the at least one additional layer of this invention may be chosen from flexible and elongatable reticulated and nonreticulated foams. Such foams may be made of, but not restricted to, polyester polyurethanes, polyether polyurethanes and polyethylene. The degree of elasticity will depend, in
10 varying degrees and parts, on properties such as the thickness, durometer and degree of plasticization of the foam and the degree to which the foam is reticulated, i.e., whether the foam cells are in communication with one another or are isolated from one another by the cell walls of the
15 foam. In general, but not without exception, elasticity and elongatability increase with decrease in thickness and durometer and with increase in plasticization and degree of reticulation. Of course, the chemical nature, molecular weight and degree of crosslinking, plasticizer concentration
20 and other factors will also dictate the elasticity and elongatability of the foam. Foams less than or equal to 6.35 millimeters thick, are preferred; with foams that are approximately equal to or less than 3.175 millimeters thick being more preferred.

25 Suitable elastic films and fabrics are those made of elastomeric materials such as natural and synthetic rubbers, elastomeric polyurethanes (ESTANE from B. F. Goodrich & Co.), elastomeric polyamides (PEBAX from Atochem Co.) and
30 elastomeric polyesters (HYTREL from E. I. DuPont de Nemours



- 22 -

- & Co.), styrene butadiene styrene block copolymers, styrene ethylene butylene styrene block copolymers, styrene isoprene styrene block copolymers (examples of these block copolymers are those having the trademark KRATON from Shell Chemical Co.), noncrosslinked ethylene vinyl acetate copolymers, ultralow density polyethylene, blends, coextruded laminates, layered laminates of such materials, and combinations thereof.
- 5
- 10 Suitable elongatable nonelastic fabrics or films for use in this invention include, but are not limited to, those made of materials such as polyethylene, preferably low and medium density polyethylene, polypropylene, noncrosslinked ethylene vinyl acetate copolymers, polyamides such as nylon 6 and
- 15 nylon 6,6, polyesters, polyvinylidene chloride, polyvinyl chloride, polyester polyurethanes, polyether polyurethanes, and blends, coextruded laminates, layered laminates of such materials, and combinations thereof.
- 20 A preferred elongatable, nonelastic film for use in this invention is polyethylene film. The film may be nonperforate if for example in a sanitary napkin it is used as a barrier or as a component material of the cuffs, wings or tabs of the sanitary napkin. The preferred elongatable nonelastic film
- 25 may be perforate if for example it is used as a cover or fluid transfer layer or as a component material of the cuffs, wings or tabs. Similar choices of perforate or nonperforate materials, their use and placement in each product, may be made in the manufacture of other products such as, but not
- 30 limited to, sanitary absorbent products including diapers,



incontinence products, as well as bandages, wound dressings, surgical dressings, cushioning and bandages for the treatment of stasis ulcers, surgical drapes, underpads and the like.

5 Suitable fibers and filaments for the fabrics useful for this invention may be chosen for the degree of elongatability and elasticity desired. Since filaments may be thought of as long fibers, the fibers and filaments referred to herein will be referred to as fibers and thereby deemed to include both
10 fibers and filaments. Fibers such as woodpulp, cotton, rayon, wool, linen, silk, ramie and jute are relatively nonelongatable and nonelastic. Relatively more elongatable and elastic are synthetic fibers such as polyethylene, polypropylene, polyester, polyester polyurethane, polyether
15 polyurethane; and bicomponent fibers such as of polyethylene and polypropylene, polyethylene and polyester, polypropylene and polyester and low and high melting polyesters. In addition, the fiber denier, cross-section, degree of crystallinity will also impact its elongatability and
20 elasticity. The degree that the fabric permits movement of one fiber with respect to another, and the flexibility, elongatability and elasticity of any binder that is used, whether it is an adhesive or thermoplastic binder, and whether the binder itself is elastic, will also dictate to
25 some degree the elongatability and elasticity of the fabric.

The gathered, composite of this invention may optionally comprise a laminated structure made of more than two plies. The following examples of composites comprising more than two
30 plies are presented without meaning to be restricted by such



examples. For example, a three ply laminated structure may be made wherein an elongatable elastic or nonelastic fabric, film, foam or combination thereof is first tensioned, and to opposite sides thereof is bonded one each of two additional
5 nontensioned layers of fabric, film or foam; or one of the two nontensioned additional layers may be adhered to the tensioned layer followed by sequentially adhering the second of the two additional nontensioned layers to the first additional nontensioned layer; after which the tensioned
10 layer is relaxed to form a gathered, layered composite. Alternatively, two layers of tensioned elongatable fabric, film or foam may be adhered or secured, alternately one on either side or both to one side of a nontensioned additional layer; after which the tensioned layers are allowed to relax
15 to form a gathered layered composite. Additional layers of tensioned elongatable and nontensioned fabrics, films and foams may be similarly laminated. One may substitute, for any layer of the composite, a component layer that does not become gathered, by means such as attaching it to a layer or
20 component after the tensioned composite or tensioned layer has been untensioned; or by using a layer made of a tensioned material that is not reversibly elongatable in the direction of tensioning and reversibly narrowable orthogonal to the direction of tensioning.

25

The elongatable elastic or nonelastic fabric, film or foam, and the at least one additional layer of fabric, film or foam may be adhered or otherwise secured to each other by any conventional techniques which are known for securing two or
30 more layers of flexible sheet materials together and



includes, but is not limited to, the use of adhesives, heat sealing, ultrasonic bonding, radiofrequency sealing, mechanical crimping, cold flow pressure sealing, and the like, and combinations thereof. Adhesive may be applied as

5 a hotmelt, for example, by spraying or through separate orifices or through a slotted orifice which has spacers to separate the exiting adhesive into spaced apart streams. Each coating stream or spray may be discontinuous or continuous. Adhesive may also be applied by screen printing

10 or by transfer coating. Hotmelt adhesives are preferred over solvent based adhesives for speed of application and for the elimination of the need to remove byproducts such as solvents and components of curing agents. The adhesive may be applied to either or both the elongatable elastic or nonelastic

15 fabric, film or foam and the at least one additional layer of fabric, film or foam. However, if adhesive is used, it is preferred, for ease and accuracy of application, that it be applied to the at least one additional layer of fabric, film or foam, since the at least one additional layer is not being

20 tensioned or is tensioned to a lesser degree than the first layer of material, and is thus more easily kept laying flat during the process of manufacture, albeit that it may be inherently three dimensional by virtue of being for example embossed or by having three dimensional apertures.

25 Mechanically applied methods of sealing such as heat sealing, ultrasonic bonding, radiofrequency sealing, mechanical crimping, cold flow pressure sealing, may be accomplished with a heated roll or stamping plate that has a patterned surface to which the appropriate energy, i.e., heat,

30 ultrasound, radiofrequency, pressure or combinations thereof,

is applied.

The elongatable elastic or nonelastic fabric, film or foam, and the at least one additional layer of fabric, film or foam
5 may be bonded to each other in any manner or pattern of adherence or securement that provides at least partially spaced apart zones of bonding, i.e., the zones of adherence or securement are separated from one another by zones of non
10 adherence or securement. The zones of adherence or securement should be wide enough to retain the integrity of the bonding between the layers of the composite material during manufacture or use. In practice, this width has been found to be at least about 0.016 in. (0.397 mm) and preferably at least about 0.031 in. (0.793 mm). However,
15 such zones should not be so wide as to severely reduce the areas of material that is gathered or to compromise the ability of the material to be gathered. In practice, the maximum width of the zones of adherence or securement has been found to be about 0.5 in. (12.7 mm) and preferably about
20 0.375 in. (9.525 mm).

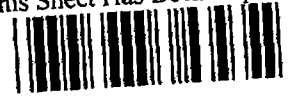
Such manner and pattern of adherence or securement provide areas where the adhered fabrics, films and foams can relax to form gathers. Examples of the elements of such patterns of
25 zones of adherence or attachment are spaced apart straight or curved lines or bars, where the lines or bars may be continuous, or may be made up of a series of discontinuous and/or continuous dots, dashes, chevrons, circles or other geometric shapes, swirls and zigzags and the like and
30 combinations thereof. Examples of curved patterns are



undulating sinusoidal lines or bars.

The zones of non-adherement or spacing between the elements of the zones of adherement may be range from about 0.0625 in. (1.588 mm) to 0.5 in. (12.7 mm) and may preferably be between 0.125 in. (3.175 mm) and 0.375 in. (9.525 mm). It should be noted that the spacing used will be dictated by both the degree of gathering, the amount of material desired in the gathers, as well as the loft of the materials used. Thus closer spacing between the elements of the zones of adherement or securement may be tolerated when the material is relatively thin and flexible. Thicker material will require the use of wider spacing between the elements of the zones of adherement or securement.

The general direction of the pattern of the zones of adherement or attachment, if it is nonrandom such as e.g. discrete lines of adhesive in a spaced apart pattern, may be at any angle to the direction in which the elongatable elastic or nonelastic fabric, film or foam is tensioned. When the elongatable elastic or nonelastic fabric is relaxed the puckers will be seen to reflect the pattern of the elements of the zones of adherement or securement, e.g., discrete points or lines wherein the lines may be continuous, discontinuous, regular, random, straight or curved, and wherein the angle that the pattern of elements of the zones makes with the direction in which the elongatable elastic fabric, film or foam has been stretched, i.e parallel, orthoganal or any angle in between. The resulting gathers will then be seen to vary, for example, from a series of



parallel ruffles or ridges to a pattern of quilted puckers of different sizes, shapes and outlines. It has been discovered that after tensioning is relaxed, that the gathers can be discerned to have a pattern of directionality, e.g., a series
5 of parallel ruffles or ridges, then the pattern of gathers along the plane of one layer, e.g., the elongatable elastic fabric, film or foam, is approximately orthogonal to the pattern of gathers in the at least one other layer along the plane of that other layer.

10

A preferred film useful in this invention is for example an elongatable or nonelastic nonperforate or perforate polyethylene or polypropylene film. Examples of such perforate nonelastic films are described in the following
15 Patent Applications, and commonly assigned and incorporated herein in their entirety by reference: to Turi et al, "Textilelike Apertured Plastic Films", Canadian Patent Application 2,130,176; "Method of Forming Improved Apertured Films, Resultant Apertured Films and Absorbent Products
20 Incorporating Resultant Apertured Films"; to James et al, US Patent Application No. 08/523,112; and to Burwell et al, "Apertured Film Having Improved Fluid Distribution Properties, Method of Forming Same and Absorbent Products Incorporating Same", US Patent Application No. 08/522,600;
25 and "Absorbent Products", US Patent Application No. 08/522,722.

Other examples of perforate films are described in US 3,054,148 to Zimmerli, US 4,690,679 and US 4,806,411 to
30 Mattingly et al, US 4,859,519 to Cabe et al, US 3,929,135 to



Thomson et al, US 4,324,246 to Mullane and European Patent Application 0,304,617 to Kao Corporation.

5 The perforate film is tensioned and an additional permeable layer of fabric, film or foam is adhered thereto, the zones of adherence are separated from one another by zones of non adherence or nonsecurement. Examples of such additional permeable layers of fabric, film, or foam are a nonwoven fabric, tissue, perforated film and reticulated foam. The
10 tension on the elastic or nonelastic fabric, film or foam is then released to form a gathered three-dimensional fluid pervious composite.

15 The gathered layered composite materials formed in accordance with such preferred films, when incorporated into an absorbent product, provide soft, comfortable gathered textures that have less contact with the body than do flat structures. The composites also provide surprisingly enhanced fluid transfer properties as well as unique
20 structural and spatial attributes, and have been found useful in the manufacture of various products including, but not limited to, sanitary absorbent products such as diapers, sanitary napkins, incontinence products, as well as bandages, wound dressings, surgical dressings, cushioning and bandages
25 for the treatment of stasis ulcers, surgical drapes, underpads and the like. Some structure benefits, as examples, are the properties of preventing wet collapse and providing compression and crush resistance to such products during use. This preferred embodiment of the perforate
30 layered composite material of this invention has also been



found to be particularly suitable for use in the absorbent products, as cover layers and as intervening fluid transfer layers. When at least a part of the layered composite material of this invention is nonperforate, it has been found
5 useful in these products as barrier layers and as covers for cuffs, wings or tabs. When the layered composite material has at least one perforate component layer, it has been found useful in these products as intervening fluid transfer layers and as containment structures for ingredients such as
10 deodorants, fragrances, medicaments and superabsorbents. When the layered composite material is comprised completely of either perforate or nonperforate component layers or has both perforate and nonperforate component layers, it has been found particularly useful as deformation and crush resistant
15 structures. Examples of lateral and vertically wicking intervening fluid transfer layers are described in "Absorbent Articles with Plates", US Patent Application Serial No. 08/220,073 to Hsieh et al, and commonly assigned and incorporated herein in its entirety by reference.

20

In accordance with this aspect of this invention, the gathered composite material is incorporated into sanitary napkins, adult incontinence products, bandages, and the like, there has now been provided an absorbent product having a top
25 fluid permeable layer, a bottom fluid impermeable layer, and an absorbent core therebetween, wherein the top fluid permeable layer comprises a perforate polyethylene film which is first tensioned to stretch the film to a length which is at least 101% of its original nontensioned length, the film
30 concomitantly undergoing narrowing in a direction orthogonal



to the direction of tensioning; adhering a second fluid pervious fabric, film or foam to the perforate polyethylene film by adhering or securing means that are at least partially separated from one another, at discrete spaced
5 apart positions along at least a portion of the tensioned perforate film; and then releasing the tension on the perforate polyethylene film to yield a product with a gathered top fluid permeable layer. This gathered, layered composite material may comprise the bottom, garment facing,
10 fluid impermeable layer, to prevent leakage from the bottom and sides of the product. In such uses, it is preferred that either or both the first elongatable fabric, film or foam and the second fabric, film or foam be fluid impervious. The sanitary napkin may optionally have wings or tabs to fix the
15 napkin to the undergarment. The gathered composite material of this invention may comprise all or part of the wings or tabs. The napkin may also optionally contain embossments or deep channels, to raise the absorbent center and thereby the fluid pervious top layer to contact the body, and to channel
20 fluids longitudinally to prevent side leakage. The absorbent core of the napkin may optionally contain a gathered composite material of this invention in the form of lateral and vertically wicking intervening fluid transfer layers and/or as containment structures for ingredients such as
25 deodorants, fragrances and superabsorbents.

In a another embodiment of this invention, there has been provided a sanitary napkin having a fluid pervious top layer, a fluid impervious bottom layer, and an absorbent core
30 therebetween, and having gathered longitudinal edges, which



may optionally form upstanding sidewalls to inhibit fluid leakage across the lateral sides of the sanitary napkin. The gathered edges may be formed by tensioning a first elongatable fabric, film or foam, and while in its tensioned state, the elongatable fabric, film or foam is concomitantly narrowed in a direction orthogonal to the direction of tensioning; adhering a second fabric, film or foam to the elongatable fabric or film by adhering or securing means that are at least partially separated from one another, at discrete spaced apart positions along at least a portion of the tensioned elongatable fabric or film, and then releasing the tension on the elongatable fabric, film or foam to yield a product with a gathered composite material wherein both layers are gathered, the gathers of one layer being aparallel to the gathers of the other layer. This gathered composite material may then be adhered or secured along side edges of a sanitary napkin. The gathered composite material, before being adhered or secured along the side edges of a sanitary napkin, may itself be tensioned, the tension being released after it is adhered or secured to the side edges, thereby raising and providing curvature to the gathered edges, the upstanding sidewalls or the napkin itself. The gathered composite material may also comprise the bottom, garment facing, fluid impermeable layer, to prevent leakage from the bottom and sides of the product.

The sanitary napkin prepared in accordance with this aspect of the invention provides the sanitary napkin with soft gathered edges and/or upstanding side walls which are not easily deformed and which, therefore, act as substantial



liquid barriers to prevent side leakage. In such uses, it is preferred that either or both the first elongatable fabric, film or foam and the second fabric, film or foam be fluid impervious. The sanitary napkin may optionally have wings or tabs to fix the napkin to the undergarment. The gathered, layered composite material of this invention may form all or part of the wings or tabs. The napkin may also optionally contain embossments or deep channels, to raise the absorbent center and thereby the fluid pervious top layer to contact the body, and to channel fluids longitudinally to prevent side leakage.

Without restricting the invention in any way, the following are examples of processes, which have been found to be suitable for making the gathered, layered composite material of this invention.

Figures 1A and 1B are schematic views of an apparatus 22, and an alternative apparatus 22A to apparatus 22, respectively, for forming the layered composite material of this invention. Analogous or similar elements in each Figure are given the same designating numbers. Referring now to Figure 1A, the process requires at least a first layer 2 of a flexible, substantially reversibly elongatable material, such as a fabric, film or foam, and a second layer 4 of a flexible material, such as a fabric, film or foam. The two layers may be of different materials or of the same material. Second layer 4 is unwound from a supply roll 6 and passed under and over a series of guide rolls 8. During the passage through series of guide rolls 8, second layer 4 is subjected to

coating by hotmelt adhesive that is fed from a slot coater 10, wherein the slot is divided into open and closed zones by a series of spacers, the hotmelt adhesive being thereby separated into discrete streams that impact and thereby coat 5 second layer 4 with a spaced apart pattern, e.g., at least two parallel lines, of adhesive. Details of the slot coater, the divided slot, the hotmelt adhesive and the coating pattern, being known in the art, are not shown in Figure 1a. It should be noted that the pattern of adhesive, here the at 10 least two parallel lines, on second layer 4 may be at any angle, from 0 to 90 degrees to the machine direction; and that the spaced apart pattern may be of a variety of designs, not necessarily parallel lines, as is discussed earlier in the section, "Detailed Description of the Invention". Second 15 layer 4 is led onto and is supported by a belt 12 that is rotated belt supporting rolls 14, 16. Second layer 4 is further led through a nip 18 between belt 12 on belt supporting roll 16, and a drive roll 20; where, in nip 18, second layer 4 is laminated to a tensioned, elongated and 20 concomitantly orthogonally narrowed first layer 2 that is being brought into nip 18 on top of, and coincidingly with, second layer 4.

First layer 2 is unwound from a supply roll 3 and led through 25 a nip 5 between a drive roll 7 and a pressure roll 9, with drive roll 7 being rotated at a slower speed than that of drive roll 20. The tensioned and concomitantly narrowed first layer 2 is led around drive roll 20 and through nip 18 between drive roll 20 and incoming second layer 4 where it is 30 laminated to second layer 4 as described above.



Alternatively, as in apparatus 22A in Figure 1B, belt 12 may be eliminated, with both first layer 2 and second layer 4 being led directly through nip 18 between drive roll 20 and pressure roll 24, with drive roll 20 rotating at a faster speed than supply roll 3; thereby causing first layer 2 to be tensioned and thereby stretched as it passes through nip 18 to be laminated to and second layer 4.

Since, in apparatus 22, and apparatus 22A, drive roll 20 is rotating faster than drive roll 7, and supply roll 3 respectively, first layer 2 is tensioned and thereby stretched in the machine direction and concomitantly narrowed in the cross machine direction.

In both Figures 1A and 2A, after bonding the concomitantly tensioned and narrowed first layer 2 to second layer 4, both the tensioning and concomitant narrowing of first layer 2 are permitted to relax, thereby allowing the layered material leaving nip 18 to form a three dimensional, layered composite material 11, wherein both first layer 2 and second layer 4 are gathered, the gathers of one layer being aparallel to the gathers of the other layer. Composite material 11 is wound on to a takeup roll 13 for further use.

Figures 2A and 2D are schematic views of another apparatus 30, and alternatives to apparatus 30, and an alternative apparatus 30A to apparatus 30, respectively, for forming the layered composite material of this invention. Figures 2B and 2C are enlarged plan views of alternative configurations of the bonding stage components shown in Figure 2A. Figures 2E

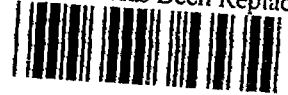


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and 2F are enlarged plan views of analogous alternative configurations of the bonding stage components shown in Figure 2D. Analogous or similar elements to those in Figures 1A and 1B are given the same designating numbers in Figures 2A to 2F. Referring now to Figure 2A, the process requires at least a first layer 2 of a flexible, substantially reversibly elongatable material, such as a fabric, film or foam, and a second layer 4 of a flexible material such as a fabric, film or foam. The two layers may be of different materials or of the same material. Second layer 4 is unwound from a supply roll 6 and passed under and over a series of guide rolls 8. Second layer 4 is led onto and is supported by a belt 12 that is rotated by belt supporting rolls 14, 16. Second layer 4 is led through a nip 18, between belt 12 on belt supporting roll 16, and a drive/heat sealing roll 17; where, in nip 18, second layer 4 is heat laminated in a spaced apart pattern to a tensioned, elongated and concomitantly orthogonally narrowed first layer 2 that is being brought into nip 18 on top of, and coincidingly with, second layer 4. An example of a drive/heat sealing roll 17 is shown in Figure 2B in plan in enlarged detail, wherein drive/heat sealing roll 17 is shown to contain, for example, at least two spaced apart raised heated ridges 19, ridges 19 being spaced apart by spacers 21 that are at a level lower than ridges 19, thereby forming grooves 23 between ridges 19.

Belt supporting roll 16 may be smooth surfaced or it may have ridges that either meet with or interdigitate ridges 19 on drive/heat sealing roll 17.

30



First layer 2 is unwound from a supply roll 3 and led through a nip between a first drive roll 7 and a pressure roll 9, with drive roll 7 being rotated at a slower speed than that of drive/heat sealing roll 17. Since drive/heat sealing roll 17 is rotating faster than drive roll 7, first layer 2 is tensioned and thereby stretched in the machine direction and concomitantly narrowed in the cross machine direction. The tensioned and concomitantly narrowed first layer 2 is led around a drive/heat sealing roll 17 and through nip 18 between drive/heat sealing roll 17 and incoming second layer 4 where it is laminated to the second layer as described above. Alternatively, with continued reference to Figure 2B, drive/heat sealing roll 17 may be unheated, belt supporting roll 16 being heated, thereby having the heat coming from belt supporting roll 16, through belt 12 and second layer 4 to heat seal and thereby laminate the two layers 2, 4 together. Yet alternatively, as in Figure 2C, belt supporting roll 16 may be heated and contain, for example, at least two spaced apart raised heated ridges 19, ridges 19 being spaced apart by spacers 21 that are at a level lower than ridges 19, thereby forming grooves 23 between ridges 19. In such a case, drive roll 17 may unheated and either be smooth surfaced or have ridges that either meet with or interdigitate ridges 19 on belt supporting roll 16. It should be noted that belt supporting roll 16 and drive roll 17 may optionally both be heated.

Alternatively, as in apparatus 30A in Figure 2D, belt 12 may be eliminated, with both first layer 2 and second layer 4 being led directly through nip 18 between drive roll 20 and



pressure roll 24, with drive roll 20 rotating at a faster speed than supply roll 3; thereby causing first layer 2 to be tensioned and thereby stretched in the machine direction and concomitantly narrowed in the cross machine direction, as it
5 passes through nip 18 to be laminated to and second layer 4. With reference to Figure 2E, drive roll is heated and contains for example, at least two spaced apart raised heated ridges 19, ridges 19 being spaced apart by spacers 21 that are at a level lower than ridges 19, thereby forming grooves
10 23 between ridges 19. Pressure roll 24 may be smooth surfaced or it may have ridges that either meet with or interdigitate ridges 19 on drive roll 20.

15 Alternatively, with reference to Figure 2F, drive roll 17 may be unheated, pressure roll 24 being heated, and containing, for example, at least two spaced apart raised heated ridges 19, ridges 19 being spaced apart by spacers 21 that are at a level lower than ridges 19, thereby forming grooves 23
20 between ridges 19. In such a case, drive roll 17 may unheated and either be smooth surfaced or have ridges that either meet with or interdigitate ridges 19 on pressure roll 24. It should be noted that pressure roll 24 and drive roll 17 may optionally both be heated.

25 After heat sealing the concomitantly tensioned and narrowed first layer to the second layer, both the tensioning and concomitant narrowing of the first layer are permitted to relax, thereby allowing the layered material leaving nip 18
30 to form a three dimensional, layered composite material 11,



wherein both first layer 2 and second layer 4 are gathered, the gathers of one layer being aparallel to the gathers of the other layer. Composite material 11 is wound on to a takeup roll 13 for further use.

5

Figure 3 is a plan view, before elongation, and concomitant narrowing orthogonal to the direction of elongation, of a flexible elongatable material 40 used to form the first layer of the layered composite material of this invention. Material 40 is described in Figure 3 to have a machine direction dimension 32 and a crossmachine direction dimension 33, being the respective directions in which the first layer will be tensioned and thereby elongated and be concomitantly narrowed, in the process of making the layered composite of this invention.

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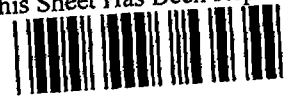
Figure 4 is plan view of an elongatable material 45, after the elongatable material shown in Figure 3, has been elongated and concomitantly narrowed orthogonal to the direction of elongation, intermediate to forming the first layer of the layered composite material of this invention. Material 45 is described in Figure 4 to now have a machine direction dimension 34 and a crossmachine direction dimension 35, being the respective directions in which the first layer has been tensioned and thereby elongated, wherein the dimensions 34 and 35 are respectively longer and shorter than dimensions 32 and 33 shown in Figure 3.

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Figure 5 is a plan view of a flexible material 50 used to form the at least one additional layer before it is bonded to

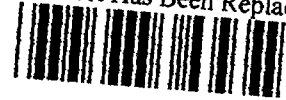
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the first layer to form the layered composite material of this invention. Material 50 is described in Figure 5 to have a machine direction dimension 36 and a crossmachine direction dimension 37, being the respective directions in which the at least one additional layer will be aligned with the first layer in the process of making the layered composite of this invention.

Figure 6 is a perspective view of a gathered layered composite material 60 of this invention comprising the elongatable material, shown in Figure 4, now shown as the first layer component 42 of gathered layered composite material 60 of this invention, after first layer 42 has been elongated in the machine direction 41, and concomitantly narrowed orthogonal to the direction of elongation, i.e., in the crossmachine direction 55, and attached to an at least one additional layer 44 by spaced apart lines of adhesive 45, wherein the spaced apart lines of adhesive are essentially parallel to the machine direction 41; and the tensioning and concomitant narrowing is relaxed to form layered composite material 60 of this invention, wherein both layers 42, 44 are gathered, the gathers of one layer being parallel to the gathers of the other layer.

First layer component 42 comprises bonded regions 46 and nonbonded regions 47, having respectively linear cross section dimensions 48, 49 and a machine direction dimension 52. On sequentially comparing dimensions shown in Figure 6 with the analogous dimensions shown in Figure 3, the sum of linear cross section dimensions 48, 49 are essentially yet



approximately equal to crossmachine direction dimension 32 shown in Figure 3; and machine direction dimension 52 is essentially yet approximately equal to machine direction dimension 33, also shown in Figure 3.

5

At least one additional layer 44 comprises bonded regions 55 and nonbonded regions 56, having respectively linear cross section dimensions 57, 58 and crossmachine direction dimension 59. On sequentially comparing dimensions shown in Figure 6 with the analogous dimensions shown in Figure 5, the sum of linear cross section dimensions 57 and 58 are essentially yet approximately equal to machine direction dimension 37 shown in Figure 5 and crossmachine section dimension 59 is essentially but approximately equal to crossmachine direction dimension 36 shown in Figure 5.

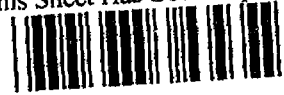
Figure 7 is a perspective view of another gathered, layered composite material 70 of this invention. Composite material 70 comprises a first layer component 71 that has been elongated in the machine direction 72 and concomitantly narrowed orthogonal to the direction of elongation, i.e., in the crossmachine direction 73 and attached to an at least one additional layer 74 by spaced apart lines of adhesive 75, wherein the spaced apart lines of adhesive are essentially parallel to cross machine direction 73; and the tensioning and concomitant narrowing is relaxed to form the layered composite material 70 of this invention, wherein both layers 71, 74 are gathered, the gathers of one layer being aparallel to the gathers of the other layer.

30



First layer component 71 comprises bonded regions 77 and nonbonded regions 78, which regions together define the gathers 79 of first layer component 71. At least one additional layer 74 comprises bonded regions 80 and nonbonded regions 81, which regions together define the gathers 82 of at least one additional layer component 74. Analogous comments may be made about the relationship of the bonded and nonbonded regions of the gathered regions of this layered composite with respect to the dimensions of both the unperturbed starting first layer and the at least one additional layer.

Figure 8 is a partial cross section perspective view of yet another gathered, layered composite material 90 of this invention. Composite material 90 comprises a first layer component 84 that has been elongated in the machine direction 85 and concomitantly narrowed orthogonal to the direction of elongation, i.e., in the crossmachine direction 86 and attached to an at least one additional layer 88 by spaced apart lines of adhesive 89, the adhesive lines being shown predominantly in phantom, wherein the spaced apart lines of adhesive are essentially not parallel to either machine direction 85 or to crossmachine direction 86, but are at some nonparallel angle to either direction, for example, 45 degrees to machine direction 85; and the tensioning and concomitant shortening is relaxed to form the layered composite material 90 of this invention; wherein both layers 84, 88 are gathered, the gathers being in the form of quilted rather than parallel puckers, and the gathers of one layer being aparallel to the gathers of the other layer.



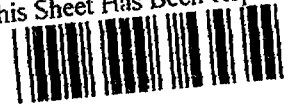
First layer component 84 comprises bonded regions 91 and unbonded regions 92, which regions together define the gathers 93 of first layer component 84. At least one additional layer 88 comprises bonded regions 94 and nonbonded regions 95, regions 94, 95, which regions together define the gathers 96 of at least one additional layer component 88. Analogous comments may be made about the relationship of the bonded and nonbonded regions of the gathered regions of this layered composite with respect to the dimensions of both the unperturbed starting first layer and the at least one additional layer.

Figure 9 shows a perspective view of an absorbent product of this invention, here a sanitary napkin 120 covered by a perforated fluid permeable top layer 100, a fluid impermeable bottom layer 102 and an absorbent core (not shown) therebetween, where at least top layer 100 is made of the gathered, layered composite material of this invention; top layer 100, here exhibiting bonded 99 and nonbonded 104 areas (the at least one additional layer not being shown). Absorbent core 104 is comprised of an absorbent, for example woodpulp, and has more absorbent, thereby being thicker in approximately the central portion 101, i.e., approximately the central third, then becoming thinner by tapering down toward the transverse ends 103, 105 of napkin 120. Napkin 120 is distinguished by having top layer 100 sealed along its entire periphery 106 to bottom layer 102, wherein bottom layer 102 may be comprised of a nonperforate material comprised of the layered composite material of this invention. Napkin 120 is further distinguished by having a



pair of deeply embossed concavely curving channels 107, 108, toward and adjacent each of two lateral sides 109, 110, respectively, along and outward of central portion 101 of napkin 120, the deeply embossed channels 107, 108, being a highly densified region containing top layer 100 and a significant depth of the absorbent comprising absorbent core 104. The thickness of absorbent core 104 in central portion 101 between the pair of channels 107, 108 is at least equal to or greater than the thickness of central portion 101 between pair of channels 107, 108 and lateral sides 109, 110. Napkin 120 also comprises a positioning adhesive (not shown), on the garment side of bottom layer 102, for attaching napkin 120 to an undergarment, positioning adhesive being protected until use with a release paper (not shown). Absorbent core 104 may optionally contain as distinct layers, gradients, or as homogeneous dispersions, any or all of absorbents such as tissue, sphagnum moss and superabsorbent.

Figure 10 shows a perspective view of an absorbent product of this invention, here a sanitary napkin 130 covered by a fluid permeable top layer 112, a fluid impermeable bottom layer 113 and an absorbent core (not shown) therebetween, where top layer 112 and/or bottom layer 114 may be made of the gathered, layered composite of this invention; top layer 112, here exhibiting bonded 116 and nonbonded 117 areas (the at least one additional layer not being shown). Napkin 130 also comprises right and left longitudinally extending cuffs 118, 119 each of the cuffs being attached along their respective base portions 121, 122 to the right and left lateral sides 123, 124 of napkin, respectively, such that the

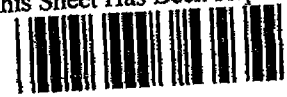


distal ends 125, 126 of cuffs 118, 119 extend outward from right and left lateral sides 123, 124 of napkin 130. Top layer 112 and bottom layer 114 are attached to each other in a flange seal 122 and to base portions 121, 122 of cuffs 118, 119. Cuffs 118, 119 may be optionally longitudinally attached along their respective base portions 121, 122 to napkin 130: anywhere, between the respective lateral sides 123, 124 and the longitudinal centerline 125; along and above or below top layer 112, but not including longitudinal centerline 125; along and above or below bottom layer 114, including longitudinal centerline 125; in such fashion that ensures that cuffs 118, 119 extend at least outward from lateral sides 123, 124. Cuffs 118, 119 in this example may also be covered with a nonwoven or, as shown here, with the gathered, layered composite material of this invention; the gathered, layered composite material here exhibiting bonded 116 and nonbonded 117 areas (the at least one additional layer not being shown). Cuffs 118, 119 may additionally be made of or contain in or on the cuffs other materials such as films, nonwovens and foam, the nonwoven or foam being preferably of a highloft material. Cuffs 118, 119 may also additionally contain elastic materials in or on the cuffs. Absorbent core 116 in Figure 10 has a roughly rectangular outline, and is thicker in the middle 127 than lateral sides 123, 124 or than the transverse ends 128, 129. Absorbent core 116 may have other outline shapes such as hourglass, dogbone or oval. Absorbent core 116, proceeding from the absorbent facing side of top layer 112, may further comprise a transfer layer of a low density nonwoven material, an auxiliary absorbent layer containing sphagnum moss and a main



absorbent layer such as of airlaid pulp. Napkin 130 also comprises positioning adhesive (not shown), on the garment side of bottom layer 114, for attaching napkin 130 to an undergarment, positioning adhesive being protected until use
5 by a release paper (not shown). Absorbent core may optionally contain as distinct layers, gradients, or as homogeneous dispersions, any or all of tissue, sphagnum moss and superabsorbent. Embodiments of napkins with cuffs such as are described herein are described in Patent Applications,
10 to Salerno et al, commonly assigned, entitled, "Absorbent Article Having Compliant Cuffs" and "Stabilized Absorbent Article", are herein incorporated in their entirety.

Figure 11 shows a perspective view of an absorbent product
15 of this invention, a sanitary napkin 150 covered by a fluid permeable top layer 131, a fluid impermeable bottom layer 132 and an absorbent core (not shown) therebetween. Napkin 150 also comprises right and left longitudinally extending wings or tabs 133, 134 each of the wings or tabs 133, 134 being
20 attached along their respective base portions 135, 136 to the right and left lateral sides 137, 138 of napkin 150, respectively, such that the distal ends 139, 140 of wings or tabs 133, 134, extend outward from the right and left lateral sides 137, 138 of sanitary napkin 150. Top layer 131 and
25 bottom layer 132 are attached to each other in a flange seal 141 and to the base portions of wings or tabs 133, 134. Wings or tabs 133, 134 in this example are also covered with the layered composite material of this invention. The wings or tabs can optionally be attached to the sanitary napkin:
30 longitudinally along and above or below the cover between and



including the center of the napkin and adjacent the lateral sides; longitudinally anywhere along the lateral sides of the napkin; and longitudinally along and above or below the barrier film backsheet. Wings or tabs 133, 134 may be
5 longitudinally attached, alternatively along their respective base portions 135, 136 anywhere, between the respective lateral sides 137, 138 and adjacent to but not including the longitudinal centerline 142; such that wings or tabs 133, 134 extend at least outward from lateral sides 137, 138.
10 Absorbent core 133 in Figure 11 has an hourglass outline and is thicker in the middle region 143 than the lateral sides 137, 138 or than the transverse ends 144, 145. Absorbent core 133 may further comprise, proceeding from the absorbent facing side of top layer 131, a transfer layer made of a low
15 density nonwoven material, an auxiliary absorbent layer comprising sphagnum moss and a main absorbent layer such as of airlaid pulp. Napkin 150 also comprises positioning adhesive (not shown), on the garment side of bottom layer 132, for attaching napkin 150 and wings or tabs 133, 134 to
20 an undergarment, positioning adhesive being protected until use with a release paper (not shown). Absorbent core 133 may optionally contain as distinct layers, gradients, or as homogeneous dispersions, any or all of absorbents such as tissue, sphagnum moss and superabsorbent. Embodiments of
25 napkins with wings such as are described herein are described in US Patent Application, Serial No. 198,809 entitled, "Body Conforming Absorbent Article" to McCoy et al, and commonly assigned, herein incorporated in its entirety by reference



Figure 12 shows a partial cross section of a perspective view of an absorbent product of this invention, here a sanitary napkin 160, covered by a perforated fluid permeable top layer 151, a fluid impermeable bottom layer 152 and an absorbent core 153, therebetween, absorbent core 153 further comprising and insert 154 made of the gathered, layered composite material of this invention. Top layer 151 and bottom layer 152 are attached to each other in a flange seal 164. Napkin 160 also comprises positioning adhesive 165, on the garment side of bottom layer 152, for attaching napkin 160, positioning adhesive 165 being protected until use with a release paper 166. Insert 154 may be positioned anywhere within absorbent core 153 between top layer 151 and bottom layer 152, and may substitute for any or all off the components of absorbent core 153. Thus, when insert 154 is comprised of at least one perforate component layer, it has been found useful as an intervening fluid transfer layer to wick fluids both laterally and vertically and for storage or containment structures for ingredients such as deodorants, fragrances, medicaments and superabsorbents. Here insert 154 is positioned between top layer 151 and absorbent core 153, and has at least one perforate component layer. Insert 154 is comprised of a first layer 156 and an at least one additional layer 159 attached to each other by spaced apart bonding means 161; wherein first layer is comprised of bonded areas 157 and nonbonded areas 158, and at least one additional layer 159 layer is comprised of bonded areas 162 and nonbonded areas 163. Since insert 154 here may act as a fluid transfer layer, absorbent core 153 may comprise an



auxiliary absorbent layer comprising such as sphagnum moss and a main absorbent layer such as of airlaid pulp; and may optionally contain as distinct layers, gradients, or as homogeneous dispersions, any or all of absorbents such as tissue, sphagnum moss and superabsorbent. When the layered composite material comprising the insert is comprised completely of perforate or nonperforate component layers or has both perforate and nonperforate component layers, it has also been found useful as deformation and crush resistant structures.

EXAMPLES

In addition to the preceding descriptions, and as additionally illustrated by the figures, the gathered layered composite of the invention is further illustrated, in the following Table, "Manufacture of Laminated Composite Material", by examples of manufacturing runs used to make the gathered, layered composite materials, without meaning to be limited by such examples. The Table describes manufacturing runs wherein a Layer 1 was tensioned and concomitantly narrowed and, while in a tensioned and narrowed state, was adhered to a Layer 2 that had parallel spaced apart hotmelt adhesive lines in the machine direction. The examples of Layer 1 described in the Table include: a perforate high 3D profile film, made of polyethylene, as described in previously cited Canadian Patent Application 2,130,176 and in US Patent Applications 08/522,600 and 08/522,722 and 08/523,112; a perforate low 3D profile film as made by

applying vacuum to a polyethylene film supported on a perforated cylindrical drum; a flat perforate film made from a coextruded film comprised of polyethylene and polyethylene polyvinyl acetate copolymer as described in previously cited
5 US Patents 4,806,411 and 4,859,519; and various nonperforate polyethylene films of different basis weights.

Tensioning and concomitant narrowing of Layer 1 was accomplished by the difference in speeds between cylinders
10 that transferred Layer 1, wherein Layer 1 was pulled and thereby stretched by the cylinder driven by Drive 2 which rotated at a faster speed than the cylinder driven by Drive 1; and wherein the cylinder driven by Drive 2 brought Layer 1 to the nip where it was laminated to Layer 2 and
15 subsequently allowed to relax from its tensioned and narrowed state. In the set of columns, labelled "Width of Layer 1", the starting width of Layer 1 is compared first with the tensioned and thereby narrowed width of Layer 1 and then with the relaxed width of Layer 1, which is the same as its
20 gathered width in the layered laminated composite. It should be noted that although the gathered width is smaller than the starting width, the actual width of material contained in gathered Layer 1 is essentially the same as that of the starting ungathered width, i.e., the recovery of Layer 1 is
25 essentially 100%. In the set of columns, labelled "Length of Layer 1", the starting length of Layer 1 is compared first with the tensioned and thereby stretched length of Layer 1 and then with the relaxed length of Layer 1, which is the same as its gathered length in the gathered layered
30 composite. It should be noted: that the gathered length of



Layer 1 is quite similar to its starting length, since essentially all the gathers of Layer 1, wherein the lines of adhesive are parallel to the direction of tensioning, occur in the width, i.e., in the crossmachine direction; and that
5 the recovery of Layer 1 in the length is essentially 100%.

Layer 2 in these manufacturing runs included: a single ply of polypropylene spunbond nonwoven (NW) of different basis weights or of tissue (Tiss) of different basis weights;
10 double plies of nonwoven and tissue; and triple plies of a nonwoven ply and two plies of tissue.

The Table also gives, for Layer 2, the spacing between hotmelt adhesive lines as well as the number of gathers/in. contained in Layer 1 in the composite, the latter being
15 determined predominantly by the degree of gathering imposed on Layer 2 by the stretched and relaxed Layer 1 and the number of gathers in Layer 1 being determined to a great degree by the spacing between the adhesive lines on Layer 2.

20

In describing the present invention, certain embodiments have been used for purposes of illustration; however, other embodiments or modifications within the spirit and scope of
25 the invention will readily occur to those skilled in the art after reading this disclosure. The invention is accordingly not to be limited to the specific embodiments described and illustrated herein, but only in accordance with the appended claims.

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- 52 -

MANUFACTURE OF CATHETERED LAYERED COMPOSITE MATERIAL

5	Layer 1 Impregnated	Adhesive Spacing mm	Layer 2 Laminated	Drive 1 Speed ft/min	Drive 2 Speed ft/min	Width of Layer 1 (mm)		Length of Layer 1 (mm)		Layer 2 Gathers (mm in)		
						Start	Tension Released	Start	Tension Released			
10	Perforate	12.7	NW 24.0 gsm	11.5	20.0	190.0	145.0	166.0	30.4	42.3	33.2	5.6
	High 30 Profile Film	12.7	NW 24.0 gsm	11.5	14.9	190.0	185.0	182.0	30.4	34.5	30.3	4.3
15		9.7	NW 24.0 gsm	11.5	20.5	191.0	146.0	170.0	30.4	42.6	33.35	33.35
		9.7	NW 24.0 gsm	11.5	14.8	191.0	146.0	170.0	30.4	34.7	30.36	30.36
20		7.9	NW 20.0 gsm	11.3	18.9	177.0	153.0	170.0	30.4	34.0	29.65	29.65
		7.9	NW 20.0 gsm	11.5	14.5	178.0	143.0	155.0	30.4	34.0	30.35	30.35
25		7.9	NW 20.0 gsm	11.5	13.9	177.0	153.0	170.0	30.4	34.0	29.6	29.6
		7.9	NW 24.0 gsm	11.5	19.1	178.0	146.0	172.0	30.4	41.0	31.96	31.96
		7.9	NW 24.0 gsm	11.5	15.0	178.0	160.0	179.0	30.4	33.0	29.9	29.9
		7.9	NW 24.0 gsm	11.4	20.7	178.0	123.0	143.0	30.4	42.6	31.1	31.1
		7.9	NW 24.0 gsm	11.4	15.0	178.0	132.0	158.0	30.4	34.5	30.2	30.2
		7.9	NW 24.0 gsm/ Ties 20.0 gsm	11.5	20.2	178.0	123.0	160.0	30.4	40.7	30.2	30.2
		7.9	NW 20.0 gsm/ Ties 20.0 gsm	11.5	14.6	178.0	125.0	160.0	30.4	34.0	30.2	30.2
		7.9	NW 20.0 gsm/ Ties 20.0 gsm/ 1.5" Wide Ties	11.5	19.5	178.0	128.0	153.0	30.4	39.4	31.0	31.0

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- 53 -

MANUFACTURE OF GATHERED LAYERED COMPOSITE MATERIAL

5	Layer 1 Laminated	Adhesive Specifying mm	Layer 2 Laminated	Drive 1 Speed ft/min.	Drive 2 Speed ft/min.	Width of Layer 1 (mm)		Length of Layer 1 (mm)		Layer 2 Gathers
						Start	Tension Released	Start	Tension Released	
10		7.9	NW 20.0 gsm/ Tiss 20.0 gsm/ 1.5" wide Tiss	11.5 15.0		178.0	150.0 165.0	30.4	33.0	30.0
15	Perforate Low 30 Profile Film	7.9	NW 24.0 gsm	18.9	170.0	145.0	158.0	30.4	43.4	32.38.2
		7.9	NW 24.0 gsm	15.0	170.0	156.0	166.0	30.4	35.2	30.47.0
20	Perforate Film Flat	7.9	NW 20.0 gsm	19.5	172.0	137.0	138.0	30.4	35.5	34.3
		7.9	NW 20.0 gsm	15.0	172.0	146.0	155.0	30.4	32.7	30.4
		7.9	NW 24.0 gsm	19.5	172.0	134.0	141.0	30.4	36.2	33.57.4
		7.9	NW 24.0 gsm	15.0	170.0	147.0	158.0	30.4	33.5	30.37.2
		7.9	Tiss 20.0 gsm	11.5 19.5		172.0	137.0 137.0	30.4	35.4	34.59.4
		7.9	Tiss 20.0 gsm	11.5 15.0		172.0	147.0 155.0	30.4	32.7	30.59.0
25	Nonperforate Film 0.8 mil PE Nonperforate Film 0.8 mil PE Nonperforate Film 0.95 mil PE	7.9	Tiss 20.0 gsm	11.5	19.2	168.0	146.0 154.0	30.4	40.0	31.712.6
		7.9	Tiss 20.0 gsm	11.5	15.0	168.0	161.0 151.0	30.4	32.8	31.612.2
		7.9	Tiss 20.0 gsm	11.5	19.2	170.0	146.0 154.0	30.4	41.1	31.612.8
		7.9	Tiss 20.0 gsm	11.5	15.0	170.0	146.0 154.0	30.4	41.1	31.612.8

MANUFACTURE OF GATHERED LAYERED COMPOSITE MATERIAL

5	Layer 1 Insulated	Adhesive Specifying mm	Layer 2 Laminated	Drive 1 Speed ft/min	Drive 2 Speed ft/min	Width of Layer 1 (mm)		Length of Layer 1 (mm)		Layer 2 Gathers
						Start	Tension Released	Start	Tension Released	
10	Nonperforate Film 0.95 mil PE	7.9	Tiss 20.0 gum	11.5	15.0	170.0	165.0	164.0	30.4	30.5 92
	Nonperforate Film 1.0 mil PE	7.9	Tiss 20.0 gum	11.5	19.3	152.0	133.0	140.0	30.4	31.7 110
	Nonperforate Film 1.0 mil PE	7.9	Tiss 20.0 gum	11.5	15.4	152.0	145.0	148.0	30.4	30.4 122
15	Nonperforate Film 1.0 mil PE	7.9	NW 24.0 gum	11.5	19.5	153.0	133.0	139.0	30.4	31.9 90
	Nonperforate Film 1.0 mil PE	7.9	NW 24.0 gum	11.4	15.0	152.0	145.0	147.0	30.4	30.5 75
	Nonperforate Film 1.0 mil PE	7.9	NW 24.0 gum	11.4	15.0	152.0	145.0	147.0	30.4	30.5 75

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- 55 -

CLAIMS:

1. A gathered, layered composite material comprising:
a first layer of a flexible, reversibly elongatable
5 material, bonded at spaced apart positions along a
substantial portion of the first layer, to at least one
additional layer of a flexible nontensioned material;

wherein both the first layer and the at least one
10 additional layer are gathered, the gathers of one layer
being aparallel to the gathers of the other layer.
2. The gathered, layered composite material according to
claim 1, wherein the first layer is a material selected from
15 the group consisting of fabric, film and foam.
3. The gathered, layered composite material according to
claim 2, wherein the film is selected from the group
consisting of nonperforate films, perforate films, embossed
20 films and nonembossed films.
4. The gathered, layered composite material according to
claim 2, wherein the fabric, film or foam is nonelastic.
- 25 5. The gathered, layered composite material according to
claim 4, wherein the fabric or film is made of materials
selected from the group consisting of polyethylene,
polypropylene, noncrosslinked ethylene vinyl acetate
copolymers, polyamides such as nylon 6 and nylon 6,6,
30 polyesters, polyvinylidene chloride, polyvinyl chloride,



polyester polyurethanes, polyether polyurethanes, and blends, coextruded laminates, layered laminates of such materials, and combinations thereof.

- 5 6. The gathered, layered composite material according to claim 2, wherein the fabric is selected from the group consisting of knitted fabrics, woven fabrics, tissues and nonwovens.
- 10 7. The gathered, layered composite material according to claim 2, wherein the fabric is made of fibers selected from the group consisting of polyethylene, polypropylene, polyester, polyester polyurethane, polyether polyurethane, bicomponent fibers such as polyethylene and polypropylene, 15 polyethylene and polyester, polypropylene and polyester and low and high melting polyesters, and combinations thereof.
- 20 8. The gathered, layered composite material according to claim 2, wherein the foam is made of materials selected from the group consisting of polyester polyurethanes, polyether polyurethanes and polyethylene.
- 25 9. The gathered, layered composite material according to claim 2, wherein the fabric, film or foam is elastic.
- 30 10. The gathered, layered composite material according to claim 9, wherein the fabric, film or foam is made of materials selected from the group consisting of natural and synthetic rubbers, elastomeric polyester and polyether polyurethanes, elastomeric polyamides and elastomeric



polyesters, styrene butadiene styrene block copolymers, styrene ethylene butylene styrene block copolymers, styrene isoprene styrene block copolymers, noncrosslinked ethylene vinyl acetate copolymers, low density polyethylene, and
5 blends, coextruded laminates, layered laminates of such materials, and combinations thereof.

11. The gathered, layered composite material according to claim 1, wherein the at least one additional layer is
10 selected from the group consisting of fabric, film and foam.

12 The gathered, layered composite material according to claim 11, wherein the fabric is selected from the group consisting of knitted fabrics, woven fabrics, tissues and
15 nonwovens.

13. The gathered, layered composite material according to claim 11, wherein the film is selected from the group consisting of nonperforate films, perforate films, embossed
20 films and nonembossed films.

14. The gathered, layered composite material according to claim 1, wherein the at least one additional layer is elastic.
25

15. The gathered, layered composite material according to claim 1, wherein the at least one additional layer is elongatable and nonelastic.

30 16. The gathered, layered composite material according to



claim 1, wherein the at least one additional layer is nonelongatable and nonelastic.

5 17. The gathered, layered composite material according to
claim 11, wherein the fabric or film is made of materials
selected from the group consisting of polyethylene,
polypropylene, noncrosslinked ethylene vinyl acetate
copolymers, polyamides such as nylon 6 and nylon 6,6,
polyesters, polyvinylidene chloride, polyvinyl chloride,
10 polyester polyurethanes, polyether polyurethanes, natural and
synthetic rubbers, elastomeric polyester and polyether
polyurethanes, elastomeric polyamides, elastomeric
polyesters, styrene butadiene styrene block copolymers,
styrene ethylene butylene styrene block copolymers, styrene
15 isoprene styrene block copolymers, ultralow density
polyethylene, and blends, coextruded laminates, layered
laminates of such materials, and combinations thereof.

20 18. The gathered, layered composite material according to
claim 11, wherein the fabric is made of fibers selected from
the group consisting of woodpulp, cotton, rayon, wool, linen,
silk, ramie, jute, polyethylene, polypropylene, polyester,
polyester polyurethane, polyether polyurethane, bicomponent
fibers such as polyethylene and polypropylene, polyethylene
25 and polyester, polypropylene and polyester and low and high
melting polyesters, and combinations thereof.

30 19. The gathered, layered composite material according to
claim 1, wherein the spaced apart positions are parallel
lines, the lines being selected from the group, straight,



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- 59 -

curved, continuous, discontinuous and combinations thereof.

20. A method of forming a gathered, layered composite material comprising:

5

tensioning a first layer of a flexible, elongatable material in an amount for it to be reversibly elongated in the direction of tensioning and for it to be reversibly narrowed in a direction coplanarly orthogonal to the direction of tensioning;

10

bonding the first layer, while it is being concomitantly tensioned in the direction of tensioning and narrowed orthogonal to the direction of tensioning, by a bonding means at spaced apart positions along a substantial portion of the first layer, to at least one additional layer comprised of a flexible nontensioned material, to form a layered composite material;

15

20

and then releasing both the tensioning, and the narrowing of the first layer, to form a three dimensional, layered composite material, wherein both the first layer and the at least one additional layer are gathered, the gathers of one layer being aparallel to the gathers of the other layer.

25

21. The gathered, layered composite material according to claim 20, wherein the first layer is a material selected from the group consisting of fabric, film and foam.

30



22. The gathered, layered composite material according to claim 21, wherein the film is selected from the group consisting of nonperforate films, perforate films, embossed films and nonembossed films.

5

23. The gathered, layered composite material according to claim 21, wherein the fabric, film or foam is nonelastic.

10 24. The gathered, layered composite material according to claim 21, wherein the fabric or film is made of materials selected from the group consisting of polyethylene, polypropylene, noncrosslinked ethylene vinyl acetate copolymers, polyamides such as nylon 6 and nylon 6,6, polyesters, polyvinylidene chloride, polyvinyl chloride,
15 polyester polyurethanes, polyether polyurethanes, and blends, coextruded laminates, layered laminates of such materials, and combinations thereof.

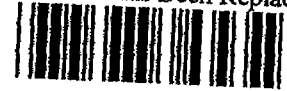
20 25. The gathered, layered composite material according to claim 23, wherein the nonelastic fabric, film or foam is tensioned in an amount sufficient to stretch the fabric, film or foam to at least 1% greater than its original length.

25 26. The gathered, layered composite material according to claim 23, wherein the nonelastic fabric, film or foam is tensioned in an amount sufficient to stretch the fabric, film or foam in an amount from about 1% to about 60% greater than its original length.

30 27. The gathered, layered composite material according to



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- 61 -

claim 23, wherein the nonelastic fabric, film or foam is tensioned in an amount sufficient to stretch the fabric, film or foam from about 5 to about 35% greater than its original length.

5

28. The gathered, layered composite material according to claim 21, wherein the fabric is selected from the group consisting of knitted fabrics, woven fabrics, tissues and nonwovens.

10

29. The gathered, layered composite material according to claim 21, wherein the fabric is made of fibers selected from the group consisting of polyethylene, polypropylene, polyester, polyester polyurethane, polyether polyurethane, bicomponent fibers and filaments, the bicomponent fibers such as polyethylene and polypropylene, polyethylene and polyester, polypropylene and polyester and low and high melting polyesters, and combinations thereof.

20

30. The gathered, layered composite material according to claim 21, wherein the foam is made of materials selected from the group consisting of polyester polyurethanes, polyether polyurethanes and polyethylene.

25

31. The gathered, layered composite material according to claim 21, wherein the fabric, film or foam is elastic.

30

32. The gathered, layered composite material according to claim 31, wherein the fabric, film or foam is made of materials selected from the group consisting of natural and



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- 62 -

5 synthetic rubbers, elastomeric polyester and polyether polyurethanes, elastomeric polyamides and elastomeric polyesters, styrene butadiene styrene block copolymers, styrene ethylene butylene styrene block copolymers, styrene isoprene styrene block copolymers, noncrosslinked ethylene vinyl acetate copolymers, ultralow density polyethylene, and blends, coextruded laminates, layered laminates of such materials, and combinations thereof.

10 33. The gathered, layered composite material according to claim 20, wherein the at least one additional layer is selected from the group consisting of fabric, film and foam.

15 34. The gathered, layered composite material according to claim 33 wherein the fabric is selected from the group consisting of knitted fabrics, woven fabrics, tissues and nonwovens.

20 35. The gathered, layered composite material according to claim 33, wherein the film is selected from the group consisting of nonperforate films, perforate films, embossed films and nonembossed films.

25 36. The gathered, layered composite material according to claim 20, wherein the at least one additional layer is elastic.

30 37. The gathered, layered composite material according to claim 20, wherein the at least one additional layer is elongatable and nonelastic.



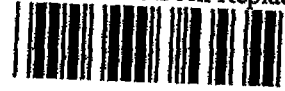
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- 63 -

38. The gathered, layered composite material according to claim 20, wherein the at least one additional layer is nonelongatable and nonelastic.
- 5 39. The gathered, layered composite material according to claim 33, wherein the fabric or film is made of materials selected from the group consisting of polyethylene, polypropylene, noncrosslinked ethylene vinyl acetate copolymers, polyamides such as nylon 6 and nylon 6,6,
10 polyesters, polyvinylidene chloride, polyvinyl chloride, polyester polyurethanes, polyether polyurethanes, natural and synthetic rubbers, elastomeric polyester and polyether polyurethanes, elastomeric polyamides, elastomeric polyesters, styrene butadiene styrene block copolymers,
15 styrene ethylene butylene styrene block copolymers, styrene isoprene styrene block copolymers, ultralow density polyethylene, and blends, coextruded laminates, layered laminates of such materials, and combinations thereof.
- 20 40. The gathered, layered composite material according to claim 33, wherein the fabric is made of fibers selected from the group consisting of woodpulp, cotton, rayon, wool, linen, silk, ramie, jute, polyethylene, polypropylene, polyester, polyester polyurethane, polyether polyurethane, bicomponent
25 fibers and filaments, the bicomponent fibers such as polyethylene and polypropylene, polyethylene and polyester, polypropylene and polyester and low and high melting polyesters, and combinations thereof.
- 30 41. The gathered, layered composite material according to



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- 64 -

claim 20, wherein the first layer is tensioned in a single direction.

5 42. The gathered, layered composite material according to claim 20, wherein the first layer is tensioned in first and second directions, the second direction being substantially orthogonal to the first direction, wherein the amount that the first layer is tensioned in the second direction is substantially less than the amount that it will be narrowed,
10 when the tensioning and narrowing are subsequently relaxed.

43. The gathered, layered composite material according to claim 20, wherein the bonding means is selected from the group consisting of adhesive bonding, heat sealing,
15 mechanical crimping and combinations thereof.

44. The gathered, layered composite material according to claim 43, wherein the adhesive bonding means is a hotmelt adhesive.
20

45. The gathered, layered composite material according to claim 20, wherein the spaced apart positions are parallel lines, the lines being selected from the group, straight, curved, continuous, discontinuous and combinations thereof.
25

46. A sanitary napkin having a fluid pervious top layer, a fluid impervious bottom layer, and an absorbent core therebetween, wherein the top layer and/or the bottom layer is comprised of a gathered, layered composite material, the
30 material further comprising:



5 a first layer of a flexible, reversibly elongatable material, bonded at spaced apart positions, along a substantial portion of the first layer, to at least one additional layer of a flexible nontensioned material;

10 wherein both the first layer and the at least one additional layer are gathered, the gathers of one layer being aparallel to the gathers of the other layer.

15 47. A sanitary napkin, having a longitudinal centerline, a pair of lateral sides and a pair of transverse ends, the napkin comprising a fluid pervious top layer, a fluid impervious bottom layer, and an absorbent core therebetween;

20 the napkin having within the central portion a pair of deeply embossed channels, the channels including the top layer and at least part of the absorbent core; each channel curving concavely toward each pair of lateral sides, respectively;

25 the absorbent core being thicker in the central portion, and tapering to less thickness form the central portion to the transverse ends; and being further characterized by having the thickness of the central portion between the channels to be at least equal to the thickness of the central portion between the channels and the lateral sides; and

30 wherein the top layer and/or the bottom layer is comprised of a gathered, layered composite material, the material further comprising:



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- 66 -

5 a first layer of a flexible, reversibly elongatable material, bonded at spaced apart positions, along a substantial portion of the first layer, to at least one additional layer of a flexible nontensioned material;

10 wherein both the first layer and the at least one additional layer are gathered, the gathers of one layer being aparallel to the gathers of the other layer.

15 48. A sanitary napkin, having a longitudinal centerline, a pair of lateral sides and a pair of transverse ends, the napkin comprising a fluid pervious top layer, a fluid impervious bottom layer, and an absorbent core therebetween;

20 and a pair of cuffs, each having a base portion and a distal end, each cuff longitudinally extending and attached, along its respective base portion, to one or a combination of the top layer, the bottom layer and respective lateral side; the longitudinally extending attachment being anywhere, between the longitudinal centerline; such that the distal ends of the cuffs extend at least outward from the lateral sides of the napkin;

25 and wherein any or all of the top layer, the bottom layer and the cuffs is comprised of a gathered, layered composite material, the material further comprising:

30 a first layer of a flexible, reversibly elongatable material, bonded at spaced apart positions, along a



substantial portion of the first layer, to at least one additional layer of a flexible nontensioned material;

5 wherein both the first layer and the at least one additional layer are gathered, the gathers of one layer being aparallel to the gathers of the other layer.

49. A sanitary napkin, having a longitudinal centerline, a pair of lateral sides and a pair of transverse ends, the
10 napkin comprising a fluid pervious top layer, a fluid impervious bottom layer, and an absorbent core therebetween; and

a pair of wings, each having a base portion and a distal end,
15 each wing longitudinally extending and attached, along its respective base portion, to one or a combination of the top layer, the bottom layer and the respective lateral side; the longitudinally extending attachment being anywhere, between the lateral side and the longitudinal centerline; such that
20 the distal ends of the wings extend at least outward from the lateral sides of the napkin; and

and wherein any or all of the top layer, the bottom layer and the wings is comprised of a gathered, layered composite
25 material, the material further comprising:

a first layer of a flexible, reversibly elongatable material, bonded at spaced apart positions, along a substantial portion of the first layer, to at least one
30 additional layer of a flexible nontensioned material;



wherein both the first layer and the at least one additional layer are gathered, the gathers of one layer being aparallel to the gathers of the other layer.

5

50. A sanitary napkin having a fluid pervious top layer, a fluid impervious bottom layer, an absorbent core therebetween, and at least one insert; the insert being located between the top layer and the bottom layer; and
10 wherein any or all of the top layer, the bottom layer and the insert is comprised of a gathered, layered composite material, the material further comprising:

15 a first layer of a flexible, reversibly elongatable material, bonded at spaced apart positions, along a substantial portion of the first layer, to at least one additional layer of a flexible nontensioned material;

20 wherein both the first layer and the at least one additional layer are gathered, the gathers of one layer being aparallel to the gathers of the other layer.

51. The sanitary napkin according to claim 50, wherein at least one, of the first layer and the at least one additional
25 layer, of which the insert is comprised, is perforate.

52. The sanitary napkin according to claim 50, wherein at least one, of the first layer and the at least one additional layer, of which the insert is comprised, is nonperforate.



ABSTRACT

The present invention is directed to a gathered, layered composite material comprised of a fabric, film, foam or combination thereof that has a first layer of flexible reversibly elongatable material, bonded at spaced apart positions to at least one additional layer of a flexible material, wherein both layers are gathered, the gathers of one layer being aparallel to the gathers of the other layer. The composite material may be made by first reversibly tensioning, the first layer and concomitantly reversibly narrowing the first layer, in a direction coplanarly orthogonal to that in which tension is applied. The tensioned and narrowed first layer is then bonded discrete spaced apart positions to an at least one additional layer of a flexible nontensioned material, comprised of a fabric, film or foam or combination thereof. When these resulting tensioned and adhered layered materials are subsequently untensioned, they form a three dimensional layered composite material, wherein both layers are gathered, the gathers of one layer being aparallel to the gathers of the other layer. The layered composites of this invention may be used in the manufacture of various products including, but not limited to, sanitary absorbent products such as diapers, sanitary napkins, incontinence products, as well as bandages, wound dressings, surgical dressings, cushioning and bandages for the treatment of stasis ulcers, surgical drapes, underpads and the like.

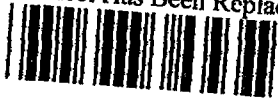


Fig. 1-A

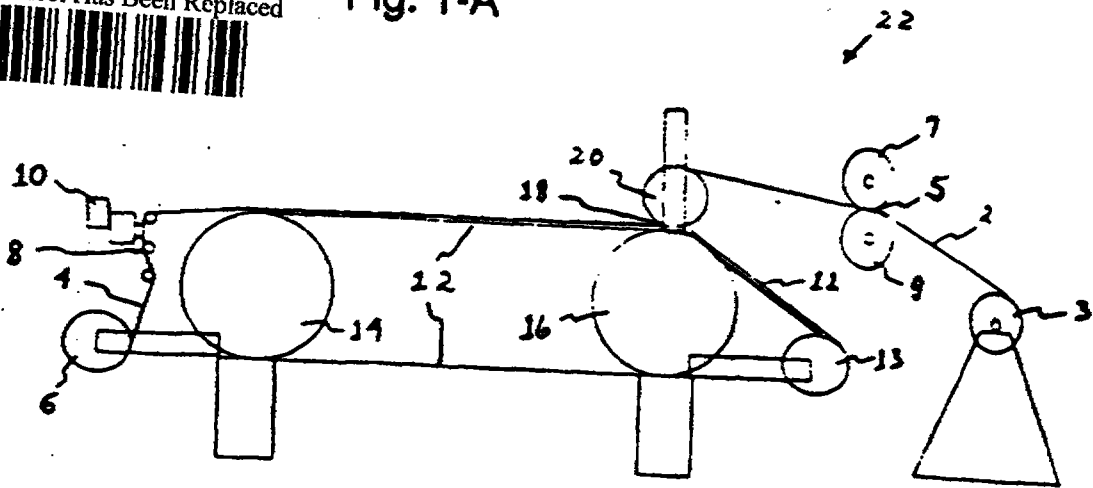


Fig. 1 - B

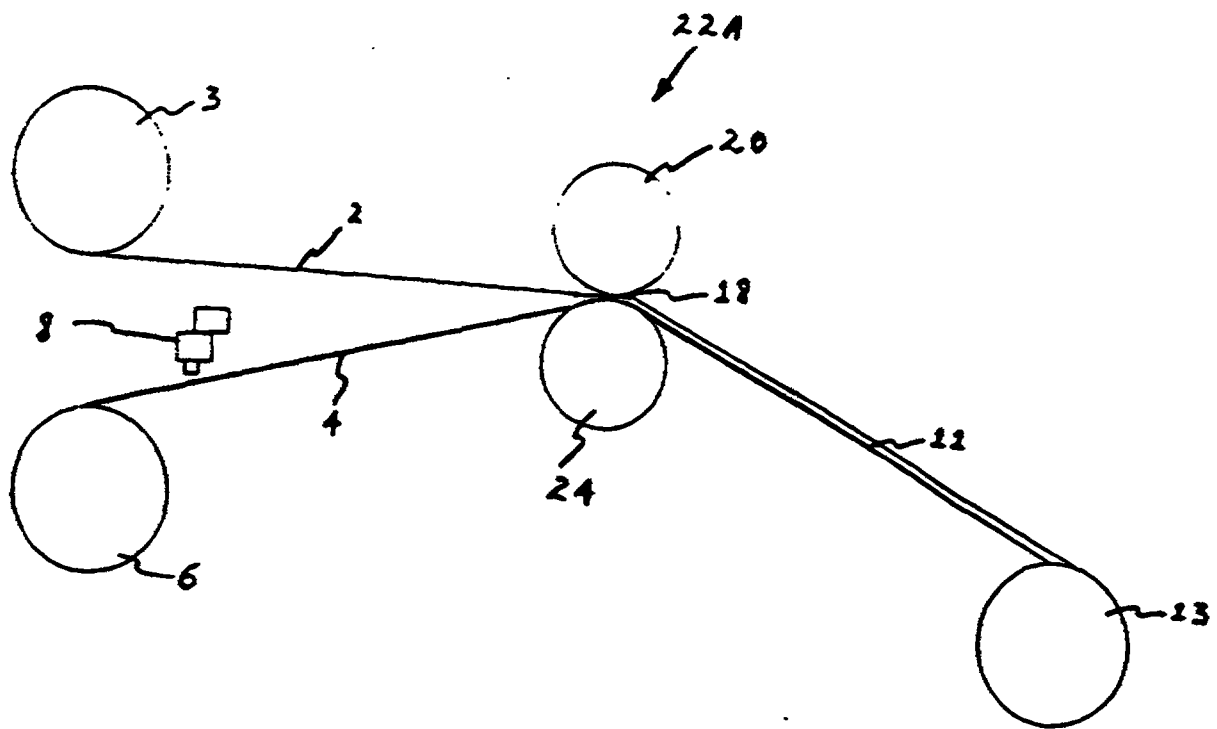
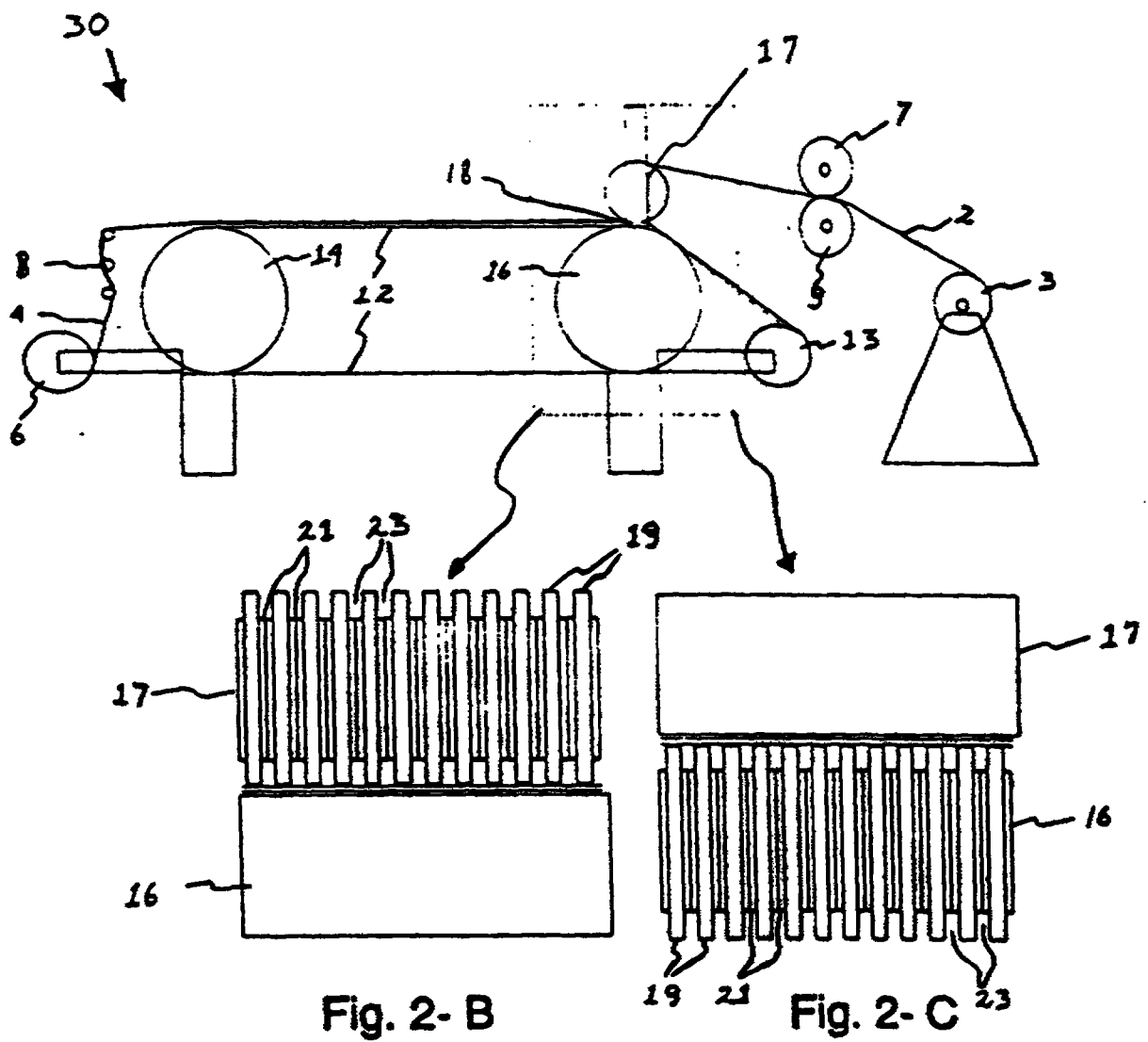


Fig. 2- A



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Fig. 2 - D

30A

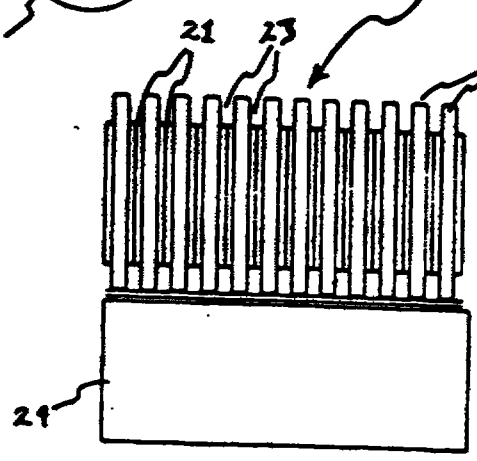
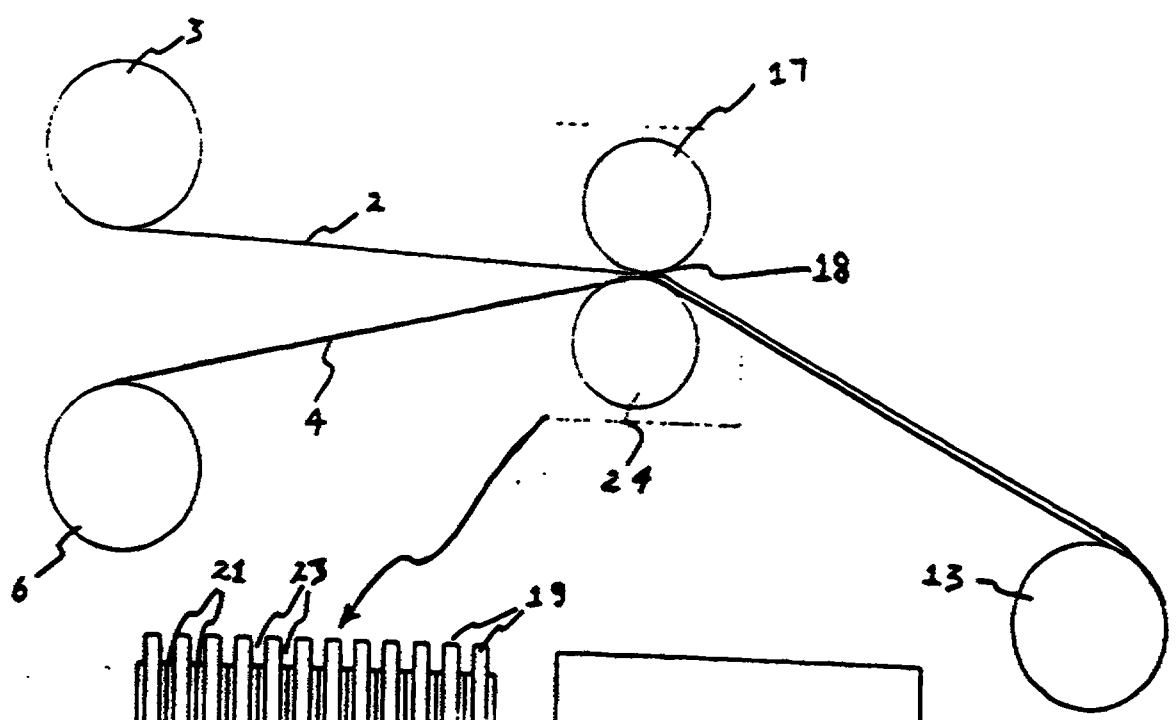


Fig. 2- E

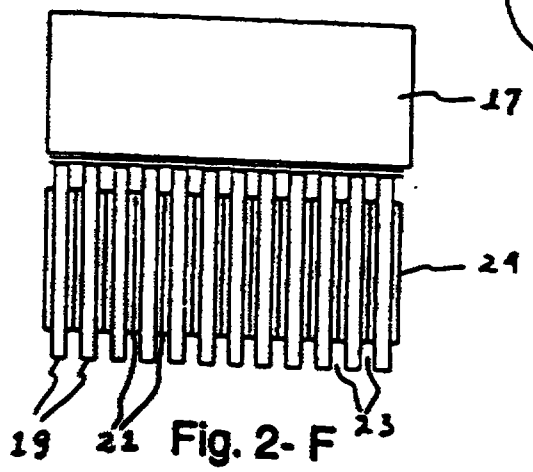


Fig. 2- F

Fig. 3

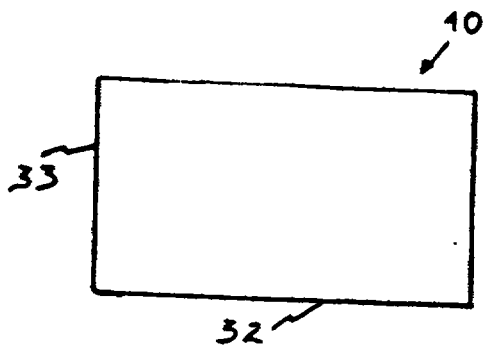


Fig. 4

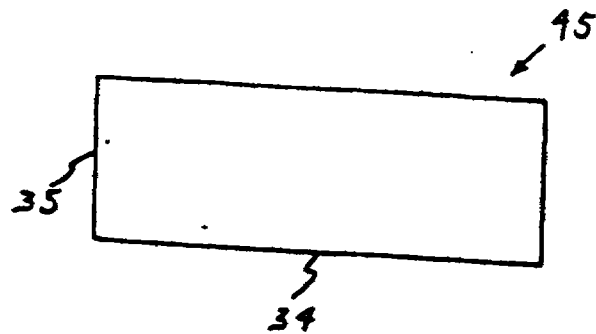
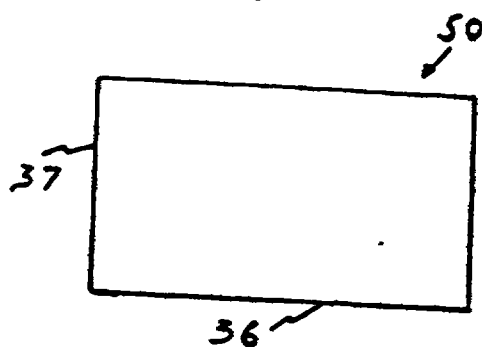


Fig. 5



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Fig. 6

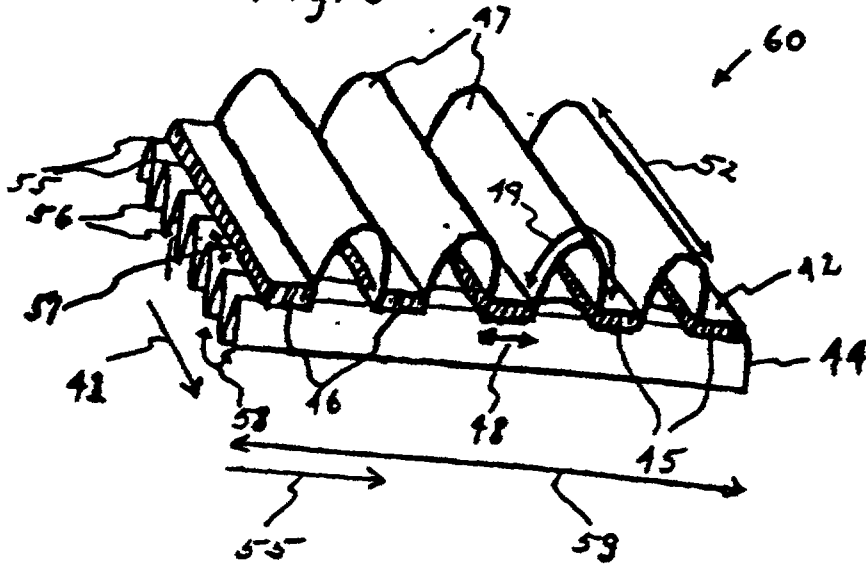


Fig. 7

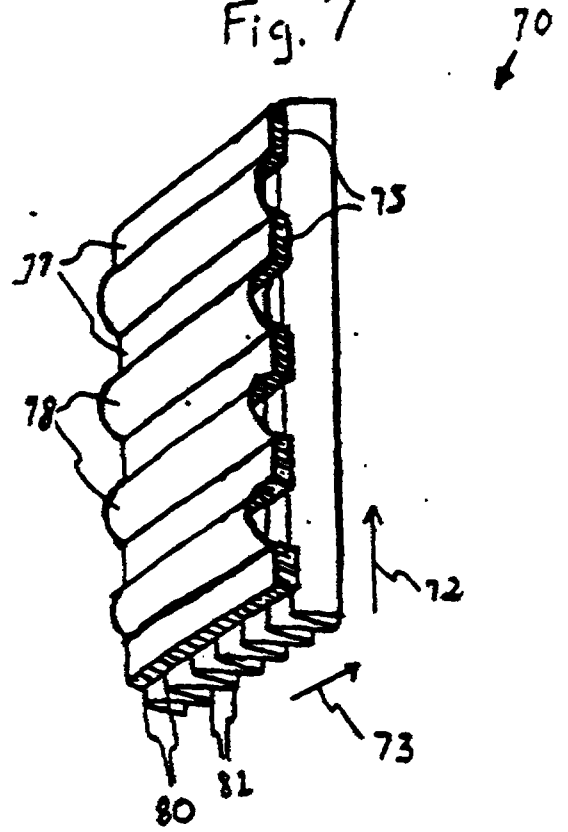
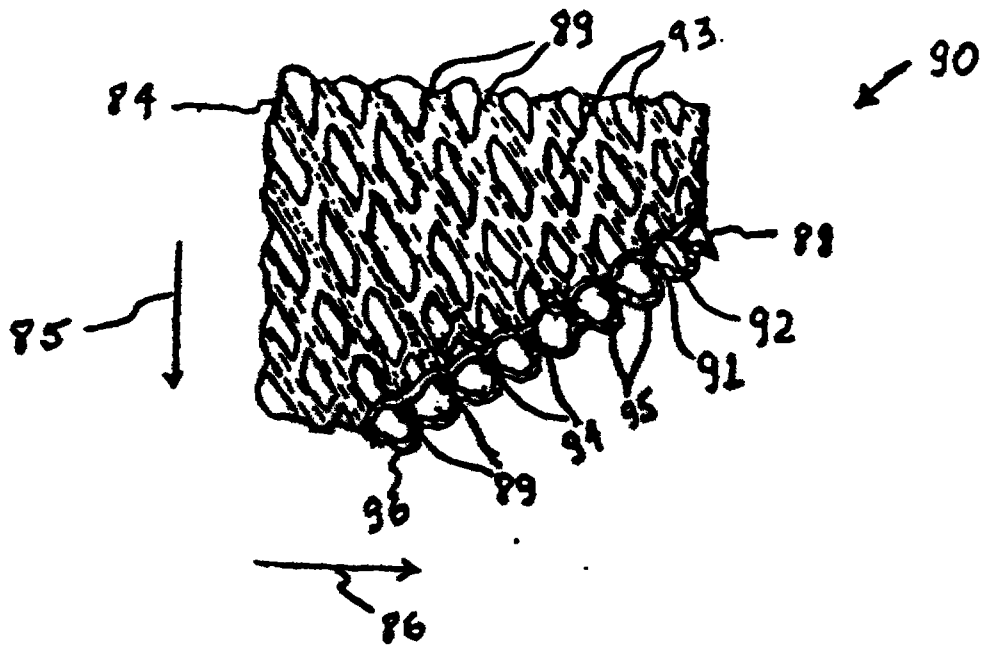


Fig. 8



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Fig. 9

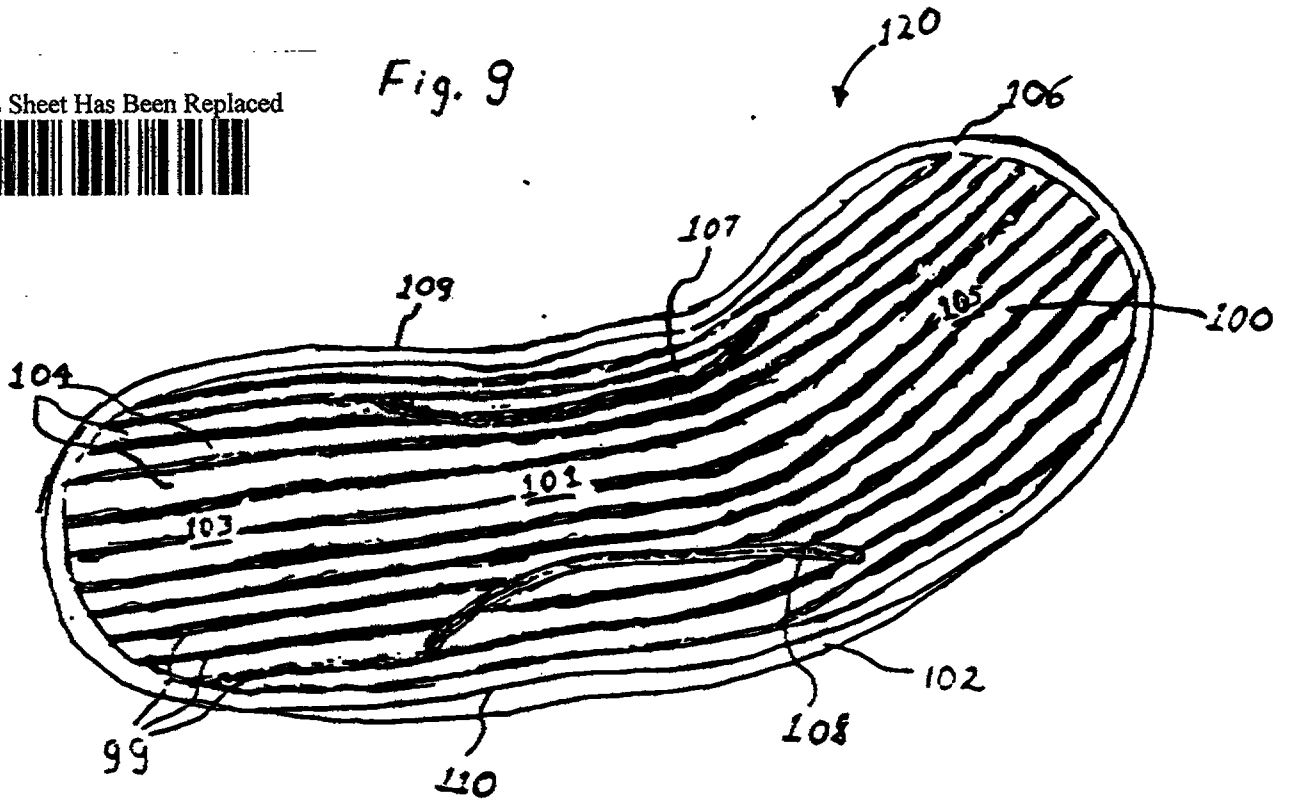


Fig. 10

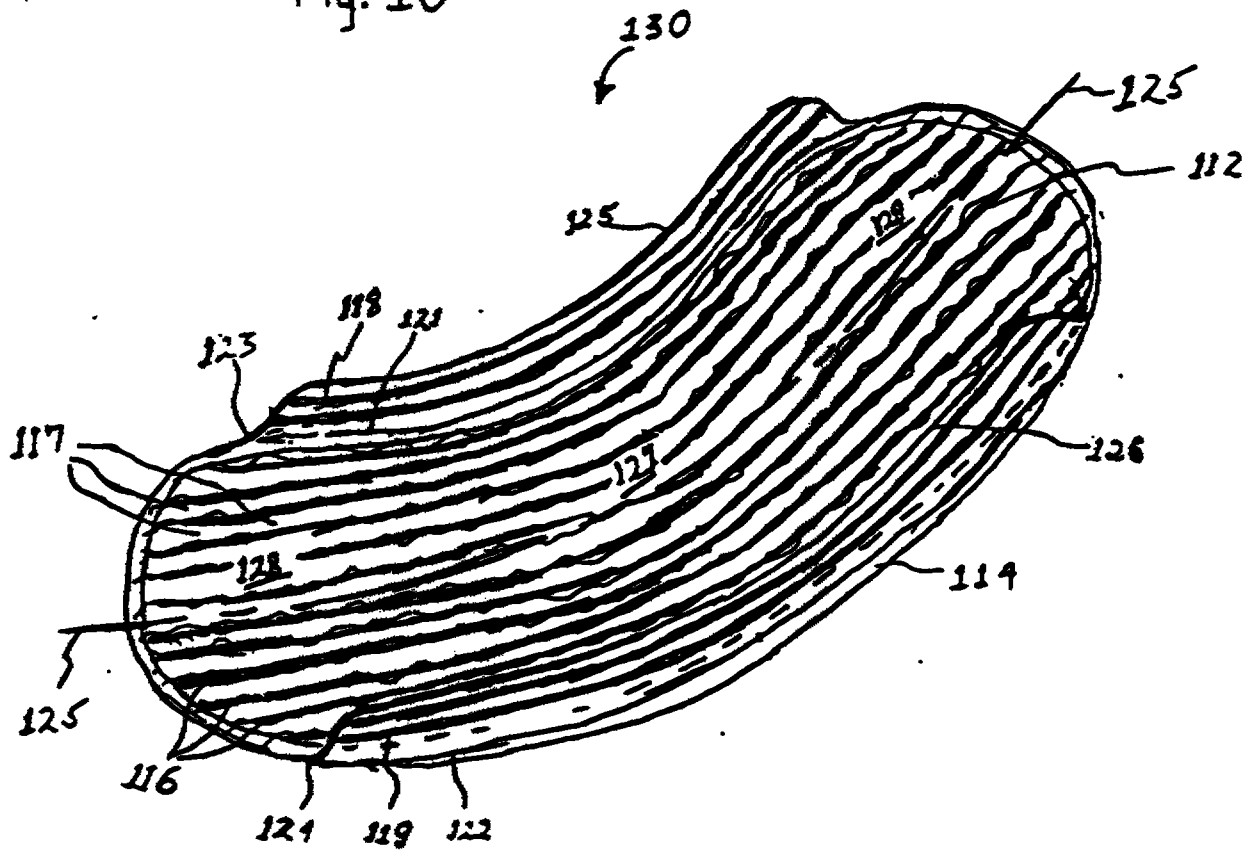


Fig. 11

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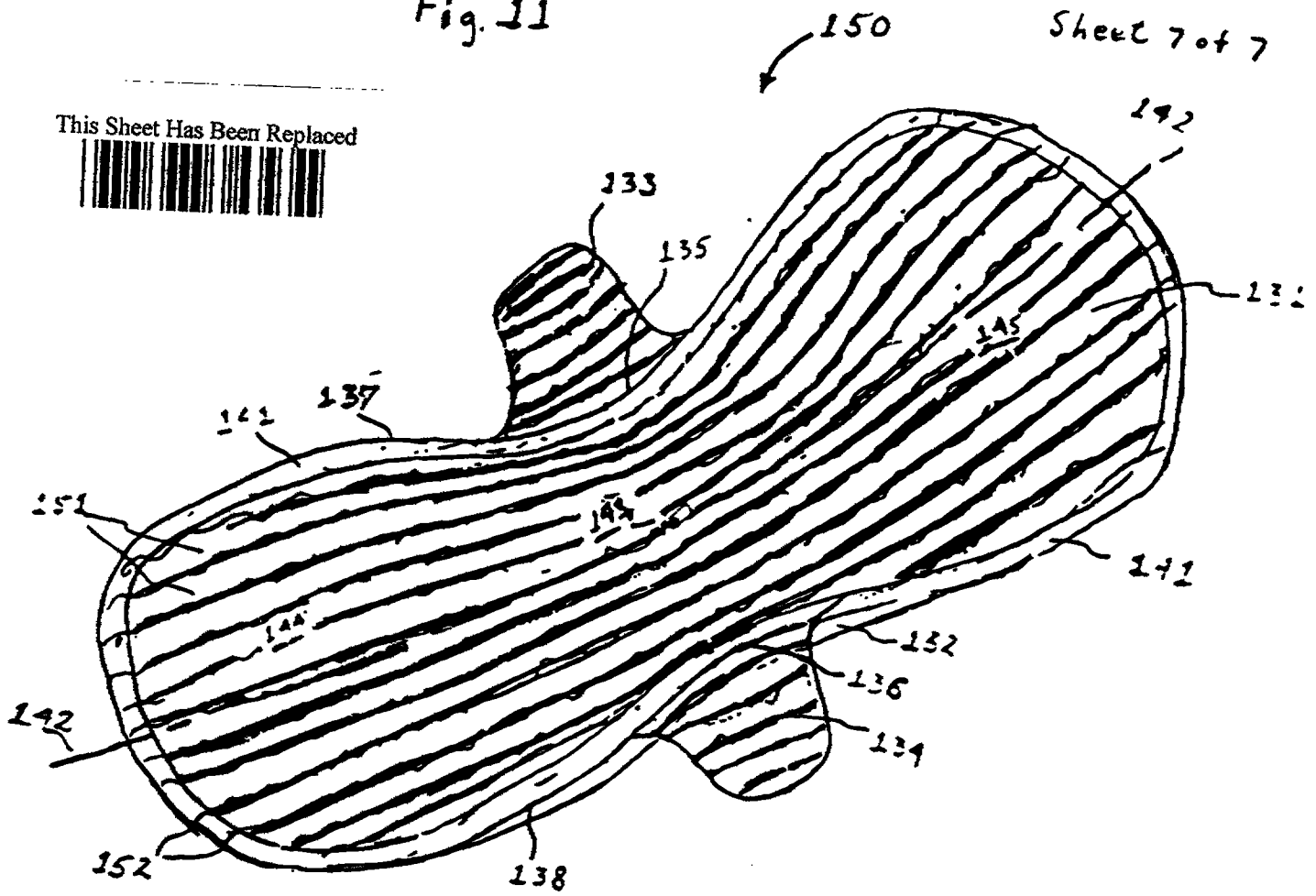
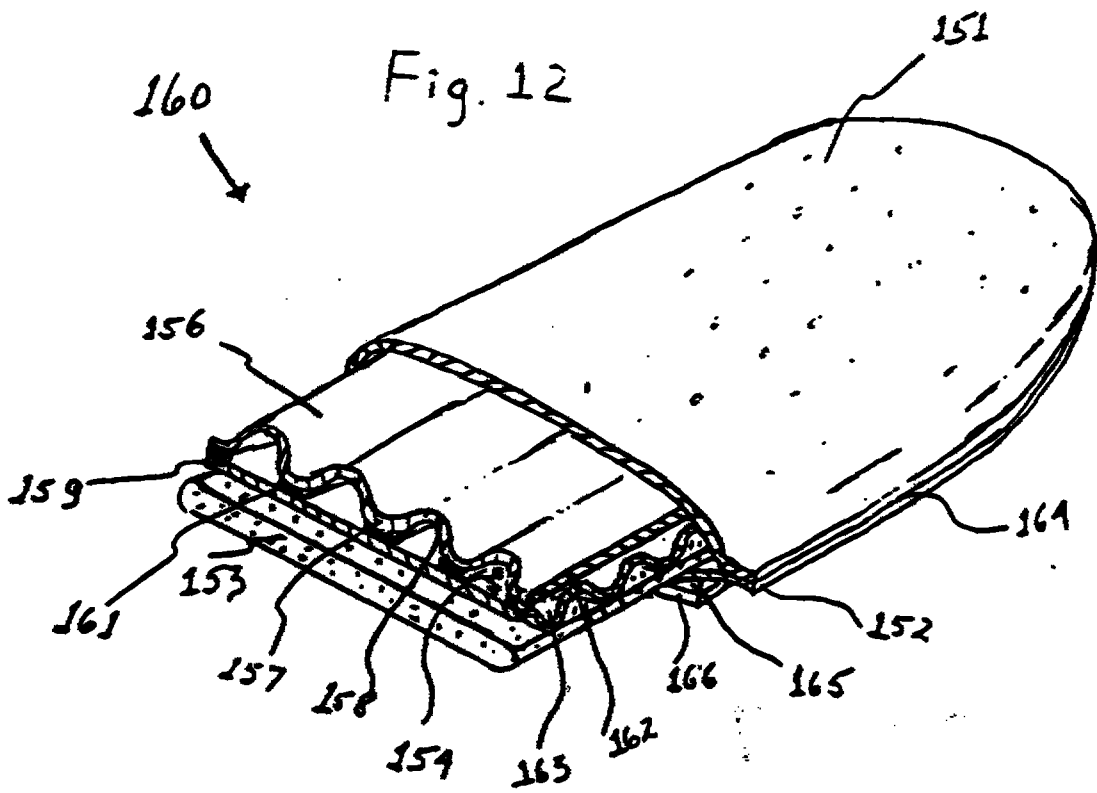
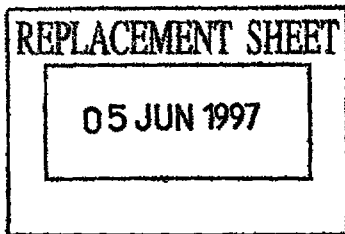


Fig. 12





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REPLACEMENT SHEETS		SG
☒	Description	: paged 1 to paged 53
☒	Claim(s)	: paged 54 to paged 67
☒	Drawing(s)	: paged 1 to paged 7
☒	Abstract	: paged 68 to paged -
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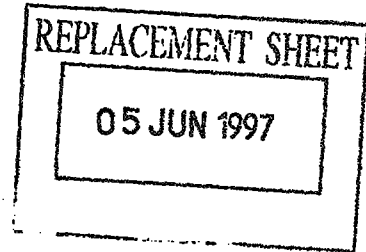
A NOVEL LAMINATED COMPOSITE MATERIAL, A METHOD OF MAKING
AND PRODUCTS DERIVED THEREFROM

FIELD OF THE INVENTION

The present invention relates to a novel, layered composite material, and more particularly to a gathered, ruffled or puckered, layered composite material. The composite material is comprised a first layer of a flexible, reversibly elongatable material, such as for example a fabric, film, foam or combination thereof, bonded at spaced apart positions to at least one additional layer of a flexible material, such as for example a fabric, film, foam or combination thereof; wherein both layers are gathered, the gathers of one layer being aparallel to the gathers of the other layer. The layered composites of this invention may be used in the manufacture of various products including, but not limited to, sanitary absorbent products such as diapers, sanitary napkins, incontinence products, as well as bandages, wound dressings, surgical dressings, cushioning and bandages for the treatment of stasis ulcers, surgical drapes, underpads and the like.

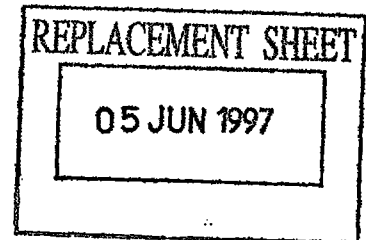
BACKGROUND OF THE INVENTION

The manufacture of flexible, gathered materials, by covering a tensioned elastic material with a second material, and securing the second material to the tensioned elastic material, followed by the step of releasing the tension of the elastic material, is known in the art. An early description of such a material, an intermittently bonded



untensioned stretch laminate web, is given in US Patent 2,075,189 issued to Galligan et al, where two superposed continuous plies of rubber, one of which is under tension and longitudinally stretched, are passed between a pair of pressure rolls traveling at the same peripheral speed. One of the rolls is provided with relatively small or narrow projections in a desired pattern, the projections cooperating with the second roll to press together, into adhesive contact, small portions of the two plies of rubber; so that relatively closely spaced small areas of the superposed plies will be united in a pattern similar to that of the projections on the pressure roll. Harwood in US Patent 3,025,199, describes an untensioned stretch laminate web, specifically suggested for use in toweling, wiping material and expendable garment material. Harwood describes the formation of a scrim comprised of intersecting sets of threads or filaments that are bonded to each other at their points of intersection to form a reticulated reinforcing network, the threads or filaments being preferably resilient. A pair of nonwoven layers are attached preferably to opposite sides of the reinforcing network scrim. The laminate of nonwovens and scrim is subsequent subjected to a stretching operation in one or more directions to permanently expand the nonwoven layers. When the tensile forces of the stretching operation are removed, the reinforcing network restores itself and the outermost nonwoven plies exhibit Z-direction bulking in the areas where the nonwovens are not bonded to the reinforcing network.

Sisson in US Patents 4,107,364 and 4,209,563 describes a

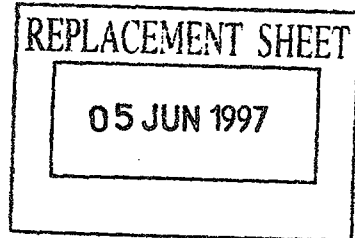


preferred embodiment, which is an untensioned stretch laminate comprised of at least one ply made substantially of relatively elastomeric synthetic polymeric filaments and at least one ply made of elongatable but relatively nonelastic synthetic polymeric filaments.

Ness in US Patent 4,525,407 discloses disposable diapers and surgical gowns incorporating untensioned stretch laminate composites comprised of an untensioned elastic member intermittently bonded to one or more unstretched less extensible substrates, the resulting laminate being rendered elastic by stretching. On stretching the laminate, the substrate undergoes permanent elongation and may become delaminated from any other substrate, but remains intermittently bonded to the elastic member. Upon release of the applied tensile forces, the elastic member causes puckering, i.e., Z-direction bulking, of the permanently elongated substrate between the bonding points.

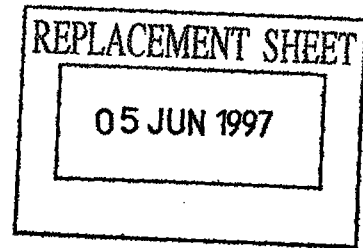
US Patent 5,336,545 issued to Morman describes a composite material made by joining a nonelastic material which has been tensioned to neck it down to a narrower width and joined to an elastic sheet. The composite material is elastic in a direction parallel to the direction of neckdown and may be stretched in that direction to the breaking point of the necked material. Neither of the two materials comprising the composite become gathered.

Ruffled or gathered fabrics have also been disclosed, for example, in US Patent 4,720,415 issued to Taylor et al and by



Buell et al in US Patent 5,151,092 wherein a traditional elastic member is applied to a backsheet that is then prestrained by mechanical stretching to permanently elongate the backsheet and stretch the elastic member. The elastic member on being released yields a ruffled or gathered material. Materials such as these include an elastomeric material which forms a stretchable elastic layer. To at least one side of this material while in a stretched condition there is attached another gatherable layer. Once the two layers have been attached to one another, the elastic layer is allowed to retract thereby gathering up and puckering the nonelastic gatherable layer to form a three dimensional material. US 4,891,258 to Fahrenkrug describes a stretchable composite structure wherein the stretchable layer may comprise a pervious elastomeric film.

The prior art of composites that are stretchable or contain stretchable components, requires the presence of a reversibly elongatable component, that provides reversible restoring forces, to be bonded to a relatively inelastic less easily extendible component, thereby creating a gathering, ruffling or puckering of the inelastic component; the gathering of the inelastic component being orthogonal to the direction in which the laminate or the elastic component is extended, i.e., in a direction cross to the direction of stretch. Additionally, the gathering is obtained only in the inelastic component, the elastic component remaining relatively ungathered. Where gathering may be achieved in both layers of a layered composite, as in some stretchable cuffs and waistbands of disposable products of sanitary



napkins and diapers, the gathers of one layer are parallel to those of the other layer, both gathers being orthogonal to the direction of stretch.

5

SUMMARY OF THE INVENTION

10 It is an object of this invention to provide a gathered, ruffled or puckered layered composite material, having a plurality of layers, wherein at least two of the component layers of the composite are gathered, and wherein the direction of gathering of at least one of the gathered component layers is aparallel to the direction of gathering of an at least one other component layer.

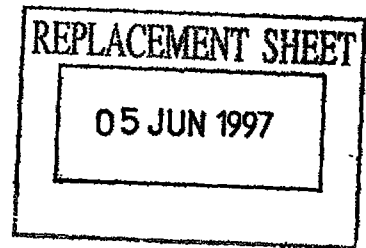
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20 It is a further object of this invention to provide a gathered, layered composite material, having a plurality of layers, wherein the material is a flexible, elastic or relatively nonelastic, fabric, film, foam or combination thereof, wherein at least one of the component layers is reversibly elongatable and thereby tensionable, i.e., stretchable, and is concomitantly reversibly narrowable across its major surface in a direction orthogonal to the direction of tensioning.

25

It is a further object of this invention to provide a method of making the gathered, layered composite materials of this invention.

30 It is a further object to provide novel absorbent products



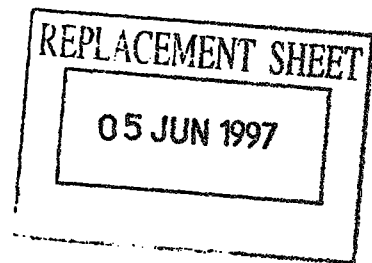
derived from the gathered, layered composite materials of this invention.

5 In accordance with the present invention, there has been provided a novel, multi-layered composite material, comprised of at least two layers of a fabric, film, foam or combination thereof, wherein the first layer is a flexible, reversibly elongatable, tensionable material, and which is bonded at spaced apart positions to at least one additional layer of a flexible sheet material, wherein both layers are gathered, 10 the gathers of one layer being aparallel to the gathers of the other layer.

Also provided in accordance with the present invention is a 15 method of forming a gathered, multi-layered composite material, having gathers, ruffles or puckers, comprising the steps of:

20 first tensioning a first layer of a flexible, reversibly elongatable, tensionable, material such as for example a fabric, film, foam or combination thereof in an amount that is effective to stretch, i.e increase its length beyond its original relaxed untensioned length in the direction of tensioning, and to also results in a 25 narrowing of the width of the first layer to less than its original relaxed, nontensioned width in a direction approximately coplanarly orthogonal to the direction of tensioning;

30 while in a tensioned state, adhering or otherwise



5 securing the first layer, at discrete spaced apart positions along at least a portion of the first layer, to at least one additional layer of a flexible nontensioned material such for example a fabric, film, foam or combination thereof to form a layered composite material;

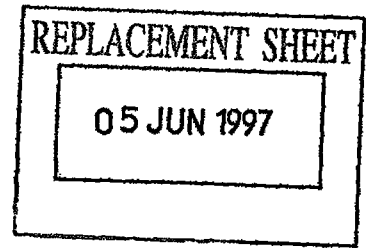
10 and then releasing the tension on the first layer of the composite material to form a gathered, layered composite material; the gathers comprising raised portions of material extending above and below the surface of the composite material, and appearing on both the first layer and the at least one additional layer, the gathers of one layer being aparallel to the gathers of the other
15 layer.

Also provided in accordance with the present invention are novel absorbent products which incorporate the layered composites of this invention, as component parts of these
20 products, including but not limited to diapers, sanitary napkins, incontinence products, as well as bandages, wound dressings, surgical dressings, cushioning and bandages for the treatment of stasis ulcers, surgical drapes, underpads and the like.

25

BRIEF DESCRIPTION OF THE DRAWINGS

30 The above mentioned and other features and objects of this invention, and the manner of attaining them, will become more



apparent and the invention itself will be better understood by reference to the following description of embodiments of the invention taken in conjunction with the accompanying drawings, wherein:

5

Figure 1A is a schematic view of an apparatus for forming the layered composite material of this invention.

10

Figure 1B is a schematic view of an alternative version of the apparatus shown in Figure 1A for forming the layered composite material of this invention.

15

Figure 2A is a schematic view of another apparatus for forming the layered composite material of this invention.

20

Figure 2B is an enlarged plan view of a configuration of bonding stage components used in the apparatus shown in Figure 2A for forming the layered composite material of this invention.

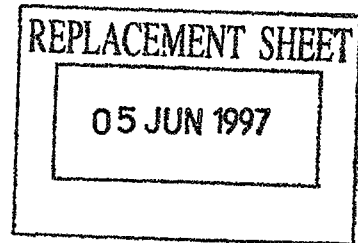
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Figure 2C is an enlarged plan view of a alternative configuration of bonding stage components used in the apparatus shown in Figure 2A for forming the layered composite material of this invention.

30

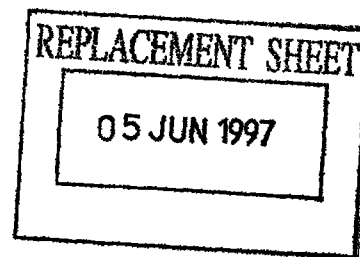
Figure 2D is a schematic view of an alternative version of the apparatus shown in Figure 2A for forming the layered composite material of this invention.

Figure 2E is an enlarged plan view of a configuration of



bonding stage components used in the apparatus shown in Figure 2D for forming the layered composite material of this invention.

- 5 Figure 2F is an enlarged plan view of a alternative configuration of bonding stage components used in the apparatus shown in Figure 2D for forming the layered composite material of this invention.
- 10 Figure 3 is a plan view, before elongation, and concomitant narrowing orthogonal to the direction of elongation, of a flexible elongatable material used to form the layered composite material of this invention.
- 15 Figure 4 is plan view of an elongatable material, after the elongatable material shown in Figure 3 has been elongated and concomitantly narrowed orthogonal to the direction of elongation, intermediate to forming the layered composite material of this invention.
- 20 Figure 5 is a plan view of a flexible material used to form the at least one additional layer before it is bonded to the first layer to form the layered composite material of this invention.
- 25 Figure 6 is a perspective view of a layered composite material of this invention comprised of the elongatable material, shown in Figure 4, after it has been elongated and concomitantly narrowed orthogonal to the direction of elongation, attached to an at least one additional layer and
- 30



untensioned to form the layered composite material of this invention.

5 Figure 7 is a perspective view of another layered composite material of this invention.

Figure 8 is a partial cross section of a perspective view of yet another layered composite material of this invention.

10 Figure 9 is a perspective view of sanitary napkin made with the layered composite material of this invention.

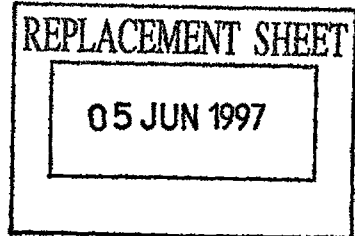
Figure 10 is a perspective view of another sanitary napkin made with the layered composite material of this invention.

15 Figure 11 is a perspective view of yet another sanitary napkin made with the layered composite material of this invention.

20 Figure 12 is a partial cross section of a perspective view of a sanitary napkin comprised of an insert made of the layered composite material of this invention.

25 DETAILED DESCRIPTION OF THE INVENTION

The present invention is directed to a novel gathered, layered composite material; and more particularly to a gathered, layered composite material which is comprised of at
30 least two layers of for example a fabric, film, foam or



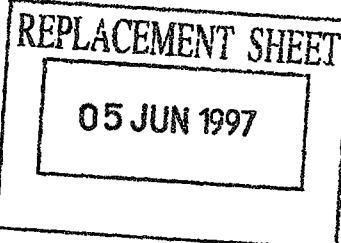
combination thereof, each of the at least two layers being gathered, the gathers of one layer being aparallel to the gathers of the other layer. It is considered an important feature of the present invention that the gathers appear on
5 both the first layer and the at least one additional layer, the gathers of one layer being aparallel to the gathers of the other layer, wherein the aparallel relationship of the gathers of each layer with each other is described as follows:

10

Each layer is roughly planarly parallel to each other layer. The gathers of each layer have an alignment directionality with each other, in that they are aligned substantially parallel, i.e., in the same direction with
15 each other. The angle of alignment directionality, that the gathers of one layer makes with the alignment directionality of the gathers of the other layer, is preferably greater than 0° , and is most preferably about 90° .

20

To be noted, is that alignment directionality of the gathers of each layer exists on relatively narrow pieces of the composite material, as may be used, e.g., on a cuff of a sanitary napkin or the waistband of a diaper,
25 as well as on relatively wide pieces of the composite material, as may be used, e.g., on the top layer or the bottom layer of a sanitary napkin. It should also be noted, that alignment directionality is best perceived, without recourse to magnification, on large areas of
30 material , e.g., about one square inch, than on small



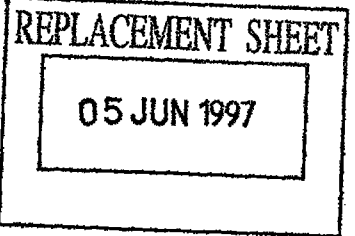
5 areas, such as narrow strips. Such larger areas are particularly useful when one needs to see the alignment directionality of the gathers when the gathers are in the form of, e.g., quilted puckers rather than, e.g., parallel gathers, where the alignment directionality is more readily apparent.

10 The present invention is also directed to a novel method of making a layered composite material comprising:

15 Tensioning a first layer, having a length and width, of a flexible material comprised at least in part of a reversibly elongatable, tensionable material such as for example a fabric, film, foam or combination thereof; the
20 tensioning being an amount that is effective to stretch, in approximately the direction of tensioning, the first layer beyond its original relaxed, nontensioned length dimension, and to also cause a narrowing of the first layer, in a direction approximately coplanarly
orthogonal to the direction of tensioning, beyond its original relaxed, nontensioned width dimension.

25 Reversibly elongatable is meant to describe the property of an elongatable material, after being tensioned to stretch the material and the tensioning being relaxed, wherein the material returns to within at least about 86% of its prestretched dimension.

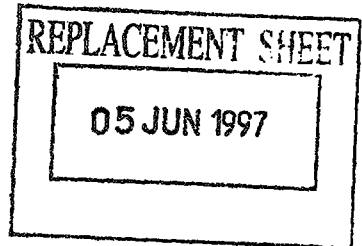
30 While in a tensioned state, the first layer is adhered or otherwise secured, by bonding means that are at least



partially separated from one another, at discrete spaced
apart positions along at least a portion of the first layer,
to an at least one additional layer of a nontensioned
flexible material comprised for example of such materials as
5 a fabric, film, foam or combination thereof, to form a
layered composite material comprised of for example a fabric,
film, foam or combination thereof. The tension on the first
layer of the composite material is then released to form a
gathered, layered composite material.

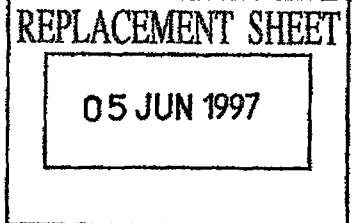
10 To be further noted, is that the at least one additional
layer may undergo some tensioning and concomitant narrowing
in the process of forming the composite material of this
invention. This tensioning and concomitant narrowing may be
15 tolerated as long as it is insufficient to negate the
formation of gathers in the both the first layer and the at
least one additional layer, the gathers of one layer being
aparallel to the gathers of the other layer.

20 To be yet further noted, that an important feature of this
invention is that the tensioning of the first layer be
accompanied by a narrowing of the first layer, in a direction
approximately coplanarly orthogonal to the direction of
tensioning. This in contrast to the common practice in the
25 art where steps are specifically taken to prevent a narrowing
of the material in a direction coplanarly orthogonal to the
direction of stretch, when processing an elongatable material
that is either purposely placed under tension to stretch the
material or is coincidentally under some tension due to
30 differentials in tensions and speeds to which the material is



subjected as it is transported and processed from one part of a process another part of the process. Such conventional manufacturing steps include spreading, tensioning and holding the material in a stretched, non-narrowable condition in the orthogonal direction by means such as tenting with pins, clips or belts; and by pulling the material in the orthogonal direction with a ridged cylindrical spreader roll or with a bowed cylindrical roll. The cylindrical spreader roll may for example have the ridges not connected to each other, or connected as in a continuous spiral around the cylindrical spreader roll, or combinations thereof. The ridges or spiral preferably have high friction surfaces, e.g., of soft rubber. The ridges also are preferably disposed, at acute angles, with respect to either side of the side of center and the direction of rotation of the cylindrical spreader roll. The surface of the bowed cylindrical roll, over which the material to be maintained in a non-narrowable condition passes, is preferably convex. The surface of the bowed cylindrical roll is also preferably made of a high friction material, e.g., of soft rubber. Additionally the material may be held in a non-narrowable condition by means of pinch or nip rolls that are applied to the material as it travels over the various cylindrical rolls described above.

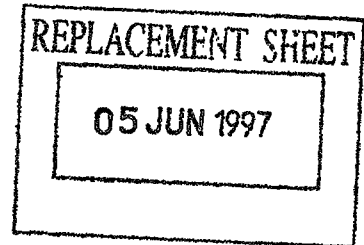
Materials useful for the both the first layer and the at least one additional layer of this invention are required to be flexible in that they are capable of bending or folding so as to gatherable. Fabrics, films, foams or combinations thereof useful for both layers of this invention may also include laminates of these materials.



The first layer of this invention may be chosen from materials such as: elastic reversibly elongatable or partially reversibly elongatable, tensionable fabrics, films, foams or combinations thereof; and nonelastic reversibly
5 elongatable or partially reversibly elongatable, tensionable fabrics, films, foams or combinations thereof. All the materials from which the first layer of this invention may be made, on being tensioned and thereby elongated, should be selected from those being concomitantly capable of undergoing
10 a reversible narrowing in a direction approximately coplanarly orthogonal to the direction of tensioning. Therefore, the first layer of this invention must be elongated to such an extent and concomitantly narrowed orthogonal to the direction of tensioning to such an extent,
15 to enable the tensioning and the narrowing to effect gathering of both the at least one additional layer and the first layer, respectively.

The at least one additional layer may be chosen from flexible
20 materials such as: elastic or nonelastic reversibly elongatable or partially reversibly elongatable, tensionable fabrics, films, foams or combinations thereof; nonreversibly elongatable, tensionable fabrics, films, foams or combinations thereof; and nonelongatable fabrics, films,
25 foams or combinations thereof.

Elastic materials are those capable of rapidly returning to approximately their initial dimensions and shape after being substantially deformed by a deforming force, usually a weak
30 force, and removal of such force.



Nonelastic materials are those that are capable of being tensioned and thereby stretched without exceeding their yield point and then returning essentially to their original dimensions and shape when the tensioning force is removed.

5 Such preferred nonelastic films fabrics and foams are those capable of being tensioned, thereby being stretched, to at least 1% greater than their original length without reaching their yield point, the yield point being the first point on a stress-strain curve at which an increase in strain (here

10 the stretch or elongation), occurs without an increase in stress (here the tensioning force), i.e., where the material has been stretched but no longer returns to its original length. It is preferred that the nonelastic fabrics, films or foams be capable of being stretched, without reaching their

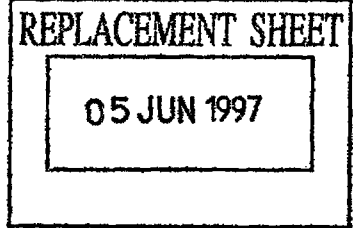
15 yield point, from 1% to at least about 60% greater than their original length and preferably between 5% to about 35% greater than their original length.

It should be noted that elastic or nonelastic materials which

20 are only partially reversibly elongatable may be used in this invention, as long as sufficient elongation reversibility and shortening reversibility resides in the materials to create the gathers of this invention.

25 The ability of a fabric, film or foam to be elongated is required at least in one direction. The at least one direction may be in the machine direction, the cross machine direction and directions therebetween; with the proviso that the material be concomitantly narrowed in a direction

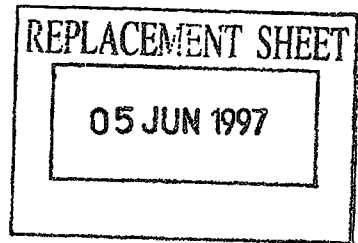
30 approximately coplanarly orthogonal to the direction in which



the material is elongated.

Fabrics, films and foams that are capable of being biaxially elongated are also useful in this invention. Thus, the
5 reversibly elongatable, tensionable fabrics, films and foams useful in this invention may be capable of being tensioned in a single direction, in two directions, or in a plurality of directions, e.g., where the film or fabric is stretched in both the X and Y directions relative to its surface, as well
10 as in its upward or Z direction, either in a specific zone area or over its entire surface. The foregoing notwithstanding, it is important in the practice of this invention, that biaxially elongatable materials be tensioned in a first direction, e.g., the machine direction, and also
15 be allowed to narrow in a second direction, e.g., the crossmachine direction, that is coplanarly orthogonal to the first direction. If, however, biaxially elongatable materials are used and are also tensioned in the second orthogonal direction, it is required that they be tensioned
20 in the second direction to a degree that can be surpassed by the potential of the material to recover by expanding; and thereby be capable of expanding coplanarly orthogonal to direction of tensioning, from the narrowing it experienced when it was in tension.

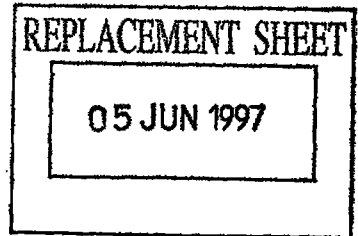
25 Reversibly elongatable, tensionable materials that are useful for the first layer and the at least one additional layer are well known in the art, and are represented either by elastic films, fabrics and foams and by nonelastic films, fabrics and
30 foams that are capable of being tensioned and are able to



return at least in part to their original dimensions and shape when the tensioning force is removed. Materials useful for the at least one additional layer may also include nonelongatable films, fabrics or foams.

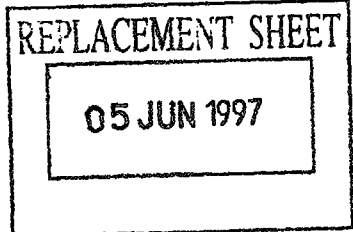
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Suitable films useful for the first layer and the at least one additional layer of this invention may be chosen from those that are continuous, i.e., nonperforate, or from those that are perforate. The perforate films include those:
10 having apertures that are either essentially in the plane of the film; having apertures that are three dimensional in the sense that the defining walls of the apertures extend beyond the plane of the film; and perforate films having combinations of in the plane apertures and apertures that are
15 three dimensional. Films are also meant to include those that are embossed. The embossments include those that are large enough to be seen by eye or to be felt by touch; and also include those that are not easily detected by eye or by touch, e.g., microembossments that may lend a matte finish to
20 the film and may also lend a fabric feel to the film. Elasticity, elongability and the ability to be narrowed, for films, will generally, but not without exception, increase with reduced thickness, increased plasticization, increased number of apertures and increased area occupied by the
25 apertures. Of course, the chemical nature, molecular weight and degree of crosslinking, plasticizer concentration and other factors will also dictate the elasticity and elongatability of the film. Films that are approximately less than or equal to 10 millimeters thick are preferred;
30 with films that are approximately equal to or less than 3



millimeters thick being more preferred.

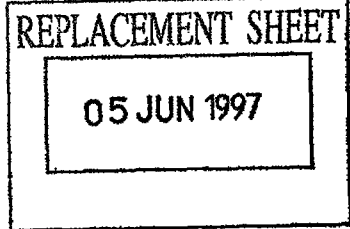
Suitable fabrics useful for the first layer and the at least one additional layer of this invention may include flexible
5 paper products such as tissues and flexible fabrics that are woven, knitted or nonwoven. The tissues and woven and knitted fabrics may include those that are made by any of the several processes that are known in the arts of paper making, weaving and knitting, respectively, and yield the various
10 tissue and fabric structures and designs that are known in these arts. Nonwovens, however, are particularly preferred for their low cost and the wide range of properties that can be imparted to them by the processes of forming and finishing and by the materials from which they are made. Suitable
15 nonwoven fabrics, as defined by the processes by which they are made, may include wetlaid, airlaid, spunbond, meltblown, chemically bonded, thermally bonded, hydroentangled nonwoven fabrics and nonwoven fabrics resulting from combinations of such processes. Nonwovens are more likely to be elongatable
20 if they are of low basis weight, bonded lightly or not at all, e.g., hydroentangled, meltblown, and lightly bonded spunbond, thermally bonded and chemically bonded nonwovens. Chemically bonded nonwovens are more likely to be elongatable if they contain elastic and elongatable fibers and contain
25 elastic or frangible binders. The direction of the fibers, e.g., random as resulting from airlaying, or unidirectional, as resulting from carding, will also determine the direction in which the nonwoven will most easily elongate and the ease with which it will elongate in each direction. Fabrics of
30 basis weight about equal to or less than 100 grams/square



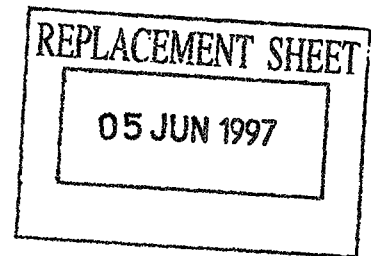
meter are preferred; with fabrics of basis weight about equal to or less than 20 grams/square meter being more preferred.

5 Suitable foams useful for the first layer and the at least one additional layer of this invention may be chosen from flexible and elongatable reticulated and nonreticulated foams. Such foams may be made of, but not restricted to, polyester polyurethanes, polyether polyurethanes and polyethylene. The degree of elasticity will depend, in
10 varying degrees and parts, on properties such as the thickness, durometer and degree of plasticization of the foam and the degree to which the foam is reticulated, i.e., whether the foam cells are in communication with one another or are isolated from one another by the cell walls of the
15 foam. In general, but not without exception, elasticity and elongatability increase with decrease in thickness and durometer and with increase in plasticization and degree of reticulation. Of course, the chemical nature, molecular weight and degree of crosslinking, plasticizer concentration
20 and other factors will also dictate the elasticity and elongatability of the foam. Foams less than or equal to 6.35 millimeters thick, are preferred; with foams that are approximately equal to or less than 3.175 millimeters thick being more preferred.

25 Suitable elastic films and fabrics are those made of elastomeric materials such as natural and synthetic rubbers, elastomeric polyurethanes (ESTANE from B. F. Goodrich & Co.), elastomeric polyamides (PEBAX from Atochem Co.) and
30 elastomeric polyesters (HYTREL from E. I. DuPont de Nemours



- & Co.), styrene butadiene styrene block copolymers, styrene ethylene butylene styrene block copolymers, styrene isoprene styrene block copolymers (examples of these block copolymers are those having the trademark KRATON from Shell Chemical Co.), noncrosslinked ethylene vinyl acetate copolymers, ultralow density polyethylene, blends, coextruded laminates, layered laminates of such materials, and combinations thereof.
- 5
- 10 Suitable elongatable nonelastic fabrics or films for use in this invention include, but are not limited to, those made of materials such as polyethylene, preferably low and medium density polyethylene, polypropylene, noncrosslinked ethylene vinyl acetate copolymers, polyamides such as nylon 6 and
- 15 nylon 6,6, polyesters, polyvinylidene chloride, polyvinyl chloride, polyester polyurethanes, polyether polyurethanes, and blends, coextruded laminates, layered laminates of such materials, and combinations thereof.
- 20 A preferred elongatable, nonelastic film for use in this invention is polyethylene film. The film may be nonperforate if for example in a sanitary napkin it is used as a barrier or as a component material of the cuffs, wings or tabs of the sanitary napkin. The preferred elongatable nonelastic film
- 25 may be perforate if for example it is used as a cover or fluid transfer layer or as a component material of the cuffs, wings or tabs. Similar choices of perforate or nonperforate materials, their use and placement in each product, may be made in the manufacture of other products such as, but not
- 30 limited to, sanitary absorbent products including diapers,



incontinence products, as well as bandages, wound dressings, surgical dressings, cushioning and bandages for the treatment of stasis ulcers, surgical drapes, underpads and the like.

5 Suitable fibers and filaments for the fabrics useful for this invention may be chosen for the degree of elongatability and elasticity desired. Since filaments may be thought of as long fibers, the fibers and filaments referred to herein will be referred to as fibers and thereby deemed to include both
10 fibers and filaments. Fibers such as woodpulp, cotton, rayon, wool, linen, silk, ramie and jute are relatively nonelongatable and nonelastic. Relatively more elongatable and elastic are synthetic fibers such as polyethylene, polypropylene, polyester, polyester polyurethane, polyether
15 polyurethane; and bicomponent fibers such as of polyethylene and polypropylene, polyethylene and polyester, polypropylene and polyester and low and high melting polyesters. In addition, the fiber denier, cross-section, degree of crystallinity will also impact its elongatability and
20 elasticity. The degree that the fabric permits movement of one fiber with respect to another, and the flexibility, elongatability and elasticity of any binder that is used, whether it is an adhesive or thermoplastic binder, and whether the binder itself is elastic, will also dictate to
25 some degree the elongatability and elasticity of the fabric.

The gathered, composite of this invention may optionally comprise a laminated structure made of more than two plies. The following examples of composites comprising more than two
30 plies are presented without meaning to be restricted by such

examples. For example, a three ply laminated structure may be made wherein an elongatable elastic or nonelastic fabric, film, foam or combination thereof is first tensioned, and to opposite sides thereof is bonded one each of two additional
5 nontensioned layers of fabric, film or foam; or one of the two nontensioned additional layers may be adhered to the tensioned layer followed by sequentially adhering the second of the two additional nontensioned layers to the first additional nontensioned layer; after which the tensioned
10 layer is relaxed to form a gathered, layered composite. Alternatively, two layers of tensioned elongatable fabric, film or foam may be adhered or secured, alternately one on either side or both to one side of a nontensioned additional layer; after which the tensioned layers are allowed to relax
15 to form a gathered layered composite. Additional layers of tensioned elongatable and nontensioned fabrics, films and foams may be similarly laminated. One may substitute, for any layer of the composite, a component layer that does not become gathered, by means such as attaching it to a layer or
20 component after the tensioned composite or tensioned layer has been untensioned; or by using a layer made of a tensioned material that is not reversibly elongatable in the direction of tensioning and reversibly narrowable orthogonal to the direction of tensioning.

25 The elongatable elastic or nonelastic fabric, film or foam, and the at least one additional layer of fabric, film or foam may be adhered or otherwise secured to each other by any conventional techniques which are known for securing two or
30 more layers of flexible sheet materials together and

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includes, but is not limited to, the use of adhesives, heat sealing, ultrasonic bonding, radiofrequency sealing, mechanical crimping, cold flow pressure sealing, and the like, and combinations thereof. Adhesive may be applied as

5 a hotmelt, for example, by spraying or through separate orifices or through a slotted orifice which has spacers to separate the exiting adhesive into spaced apart streams. Each coating stream or spray may be discontinuous or continuous. Adhesive may also be applied by screen printing

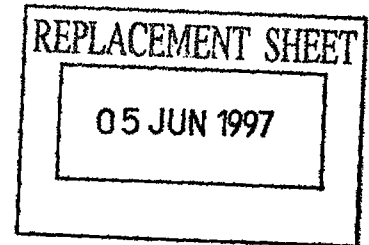
10 or by transfer coating. Hotmelt adhesives are preferred over solvent based adhesives for speed of application and for the elimination of the need to remove byproducts such as solvents and components of curing agents. The adhesive may be applied to either or both the elongatable elastic or nonelastic

15 fabric, film or foam and the at least one additional layer of fabric, film or foam. However, if adhesive is used, it is preferred, for ease and accuracy of application, that it be applied to the at least one additional layer of fabric, film or foam, since the at least one additional layer is not being

20 tensioned or is tensioned to a lesser degree than the first layer of material, and is thus more easily kept laying flat during the process of manufacture, albeit that it may be inherently three dimensional by virtue of being for example embossed or by having three dimensional apertures.

25 Mechanically applied methods of sealing such as heat sealing, ultrasonic bonding, radiofrequency sealing, mechanical crimping, cold flow pressure sealing, may be accomplished with a heated roll or stamping plate that has a patterned surface to which the appropriate energy, i.e., heat,

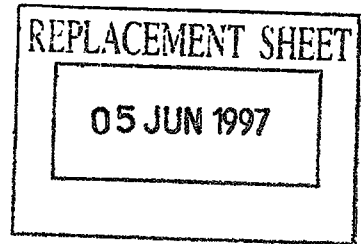
30 ultrasound, radiofrequency, pressure or combinations thereof,



is applied.

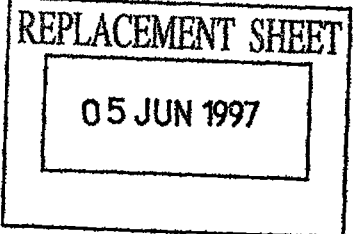
The elongatable elastic or nonelastic fabric, film or foam, and the at least one additional layer of fabric, film or foam may be bonded to each other in any manner or pattern of adherence or securement that provides at least partially spaced apart zones of bonding, i.e., the zones of adherence or securement are separated from one another by zones of non adherence or securement. The zones of adherence or securement should be wide enough to retain the integrity of the bonding between the layers of the composite material during manufacture or use. In practice, this width has been found to be at least about 0.016 in. (0.397 mm) and preferably at least about 0.031 in. (0.793 mm). However, such zones should not be so wide as to severely reduce the areas of material that is gathered or to compromise the ability of the material to be gathered. In practice, the maximum width of the zones of adherence or securement has been found to be about 0.5 in. (12.7 mm) and preferably about 0.375 in. (9.525 mm).

Such manner and pattern of adherence or securement provide areas where the adhered fabrics, films and foams can relax to form gathers. Examples of the elements of such patterns of zones of adherence or attachment are spaced apart straight or curved lines or bars, where the lines or bars may be continuous, or may be made up of a series of discontinuous and/or continuous dots, dashes, chevrons, circles or other geometric shapes, swirls and zigzags and the like and combinations thereof. Examples of curved patterns are



undulating sinusoidal lines or bars.

- 5 The zones of non-adherement or spacing between the elements of the zones of adherement may be range from about 0.0625 in. (1.588 mm) to 0.5 in. (12.7 mm) and may preferably be between 0.125 in. (3.175 mm) and 0.375 in. (9.525 mm). It should be noted that the spacing used will be dictated by both the degree of gathering, the amount of material desired in the gathers, as well as the loft of the materials used. Thus
- 10 closer spacing between the elements of the zones of adherement or securement may be tolerated when the material is relatively thin and flexible. Thicker material will require the use of wider spacing between the elements of the zones of adherement or securement.
- 15
- 20 The general direction of the pattern of the zones of adherement or attachment, if it is nonrandom such as e.g. discrete lines of adhesive in a spaced apart pattern, may be at any angle to the direction in which the elongatable elastic or nonelastic fabric, film or foam is tensioned. When the elongatable elastic or nonelastic fabric is relaxed the puckers will be seen to reflect the pattern of the elements of the zones of adherement or securement, e.g.,
- 25 discrete points or lines wherein the lines may be continuous, discontinuous, regular, random, straight or curved, and wherein the angle that the pattern of elements of the zones makes with the direction in which the elongatable elastic fabric, film or foam has been stretched, i.e parallel, orthoganal or any angle in between. The resulting gathers
- 30 will then be seen to vary, for example, from a series of

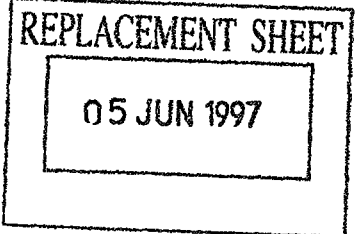


parallel ruffles or ridges to a pattern of quilted puckers of different sizes, shapes and outlines. It has been discovered that after tensioning is relaxed, that the gathers can be discerned to have a pattern of directionality, e.g., a series
5 of parallel ruffles or ridges, then the pattern of gathers along the plane of one layer, e.g., the elongatable elastic fabric, film or foam, is approximately orthogonal to the pattern of gathers in the at least one other layer along the plane of that other layer.

10

A preferred film useful in this invention is for example an elongatable or nonelastic nonperforate or perforate polyethylene or polypropylene film. Examples of such perforate nonelastic films are described in the following
15 Patent Applications, and commonly assigned and incorporated herein in their entirety by reference: to Turi et al, "Textilelike Apertured Plastic Films", Canadian Patent Application 2,130,176; "Method of Forming Improved Apertured Films, Resultant Apertured Films and Absorbent Products
20 Incorporating Resultant Apertured Films"; to James et al, US Patent Application No. 08/523,112; and to Burwell et al, "Apertured Film Having Improved Fluid Distribution Properties, Method of Forming Same and Absorbent Products Incorporating Same", US Patent Application No. 08/522,600;
25 and "Absorbent Products", US Patent Application No. 08/522,722.

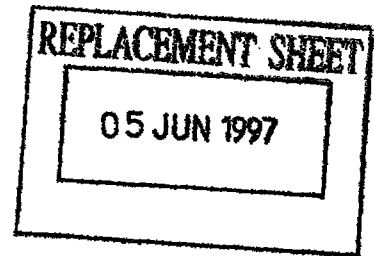
Other examples of perforate films are described in US 3,054,148 to Zimmerli, US 4,690,679 and US 4,806,411 to
30 Mattingly et al, US 4,859,519 to Cabe et al, US 3,929,135 to



Thomson et al, US 4,324,246 to Mullane and European Patent Application 0,304,617 to Kao Corporation.

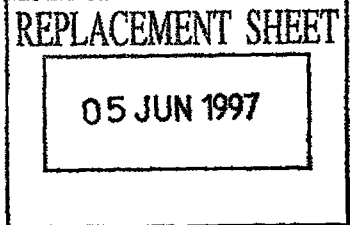
5 The perforate film is tensioned and an additional permeable layer of fabric, film or foam is adhered thereto, the zones of adherence are separated from one another by zones of non adherence or nonsecurement. Examples of such additional permeable layers of fabric, film, or foam are a nonwoven fabric, tissue, perforated film and reticulated foam. The
10 tension on the elastic or nonelastic fabric, film or foam is then released to form a gathered three-dimensional fluid pervious composite.

15 The gathered layered composite materials formed in accordance with such preferred films, when incorporated into an absorbent product, provide soft, comfortable gathered textures that have less contact with the body than do flat structures. The composites also provide surprisingly enhanced fluid transfer properties as well as unique
20 structural and spatial attributes, and have been found useful in the manufacture of various products including, but not limited to, sanitary absorbent products such as diapers, sanitary napkins, incontinence products, as well as bandages, wound dressings, surgical dressings, cushioning and bandages
25 for the treatment of stasis ulcers, surgical drapes, underpads and the like. Some structure benefits, as examples, are the properties of preventing wet collapse and providing compression and crush resistance to such products during use. This preferred embodiment of the perforate
30 layered composite material of this invention has also been



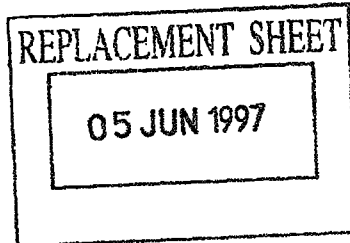
found to be particularly suitable for use in the absorbent products, as cover layers and as intervening fluid transfer layers. When at least a part of the layered composite material of this invention is nonperforate, it has been found
5 useful in these products as barrier layers and as covers for cuffs, wings or tabs. When the layered composite material has at least one perforate component layer, it has been found useful in these products as intervening fluid transfer layers and as containment structures for ingredients such as
10 deodorants, fragrances, medicaments and superabsorbents. When the layered composite material is comprised completely of either perforate or nonperforate component layers or has both perforate and nonperforate component layers, it has been found particularly useful as deformation and crush resistant
15 structures. Examples of lateral and vertically wicking intervening fluid transfer layers are described in "Absorbent Articles with Plates", US Patent Application Serial No. 08/220,073 to Hsieh et al, and commonly assigned and incorporated herein in its entirety by reference.

20 In accordance with this aspect of this invention, the gathered composite material is incorporated into sanitary napkins, adult incontinence products, bandages, and the like, there has now been provided an absorbent product having a top
25 fluid permeable layer, a bottom fluid impermeable layer, and an absorbent core therebetween, wherein the top fluid permeable layer comprises a perforate polyethylene film which is first tensioned to stretch the film to a length which is at least 101% of its original nontensioned length, the film
30 concomitantly undergoing narrowing in a direction orthogonal



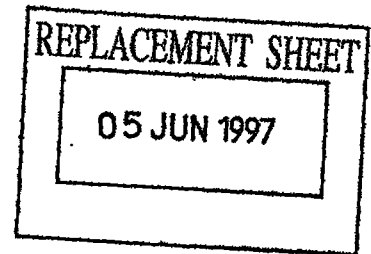
to the direction of tensioning; adhering a second fluid pervious fabric, film or foam to the perforate polyethylene film by adhering or securing means that are at least partially separated from one another, at discrete spaced
5 apart positions along at least a portion of the tensioned perforate film; and then releasing the tension on the perforate polyethylene film to yield a product with a gathered top fluid permeable layer. This gathered, layered composite material may comprise the bottom, garment facing,
10 fluid impermeable layer, to prevent leakage from the bottom and sides of the product. In such uses, it is preferred that either or both the first elongatable fabric, film or foam and the second fabric, film or foam be fluid impervious. The sanitary napkin may optionally have wings or tabs to fix the
15 napkin to the undergarment. The gathered composite material of this invention may comprise all or part of the wings or tabs. The napkin may also optionally contain embossments or deep channels, to raise the absorbent center and thereby the fluid pervious top layer to contact the body, and to channel
20 fluids longitudinally to prevent side leakage. The absorbent core of the napkin may optionally contain a gathered composite material of this invention in the form of lateral and vertically wicking intervening fluid transfer layers and/or as containment structures for ingredients such as
25 deodorants, fragrances and superabsorbents.

In a another embodiment of this invention, there has been provided a sanitary napkin having a fluid pervious top layer, a fluid impervious bottom layer, and an absorbent core
30 therebetween, and having gathered longitudinal edges, which



may optionally form upstanding sidewalls to inhibit fluid leakage across the lateral sides of the sanitary napkin. The gathered edges may be formed by tensioning a first elongatable fabric, film or foam, and while in its tensioned state, the elongatable fabric, film or foam is concomitantly narrowed in a direction orthogonal to the direction of tensioning; adhering a second fabric, film or foam to the elongatable fabric or film by adhering or securing means that are at least partially separated from one another, at discrete spaced apart positions along at least a portion of the tensioned elongatable fabric or film, and then releasing the tension on the elongatable fabric, film or foam to yield a product with a gathered composite material wherein both layers are gathered, the gathers of one layer being aparallel to the gathers of the other layer. This gathered composite material may then be adhered or secured along side edges of a sanitary napkin. The gathered composite material, before being adhered or secured along the side edges of a sanitary napkin, may itself be tensioned, the tension being released after it is adhered or secured to the side edges, thereby raising and providing curvature to the gathered edges, the upstanding sidewalls or the napkin itself. The gathered composite material may also comprise the bottom, garment facing, fluid impermeable layer, to prevent leakage from the bottom and sides of the product.

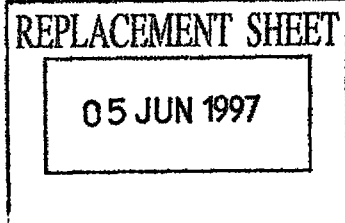
The sanitary napkin prepared in accordance with this aspect of the invention provides the sanitary napkin with soft gathered edges and/or upstanding side walls which are not easily deformed and which, therefore, act as substantial



liquid barriers to prevent side leakage. In such uses, it is preferred that either or both the first elongatable fabric, film or foam and the second fabric, film or foam be fluid impervious. The sanitary napkin may optionally have wings or tabs to fix the napkin to the undergarment. The gathered, layered composite material of this invention may form all or part of the wings or tabs. The napkin may also optionally contain embossments or deep channels, to raise the absorbent center and thereby the fluid pervious top layer to contact the body, and to channel fluids longitudinally to prevent side leakage.

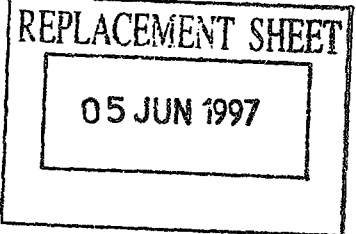
Without restricting the invention in any way, the following are examples of processes, which have been found to be suitable for making the gathered, layered composite material of this invention.

Figures 1A and 1B are schematic views of an apparatus 22, and an alternative apparatus 22A to apparatus 22, respectively, for forming the layered composite material of this invention. Analogous or similar elements in each Figure are given the same designating numbers. Referring now to Figure 1A, the process requires at least a first layer 2 of a flexible, substantially reversibly elongatable material, such as a fabric, film or foam, and a second layer 4 of a flexible material, such as a fabric, film or foam. The two layers may be of different materials or of the same material. Second layer 4 is unwound from a supply roll 6 and passed under and over a series of guide rolls 8. During the passage through series of guide rolls 8, second layer 4 is subjected to



coating by hotmelt adhesive that is fed from a slot coater 10, wherein the slot is divided into open and closed zones by a series of spacers, the hotmelt adhesive being thereby separated into discrete streams that impact and thereby coat
5 second layer 4 with a spaced apart pattern, e.g., at least two parallel lines, of adhesive. Details of the slot coater, the divided slot, the hotmelt adhesive and the coating pattern, being known in the art, are not shown in Figure 1a. It should be noted that the pattern of adhesive, here the at
10 least two parallel lines, on second layer 4 may be at any angle, from 0 to 90 degrees to the machine direction; and that the spaced apart pattern may be of a variety of designs, not necessarily parallel lines, as is discussed earlier in the section, "Detailed Description of the Invention". Second
15 layer 4 is led onto and is supported by a belt 12 that is rotated belt supporting rolls 14, 16. Second layer 4 is further led through a nip 18 between belt 12 on belt supporting roll 16, and a drive roll 20; where, in nip 18, second layer 4 is laminated to a tensioned, elongated and
20 concomitantly orthogonally narrowed first layer 2 that is being brought into nip 18 on top of, and coincidingly with, second layer 4.

First layer 2 is unwound from a supply roll 3 and led through
25 a nip 5 between a drive roll 7 and a pressure roll 9, with drive roll 7 being rotated at a slower speed than that of drive roll 20. The tensioned and concomitantly narrowed first layer 2 is led around drive roll 20 and through nip 18 between drive roll 20 and incoming second layer 4 where it is
30 laminated to second layer 4 as described above.

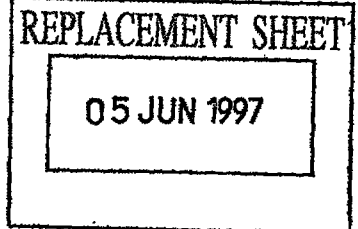


Alternatively, as in apparatus 22A in Figure 1B, belt 12 may be eliminated, with both first layer 2 and second layer 4 being led directly through nip 18 between drive roll 20 and pressure roll 24, with drive roll 20 rotating at a faster
5 speed than supply roll 3; thereby causing first layer 2 to be tensioned and thereby stretched as it passes through nip 18 to be laminated to and second layer 4.

10 Since, in apparatus 22, and apparatus 22A, drive roll 20 is rotating faster than drive roll 7, and supply roll 3 respectively, first layer 2 is tensioned and thereby stretched in the machine direction and concomitantly narrowed in the cross machine direction.

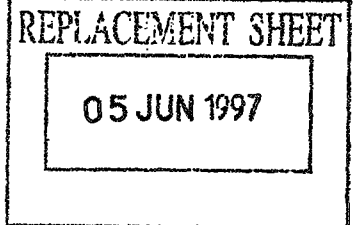
15 In both Figures 1A and 2A, after bonding the concomitantly tensioned and narrowed first layer 2 to second layer 4, both the tensioning and concomitant narrowing of first layer 2 are permitted to relax, thereby allowing the layered material leaving nip 18 to form a three dimensional, layered composite
20 material 11, wherein both first layer 2 and second layer 4 are gathered, the gathers of one layer being aparallel to the gathers of the other layer. Composite material 11 is wound on to a takeup roll 13 for further use.

25 Figures 2A and 2D are schematic views of another apparatus 30, and alternatives to apparatus 30, and an alternative apparatus 30A to apparatus 30, respectively, for forming the layered composite material of this invention. Figures 2B and 2C are enlarged plan views of alternative configurations of
30 the bonding stage components shown in Figure 2A. Figures 2E



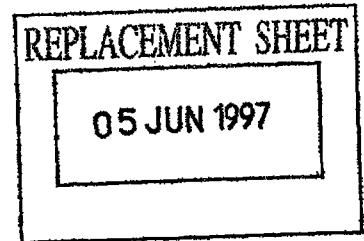
and 2F are enlarged plan views of analogous alternative configurations of the bonding stage components shown in Figure 2D. Analogous or similar elements to those in Figures 1A and 1B are given the same designating numbers in Figures 2A to 2F. Referring now to Figure 2A, the process requires at least a first layer 2 of a flexible, substantially reversibly elongatable material, such as a fabric, film or foam, and a second layer 4 of a flexible material such as a fabric, film or foam. The two layers may be of different materials or of the same material. Second layer 4 is unwound from a supply roll 6 and passed under and over a series of guide rolls 8. Second layer 4 is led onto and is supported by a belt 12 that is rotated by belt supporting rolls 14, 16. Second layer 4 is led through a nip 18, between belt 12 on belt supporting roll 16, and a drive/heat sealing roll 17; where, in nip 18, second layer 4 is heat laminated in a spaced apart pattern to a tensioned, elongated and concomitantly orthogonally narrowed first layer 2 that is being brought into nip 18 on top of, and coincidingly with, second layer 4. An example of a drive/heat sealing roll 17 is shown in Figure 2B in plan in enlarged detail, wherein drive/heat sealing roll 17 is shown to contain, for example, at least two spaced apart raised heated ridges 19, ridges 19 being spaced apart by spacers 21 that are at a level lower than ridges 19, thereby forming grooves 23 between ridges 19.

Belt supporting roll 16 may be smooth surfaced or it may have ridges that either meet with or interdigitate ridges 19 on drive/heat sealing roll 17.



First layer 2 is unwound from a supply roll 3 and led through a nip between a first drive roll 7 and a pressure roll 9, with drive roll 7 being rotated at a slower speed than that of drive/heat sealing roll 17. Since drive/heat sealing roll 17 is rotating faster than drive roll 7, first layer 2 is tensioned and thereby stretched in the machine direction and concomitantly narrowed in the cross machine direction. The tensioned and concomitantly narrowed first layer 2 is led around a drive/heat sealing roll 17 and through nip 18 between drive/heat sealing roll 17 and incoming second layer 4 where it is laminated to the second layer as described above. Alternatively, with continued reference to Figure 2B, drive/heat sealing roll 17 may be unheated, belt supporting roll 16 being heated, thereby having the heat coming from belt supporting roll 16, through belt 12 and second layer 4 to heat seal and thereby laminate the two layers 2, 4 together. Yet alternatively, as in Figure 2C, belt supporting roll 16 may be heated and contain, for example, at least two spaced apart raised heated ridges 19, ridges 19 being spaced apart by spacers 21 that are at a level lower than ridges 19, thereby forming grooves 23 between ridges 19. In such a case, drive roll 17 may unheated and either be smooth surfaced or have ridges that either meet with or interdigitate ridges 19 on belt supporting roll 16. It should be noted that belt supporting roll 16 and drive roll 17 may optionally both be heated.

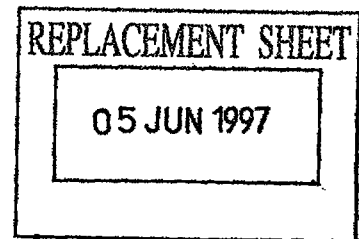
Alternatively, as in apparatus 30A in Figure 2D, belt 12 may be eliminated, with both first layer 2 and second layer 4 being led directly through nip 18 between drive roll 20 and



pressure roll 24, with drive roll 20 rotating at a faster speed than supply roll 3; thereby causing first layer 2 to be tensioned and thereby stretched in the machine direction and concomitantly narrowed in the cross machine direction, as it passes through nip 18 to be laminated to and second layer 4. With reference to Figure 2E, drive roll is heated and contains for example, at least two spaced apart raised heated ridges 19, ridges 19 being spaced apart by spacers 21 that are at a level lower than ridges 19, thereby forming grooves 23 between ridges 19. Pressure roll 24 may be smooth surfaced or it may have ridges that either meet with or interdigitate ridges 19 on drive roll 20.

Alternatively, with reference to Figure 2F, drive roll 17 may be unheated, pressure roll 24 being heated, and containing, for example, at least two spaced apart raised heated ridges 19, ridges 19 being spaced apart by spacers 21 that are at a level lower than ridges 19, thereby forming grooves 23 between ridges 19. In such a case, drive roll 17 may unheated and either be smooth surfaced or have ridges that either meet with or interdigitate ridges 19 on pressure roll 24. It should be noted that pressure roll 24 and drive roll 17 may optionally both be heated.

After heat sealing the concomitantly tensioned and narrowed first layer to the second layer, both the tensioning and concomitant narrowing of the first layer are permitted to relax, thereby allowing the layered material leaving nip 18 to form a three dimensional, layered composite material 11,



wherein both first layer 2 and second layer 4 are gathered, the gathers of one layer being aparallel to the gathers of the other layer. Composite material 11 is wound on to a takeup roll 13 for further use.

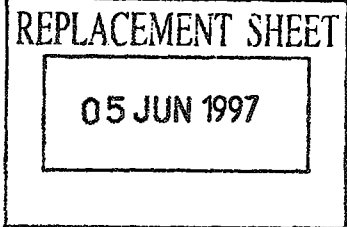
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Figure 3 is a plan view, before elongation, and concomitant narrowing orthogonal to the direction of elongation, of a flexible elongatable material 40 used to form the first layer of the layered composite material of this invention.

10 Material 40 is described in Figure 3 to have a machine direction dimension 32 and a crossmachine direction dimension 33, being the respective directions in which the first layer will be tensioned and thereby elongated and be concomitantly narrowed, in the process of making the layered composite of
15 this invention.

Figure 4 is plan view of an elongatable material 45, after the elongatable material shown in Figure 3, has been elongated and concomitantly narrowed orthogonal to the
20 direction of elongation, intermediate to forming the first layer of the layered composite material of this invention. Material 45 is described in Figure 4 to now have a machine direction dimension 34 and a crossmachine direction dimension 35, being the respective directions in which the first layer
25 has been tensioned and thereby elongated, wherein the dimensions 34 and 35 are respectively longer and shorter than dimensions 32 and 33 shown in Figure 3.

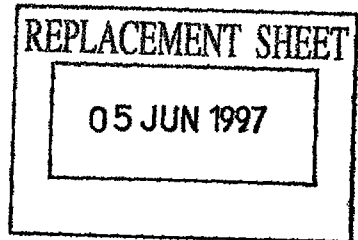
Figure 5 is a plan view of a flexible material 50 used to
30 form the at least one additional layer before it is bonded to



the first layer to form the layered composite material of this invention. Material 50 is described in Figure 5 to have a machine direction dimension 36 and a crossmachine direction dimension 37, being the respective directions in which the at least one additional layer will aligned with the first layer in the process of making the layered composite of this invention.

Figure 6 is a perspective view of a gathered layered composite material 60 of this invention comprising the elongatable material, shown in Figure 4, now shown as the first layer component 42 of gathered layered composite material 60 of this invention, after first layer 42 has been elongated in the machine direction 41, and concomitantly narrowed orthogonal to the direction of elongation, i.e., in the crossmachine direction 55, and attached to an at least one additional layer 44 by spaced apart lines of adhesive 45, wherein the spaced apart lines of adhesive are essentially parallel to the machine direction 41; and the tensioning and concomitant narrowing is relaxed to form layered composite material 60 of this invention, wherein both layers 42, 44 are gathered, the gathers of one layer being aparallel to the gathers of the other layer.

First layer component 42 comprises bonded regions 46 and nonbonded regions 47, having respectively linear cross section dimensions 48, 49 and a machine direction dimension 52. On sequentially comparing dimensions shown in Figure 6 with the analogous dimensions shown in Figure 3, the sum of linear cross section dimensions 48, 49 are essentially yet

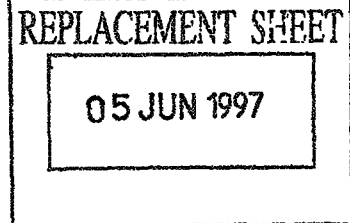


approximately equal to crossmachine direction dimension 32 shown in Figure 3; and machine direction dimension 52 is essentially yet approximately equal to machine direction dimension 33, also shown in Figure 3.

5 At least one additional layer 44 comprises bonded regions 55 and nonbonded regions 56, having respectively linear cross section dimensions 57, 58 and crossmachine direction dimension 59. On sequentially comparing dimensions shown in
10 Figure 6 with the analogous dimensions shown in Figure 5, the sum of linear cross section dimensions 57 and 58 are essentially yet approximately equal to machine direction dimension 37 shown in Figure 5 and crossmachine section dimension 59 is essentially but approximately equal to
15 crossmachine direction dimension 36 shown in Figure 5.

Figure 7 is a perspective view of another gathered, layered composite material 70 of this invention. Composite material 70 comprises a first layer component 71 that has been
20 elongated in the machine direction 72 and concomitantly narrowed orthogonal to the direction of elongation, i.e., in the crossmachine direction 73 and attached to an at least one additional layer 74 by spaced apart lines of adhesive 75, wherein the spaced apart lines of adhesive are essentially
25 parallel to cross machine direction 73; and the tensioning and concomitant narrowing is relaxed to form the layered composite material 70 of this invention, wherein both layers 71, 74 are gathered, the gathers of one layer being aparallel to the gathers of the other layer.

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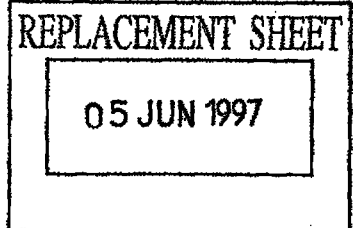


First layer component 71 comprises bonded regions 77 and nonbonded regions 78, which regions together define the gathers 79 of first layer component 71. At least one additional layer 74 comprises bonded regions 80 and nonbonded regions 81, which regions together define the gathers 82 of at least one additional layer component 74. Analogous comments may be made about the relationship of the bonded and nonbonded regions of the gathered regions of this layered composite with respect to the dimensions of both the unperturbed starting first layer and the at least one additional layer.

Figure 8 is a partial cross section perspective view of yet another gathered, layered composite material 90 of this invention. Composite material 90 comprises a first layer component 84 that has been elongated in the machine direction 85 and concomitantly narrowed orthogonal to the direction of elongation, i.e., in the crossmachine direction 86 and attached to an at least one additional layer 88 by spaced apart lines of adhesive 89, the adhesive lines being shown predominantly in phantom, wherein the spaced apart lines of adhesive are essentially not parallel to either machine direction 85 or to crossmachine direction 86, but are at some nonparallel angle to either direction, for example, 45 degrees to machine direction 85; and the tensioning and concomitant shortening is relaxed to form the layered composite material 90 of this invention; wherein both layers 84, 88 are gathered, the gathers being in the form of quilted rather than parallel puckers, and the gathers of one layer being aparallel to the gathers of the other layer.

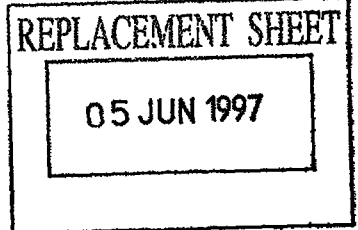
First layer component 84 comprises bonded regions 91 and unbonded regions 92, which regions together define the gathers 93 of first layer component 84. At least one additional layer 88 comprises bonded regions 94 and nonbonded regions 95, regions 94, 95, which regions together define the gathers 96 of at least one additional layer component 88. Analogous comments may be made about the relationship of the bonded and nonbonded regions of the gathered regions of this layered composite with respect to the dimensions of both the unperturbed starting first layer and the at least one additional layer.

Figure 9 shows a perspective view of an absorbent product of this invention, here a sanitary napkin 120 covered by a perforated fluid permeable top layer 100, a fluid impermeable bottom layer 102 and an absorbent core (not shown) therebetween, where at least top layer 100 is made of the gathered, layered composite material of this invention; top layer 100, here exhibiting bonded 99 and nonbonded 104 areas (the at least one additional layer not being shown). Absorbent core 104 is comprised of an absorbent, for example woodpulp, and has more absorbent, thereby being thicker in approximately the central portion 101, i.e., approximately the central third, then becoming thinner by tapering down toward the transverse ends 103, 105 of napkin 120. Napkin 120 is distinguished by having top layer 100 sealed along its entire periphery 106 to bottom layer 102, wherein bottom layer 102 may be comprised of a nonperforate material comprised of the layered composite material of this invention. Napkin 120 is further distinguished by having a

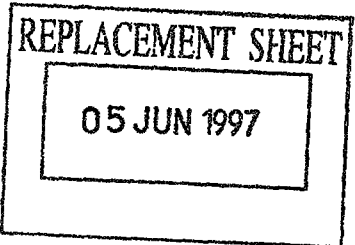


pair of deeply embossed concavely curving channels 107, 108, toward and adjacent each of two lateral sides 109, 110, respectively, along and outward of central portion 101 of napkin 120, the deeply embossed channels 107, 108, being a
5 highly densified region containing top layer 100 and a significant depth of the absorbent comprising absorbent core 104. The thickness of absorbent core 104 in central portion 101 between the pair of channels 107, 108 is at least equal to or greater than the thickness of central portion 101
10 between pair of channels 107, 108 and lateral sides 109, 110. Napkin 120 also comprises a positioning adhesive (not shown), on the garment side of bottom layer 102, for attaching napkin 120 to an undergarment, positioning adhesive being protected until use with a release paper (not shown). Absorbent core
15 104 may optionally contain as distinct layers, gradients, or as homogeneous dispersions, any or all of absorbents such as tissue, sphagnum moss and superabsorbent.

Figure 10 shows a perspective view of an absorbent product
20 of this invention, here a sanitary napkin 130 covered by a fluid permeable top layer 112, a fluid impermeable bottom layer 113 and an absorbent core (not shown) therebetween, where top layer 112 and/or bottom layer 114 may be made of the gathered, layered composite of this invention; top layer
25 112, here exhibiting bonded 116 and nonbonded 117 areas (the at least one additional layer not being shown). Napkin 130 also comprises right and left longitudinally extending cuffs 118, 119 each of the cuffs being attached along their respective base portions 121, 122 to the right and left
30 lateral sides 123, 124 of napkin, respectively, such that the



distal ends 125, 126 of cuffs 118, 119 extend outward from right and left lateral sides 123, 124 of napkin 130. Top layer 112 and bottom layer 114 are attached to each other in a flange seal 122 and to base portions 121, 122 of cuffs 118, 119. Cuffs 118, 119 may be optionally longitudinally attached along their respective base portions 121, 122 to napkin 130: anywhere, between the respective lateral sides 123, 124 and the longitudinal centerline 125; along and above or below top layer 112, but not including longitudinal centerline 125; along and above or below bottom layer 114, including longitudinal centerline 125; in such fashion that ensures that cuffs 118, 119 extend at least outward from lateral sides 123, 124. Cuffs 118, 119 in this example may also be covered with a nonwoven or, as shown here, with the gathered, layered composite material of this invention; the gathered, layered composite material here exhibiting bonded 116 and nonbonded 117 areas (the at least one additional layer not being shown). Cuffs 118, 119 may additionally be made of or contain in or on the cuffs other materials such as films, nonwovens and foam, the nonwoven or foam being preferably of a highloft material. Cuffs 118, 119 may also additionally contain elastic materials in or on the cuffs. Absorbent core 116 in Figure 10 has a roughly rectangular outline, and is thicker in the middle 127 than lateral sides 123, 124 or than the transverse ends 128, 129. Absorbent core 116 may have other outline shapes such as hourglass, dogbone or oval. Absorbent core 116, proceeding from the absorbent facing side of top layer 112, may further comprise a transfer layer of a low density nonwoven material, an auxiliary absorbent layer containing sphagnum moss and a main



absorbent layer such as of airlaid pulp. Napkin 130 also comprises positioning adhesive (not shown), on the garment side of bottom layer 114, for attaching napkin 130 to an undergarment, positioning adhesive being protected until use by a release paper (not shown). Absorbent core may optionally contain as distinct layers, gradients, or as homogeneous dispersions, any or all of tissue, sphagnum moss and superabsorbent. Embodiments of napkins with cuffs such as are described herein are described in Patent Applications, to Salerno et al, commonly assigned, entitled, "Absorbent Article Having Compliant Cuffs" and "Stabilized Absorbent Article", are herein incorporated in their entirety.

Figure 11 shows a perspective view of an absorbent product of this invention, a sanitary napkin 150 covered by a fluid permeable top layer 131, a fluid impermeable bottom layer 132 and an absorbent core (not shown) therebetween. Napkin 150 also comprises right and left longitudinally extending wings or tabs 133, 134 each of the wings or tabs 133, 134 being attached along their respective base portions 135, 136 to the right and left lateral sides 137, 138 of napkin 150, respectively, such that the distal ends 139, 140 of wings or tabs 133, 134, extend outward from the right and left lateral sides 137, 138 of sanitary napkin 150. Top layer 131 and bottom layer 132 are attached to each other in a flange seal 141 and to the base portions of wings or tabs 133, 134. Wings or tabs 133, 134 in this example are also covered with the layered composite material of this invention. The wings or tabs can optionally be attached to the sanitary napkin: longitudinally along and above or below the cover between and

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-46-

including the center of the napkin and adjacent the lateral sides; longitudinally anywhere along the lateral sides of the napkin; and longitudinally along and above or below the barrier film backsheet. Wings or tabs 133, 134 may be
5 longitudinally attached, alternatively along their respective base portions 135, 136 anywhere, between the respective lateral sides 137, 138 and adjacent to but not including the longitudinal centerline 142; such that wings or tabs 133, 134 extend at least outward from lateral sides 137, 138.
10 Absorbent core 133 in Figure 11 has an hourglass outline and is thicker in the middle region 143 than the lateral sides 137, 138 or than the transverse ends 144, 145. Absorbent core 133 may further comprise, proceeding from the absorbent facing side of top layer 131, a transfer layer made of a low
15 density nonwoven material, an auxiliary absorbent layer comprising sphagnum moss and a main absorbent layer such as of airlaid pulp. Napkin 150 also comprises positioning adhesive (not shown), on the garment side of bottom layer 132, for attaching napkin 150 and wings or tabs 133, 134 to
20 an undergarment, positioning adhesive being protected until use with a release paper (not shown). Absorbent core 133 may optionally contain as distinct layers, gradients, or as homogeneous dispersions, any or all of absorbents such as tissue, sphagnum moss and superabsorbent. Embodiments of
25 napkins with wings such as are described herein are described in US Patent Application, Serial No. 198,809 entitled, "Body Conforming Absorbent Article" to McCoy et al; and commonly assigned, herein incorporated in its entirety by reference

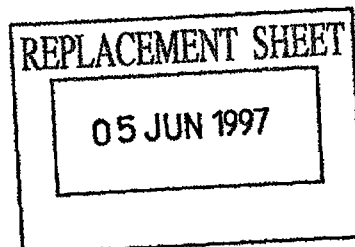
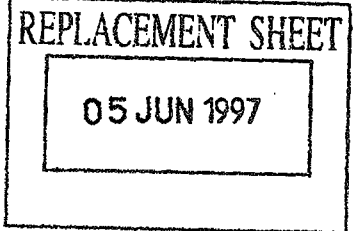


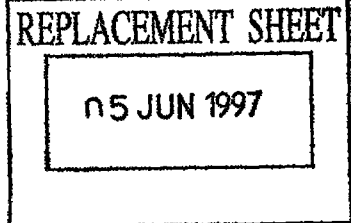
Figure 12 shows a partial cross section of a perspective view of an absorbent product of this invention, here a sanitary napkin 160, covered by a perforated fluid permeable top layer 151, a fluid impermeable bottom layer 152 and an absorbent core 153, therebetween, absorbent core 153 further comprising and insert 154 made of the gathered, layered composite material of this invention. Top layer 151 and bottom layer 152 are attached to each other in a flange seal 164. Napkin 160 also comprises positioning adhesive 165, on the garment side of bottom layer 152, for attaching napkin 160, positioning adhesive 165 being protected until use with a release paper 166. Insert 154 may be positioned anywhere within absorbent core 153 between top layer 151 and bottom layer 152, and may substitute for any or all off the components of absorbent core 153. Thus, when insert 154 is comprised of at least one perforate component layer, it has been found useful as an intervening fluid transfer layer to wick fluids both laterally and vertically and for storage or containment structures for ingredients such as deodorants, fragrances, medicaments and superabsorbents. Here insert 154 is positioned between top layer 151 and absorbent core 153, and has at least one perforate component layer. Insert 154 is comprised of a first layer 156 and an at least one additional layer 159 attached to each other by spaced apart bonding means 161; wherein first layer is comprised of bonded areas 157 and nonbonded areas 158, and at least one additional layer 159 layer is comprised of bonded areas 162 and nonbonded areas 163. Since insert 154 here may act as a fluid transfer layer, absorbent core 153 may comprise an



auxiliary absorbent layer comprising such as sphagnum moss and a main absorbent layer such as of airlaid pulp; and may optionally contain as distinct layers, gradients, or as homogeneous dispersions, any or all of absorbents such as tissue, sphagnum moss and superabsorbent. When the layered composite material comprising the insert is comprised completely of perforate or nonperforate component layers or has both perforate and nonperforate component layers, it has also been found useful as deformation and crush resistant structures.

EXAMPLES

In addition to the preceding descriptions, and as additionally illustrated by the figures, the gathered layered composite of the invention is further illustrated, in the following Table, "Manufacture of Laminated Composite Material", by examples of manufacturing runs used to make the gathered, layered composite materials, without meaning to be limited by such examples. The Table describes manufacturing runs wherein a Layer 1 was tensioned and concomitantly narrowed and, while in a tensioned and narrowed state, was adhered to a Layer 2 that had parallel spaced apart hotmelt adhesive lines in the machine direction. The examples of Layer 1 described in the Table include: a perforate high 3D profile film, made of polyethylene, as described in previously cited Canadian Patent Application 2,130,176 and in US Patent Applications 08/522,600 and 08/522,722 and 08/523,112; a perforate low 3D profile film as made by



applying vacuum to a polyethylene film supported on a perforated cylindrical drum; a flat perforate film made from a coextruded film comprised of polyethylene and polyethylene polyvinyl acetate copolymer as described in previously cited
5 US Patents 4,806,411 and 4,859,519; and various nonperforate polyethylene films of different basis weights.

Tensioning and concomitant narrowing of Layer 1 was accomplished by the difference in speeds between cylinders
10 that transferred Layer 1, wherein Layer 1 was pulled and thereby stretched by the cylinder driven by Drive 2 which rotated at a faster speed than the cylinder driven by Drive 1; and wherein the cylinder driven by Drive 2 brought Layer 1 to the nip where it was laminated to Layer 2 and
15 subsequently allowed to relax from its tensioned and narrowed state. In the set of columns, labelled "Width of Layer 1", the starting width of Layer 1 is compared first with the tensioned and thereby narrowed width of Layer 1 and then with the relaxed width of Layer 1, which is the same as its
20 gathered width in the layered laminated composite. It should be noted that although the gathered width is smaller than the starting width, the actual width of material contained in gathered Layer 1 is essentially the same as that of the starting ungathered width, i.e., the recovery of Layer 1 is
25 essentially 100%. In the set of columns, labelled "Length of Layer 1", the starting length of Layer 1 is compared first with the tensioned and thereby stretched length of Layer 1 and then with the relaxed length of Layer 1, which is the same as its gathered length in the gathered layered
30 composite. It should be noted: that the gathered length of

Layer 1 is quite similar to its starting length, since essentially all the gathers of Layer 1, wherein the lines of adhesive are parallel to the direction of tensioning, occur in the width, i.e., in the crossmachine direction; and that
5 the recovery of Layer 1 in the length is essentially 100%.

Layer 2 in these manufacturing runs included: a single ply of polypropylene spunbond nonwoven (NW) of different basis weights or of tissue (Tiss) of different basis weights;
10 double plies of nonwoven and tissue; and triple plies of a nonwoven ply and two plies of tissue.

The Table also gives, for Layer 2, the spacing between hotmelt adhesive lines as well as the number of gathers/in. contained in Layer 1 in the composite, the latter being
15 determined predominantly by the degree of gathering imposed on Layer 2 by the stretched and relaxed Layer 1 and the number of gathers in Layer 1 being determined to a great degree by the spacing between the adhesive lines on Layer 2.

20

In describing the present invention, certain embodiments have been used for purposes of illustration; however, other embodiments or modifications within the spirit and scope of
25 the invention will readily occur to those skilled in the art after reading this disclosure. The invention is accordingly not to be limited to the specific embodiments described and illustrated herein, but only in accordance with the appended claims.

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MANUFACTURE OF GATHERED LAYERED COMPOSITE MATERIAL

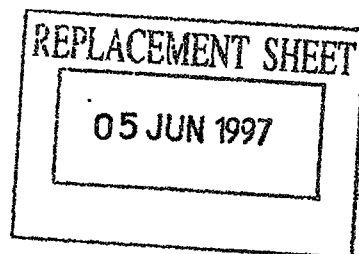
5	Layer 1 Isolated	Adhesive Spacing mm	Layer 2 Laminated	Drive 1 Speed ft/min.	Drive 2 Speed ft/min.	Width of Layer 1 (mm)		Length of Layer 1 (mm)		Layer 2 Gathers (per in.)
						Start	Tension Relaxed	Start	Tension Relaxed	
10	Perforate	12.7	NW 24.0 gsm	11.5	20.0	190.0	145.0	30.4	42.3	5.6
	High 30	12.7	NW 24.0 gsm	11.5	14.9	190.0	185.0	30.4	34.5	4.3
15	Profile Film	9.7	NW 24.0 gsm	11.5	20.5	191.0	146.0	30.4	42.6	33.38
		9.7	NW 24.0 gsm	11.5	14.8	191.0	146.0	30.4	34.7	30.36
20		7.9	NW 20.0 gsm	11.3	18.9	177.0	153.0	30.4	34.0	29.68
		7.9	NW 20.0 gsm	11.5	14.5	178.0	143.0	30.4	34.0	30.36
25		7.9	NW 20.0 gsm	11.5	13.9	177.0	153.0	30.4	34.0	29.6
		7.9	NW 24.0 gsm	11.5	19.1	178.0	146.0	30.4	41.0	31.96
		7.9	NW 24.0 gsm	11.5	15.0	178.0	160.0	30.4	33.0	29.9
		7.9	NW 24.0 gsm	11.4	20.7	178.0	123.0	30.4	42.6	31.1
		7.9	NW 24.0 gsm	11.4	15.0	178.0	132.0	30.4	34.5	30.2
		7.9	NW 24.0 gsm/ Tias 20.0 gsm	11.5	20.2	178.0	123.0	30.4	40.7	30.2
		7.9	NW 20.0 gsm/ Tias 20.0 gsm	11.5	14.6	178.0	125.0	30.4	34.0	30.2
		7.9	NW 20.0 gsm/ Tias 20.0 gsm/ 1.5" Wide Tias	11.5	19.5	178.0	128.0	30.4	39.4	31.0

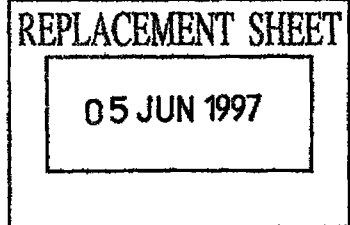
MANUFACTURE OF CATHETERED LAYERED COMPOSITE MATERIAL

5	Layer 1 <u>Impregnated</u>	Adhesive Spacing mm	Layer 2 <u>Laminated</u>	Drive 1 Speed ft/min	Drive 2 Speed ft/min	Width of Layer 1 (mm)		Length of Layer 1 (mm)		Layer 2 Gathers
						Start	Tension Released	Start	Tension Released	
10		7.9	NW 20.0 gsm/ Tiss 20.0 gsm/ 1.5" wide Tiss	11.5 15.0		178.0	150.0 165.0	30.4	33.0	30.0
	Perforate Low 3D	7.9	NW 24.0 gsm	18.9	170.0	145.0	158.0	30.4	43.4	32.38.2
	Profile Film	7.9	NW 24.0 gsm	15.0	170.0	156.0	166.0	30.4	35.2	30.47.0
15										
	Perforate	7.9	NW 20.0 gsm	19.5	172.0	137.0	138.0	30.4	35.5	34.3
	Film Flat	7.9	NW 20.0 gsm	15.0	172.0	146.0	155.0	30.4	32.7	30.4
		7.9	NW 24.0 gsm	19.5	172.0	134.0	141.0	30.4	36.2	33.57.4
		7.9	NW 24.0 gsm	15.0	170.0	147.0	158.0	30.4	33.5	30.37.2
20		7.9	Tiss 20.0 gsm	11.5 19.5		172.0	137.0 137.0	30.4	35.4	34.59.4
		7.9	Tiss 20.0 gsm	11.5 15.0		172.0	147.0 155.0	30.4	32.7	30.59.0
25	Nonperforate Film 0.8 mil PE	7.9	Tiss 20.0 gsm	11.5	19.2	168.0	146.0 154.0	30.4	40.0	31.712.6
	Nonperforate Film 0.8 mil PE	7.9	Tiss 20.0 gsm	11.5	15.0	168.0	161.0 151.0	30.4	32.8	31.612.2
	Nonperforate Film 0.95 mil PE	7.9	Tiss 20.0 gsm	11.5	19.2	170.0	146.0 154.0	30.4	41.1	31.612.8

MANUFACTURE OF GATHERED LAYERED COMPOSITE MATERIAL

	Layer 1 Tensilonged	Adhesive Spacing mm	Layer 2 Laminated	Drive 1 Speed ft/min	Drive 2 Speed ft/min	Width of Layer 1 (mm)		Length of Layer 1 (mm)		Layer 2 Gathers (mm)
						Start	Tension Relaxed	Start	Tension Relaxed	
5	Nonperforate	7.9	Tias 20.0 gsm	11.5	15.0	170.0	165.0	164.0	30.4	30.5 92
	Film 0.95 mil PE									
	Nonperforate	7.9	Tias 20.0 gsm	11.5	19.3	152.0	133.0	140.0	30.4	31.710
10	Film 1.0 mil PE									
	Nonperforate	7.9	Tias 20.0 gsm	11.5	15.4	152.0	145.0	148.0	30.4	30.4 92
	Film 1.0 mil PE									
15	Nonperforate	7.9	MV 24.0 gsm	11.5	19.5	153.0	133.0	139.0	30.4	31.9 90
	Film 1.0 mil PE									
	Nonperforate	7.9	MV 24.0 gsm	11.4	15.0	152.0	145.0	147.0	30.4	30.5 75
	Film 1.0 mil PE									

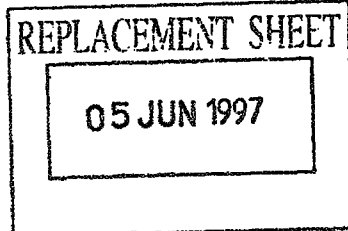




CLAIMS:

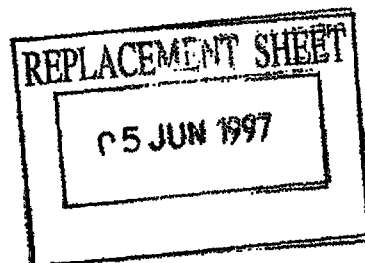
1. A gathered, layered composite material comprising:
a first layer of a flexible, reversibly elongatable
5 material, bonded at spaced apart positions along a
substantial portion of the first layer, to at least one
additional layer of a flexible nontensioned material;

wherein both the first layer and the at least one
10 additional layer are gathered, the gathers of one layer
being aparallel to the gathers of the other layer.
2. The gathered, layered composite material according to
claim 1, wherein the first layer is a material selected from
15 the group consisting of fabric, film and foam.
3. The gathered, layered composite material according to
claim 2, wherein the film is selected from the group
consisting of nonperforate films, perforate films, embossed
20 films and nonembossed films.
4. The gathered, layered composite material according to
claim 2, wherein the fabric, film or foam is nonelastic.
- 25 5. The gathered, layered composite material according to
claim 4, wherein the fabric or film is made of materials
selected from the group consisting of polyethylene,
polypropylene, noncrosslinked ethylene vinyl acetate
copolymers, polyamides such as nylon 6 and nylon 6,6,
30 polyesters, polyvinylidene chloride, polyvinyl chloride,



polyester polyurethanes, polyether polyurethanes, and blends, coextruded laminates, layered laminates of such materials, and combinations thereof.

- 5 6. The gathered, layered composite material according to claim 2, wherein the fabric is selected from the group consisting of knitted fabrics, woven fabrics, tissues and nonwovens.
- 10 7. The gathered, layered composite material according to claim 2, wherein the fabric is made of fibers selected from the group consisting of polyethylene, polypropylene, polyester, polyester polyurethane, polyether polyurethane, bicomponent fibers such as polyethylene and polypropylene,
- 15 polyethylene and polyester, polypropylene and polyester and low and high melting polyesters, and combinations thereof.
- 20 8. The gathered, layered composite material according to claim 2, wherein the foam is made of materials selected from the group consisting of polyester polyurethanes, polyether polyurethanes and polyethylene.
- 25 9. The gathered, layered composite material according to claim 2, wherein the fabric, film or foam is elastic.
- 30 10. The gathered, layered composite material according to claim 9, wherein the fabric, film or foam is made of materials selected from the group consisting of natural and synthetic rubbers, elastomeric polyester and polyether polyurethanes, elastomeric polyamides and elastomeric



polyesters, styrene butadiene styrene block copolymers, styrene ethylene butylene styrene block copolymers, styrene isoprene styrene block copolymers, noncrosslinked ethylene vinyl acetate copolymers, low density polyethylene, and
5 blends, coextruded laminates, layered laminates of such materials, and combinations thereof.

11. The gathered, layered composite material according to claim 1, wherein the at least one additional layer is
10 selected from the group consisting of fabric, film and foam.

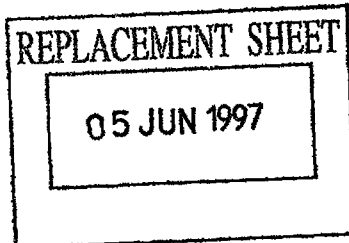
12 The gathered, layered composite material according to claim 11, wherein the fabric is selected from the group consisting of knitted fabrics, woven fabrics, tissues and
15 nonwovens.

13. The gathered, layered composite material according to claim 11, wherein the film is selected from the group consisting of nonperforate films, perforate films, embossed
20 films and nonembossed films.

14. The gathered, layered composite material according to claim 1, wherein the at least one additional layer is elastic.
25

15. The gathered, layered composite material according to claim 1, wherein the at least one additional layer is elongatable and nonelastic.

30 16. The gathered, layered composite material according to

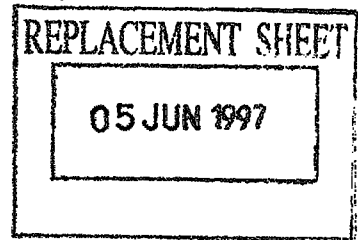


claim 1, wherein the at least one additional layer is nonelongatable and nonelastic.

17. The gathered, layered composite material according to
5 claim 11, wherein the fabric or film is made of materials
selected from the group consisting of polyethylene,
polypropylene, noncrosslinked ethylene vinyl acetate
copolymers, polyamides such as nylon 6 and nylon 6,6,
polyesters, polyvinylidene chloride, polyvinyl chloride,
10 polyester polyurethanes, polyether polyurethanes, natural and
synthetic rubbers, elastomeric polyester and polyether
polyurethanes, elastomeric polyamides, elastomeric
polyesters, styrene butadiene styrene block copolymers,
styrene ethylene butylene styrene block copolymers, styrene
15 isoprene styrene block copolymers, ultralow density
polyethylene, and blends, coextruded laminates, layered
laminates of such materials, and combinations thereof.

18. The gathered, layered composite material according to
20 claim 11, wherein the fabric is made of fibers selected from
the group consisting of woodpulp, cotton, rayon, wool, linen,
silk, ramie, jute, polyethylene, polypropylene, polyester,
polyester polyurethane, polyether polyurethane, bicomponent
fibers such as polyethylene and polypropylene, polyethylene
25 and polyester, polypropylene and polyester and low and high
melting polyesters, and combinations thereof.

19. The gathered, layered composite material according to
claim 1, wherein the spaced apart positions are parallel
30 lines, the lines being selected from the group, straight,



curved, continuous, discontinuous and combinations thereof.

20. A method of forming a gathered, layered composite material comprising:

5

tensioning a first layer of a flexible, elongatable material in an amount for it to be reversibly elongated in the direction of tensioning and for it to be reversibly narrowed in a direction coplanarly orthogonal to the direction of tensioning;

10

bonding the first layer, while it is being concomitantly tensioned in the direction of tensioning and narrowed orthogonal to the direction of tensioning, by a bonding means at spaced apart positions along a substantial portion of the first layer, to at least one additional layer comprised of a flexible nontensioned material, to form a layered composite material;

15

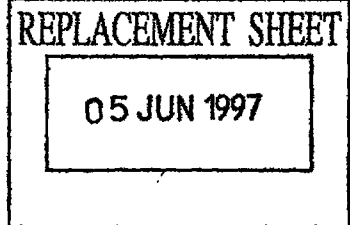
and then releasing both the tensioning, and the narrowing of the first layer, to form a three dimensional, layered composite material, wherein both the first layer and the at least one additional layer are gathered, the gathers of one layer being aparallel to the gathers of the other layer.

20

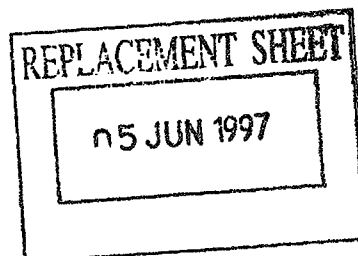
25

21. The gathered, layered composite material according to claim 20, wherein the first layer is a material selected from the group consisting of fabric, film and foam.

30



22. The gathered, layered composite material according to claim 21, wherein the film is selected from the group consisting of nonperforate films, perforate films, embossed films and nonembossed films.
- 5
23. The gathered, layered composite material according to claim 21, wherein the fabric, film or foam is nonelastic.
24. The gathered, layered composite material according to claim 21, wherein the fabric or film is made of materials selected from the group consisting of polyethylene, polypropylene, noncrosslinked ethylene vinyl acetate copolymers, polyamides such as nylon 6 and nylon 6,6, polyesters, polyvinylidene chloride, polyvinyl chloride, polyester polyurethanes, polyether polyurethanes, and blends, coextruded laminates, layered laminates of such materials, and combinations thereof.
- 10
- 15
25. The gathered, layered composite material according to claim 23, wherein the nonelastic fabric, film or foam is tensioned in an amount sufficient to stretch the fabric, film or foam to at least 1% greater than its original length.
- 20
26. The gathered, layered composite material according to claim 23, wherein the nonelastic fabric, film or foam is tensioned in an amount sufficient to stretch the fabric, film or foam in an amount from about 1% to about 60% greater than its original length.
- 25
- 30 27. The gathered, layered composite material according to



claim 23, wherein the nonelastic fabric, film or foam is tensioned in an amount sufficient to stretch the fabric, film or foam from about 5 to about 35% greater than its original length.

5

28. The gathered, layered composite material according to claim 21, wherein the fabric is selected from the group consisting of knitted fabrics, woven fabrics, tissues and nonwovens.

10

29. The gathered, layered composite material according to claim 21, wherein the fabric is made of fibers selected from the group consisting of polyethylene, polypropylene, polyester, polyester polyurethane, polyether polyurethane, bicomponent fibers and filaments, the bicomponent fibers such as polyethylene and polypropylene, polyethylene and polyester, polypropylene and polyester and low and high melting polyesters, and combinations thereof.

20

30. The gathered, layered composite material according to claim 21, wherein the foam is made of materials selected from the group consisting of polyester polyurethanes, polyether polyurethanes and polyethylene.

25

31. The gathered, layered composite material according to claim 21, wherein the fabric, film or foam is elastic.

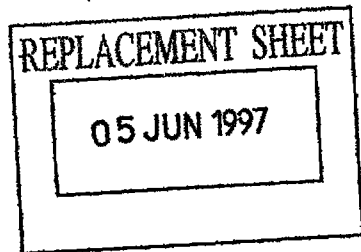
30

32. The gathered, layered composite material according to claim 31, wherein the fabric, film or foam is made of materials selected from the group consisting of natural and



05 JUN 1997

- synthetic rubbers, elastomeric polyester and polyether polyurethanes, elastomeric polyamides and elastomeric polyesters, styrene butadiene styrene block copolymers, styrene ethylene butylene styrene block copolymers, styrene
- 5 isoprene styrene block copolymers, noncrosslinked ethylene vinyl acetate copolymers, ultralow density polyethylene, and blends, coextruded laminates, layered laminates of such materials, and combinations thereof.
- 10 33. The gathered, layered composite material according to claim 20, wherein the at least one additional layer is selected from the group consisting of fabric, film and foam.
- 15 34. The gathered, layered composite material according to claim 33 wherein the fabric is selected from the group consisting of knitted fabrics, woven fabrics, tissues and nonwovens.
- 20 35. The gathered, layered composite material according to claim 33, wherein the film is selected from the group consisting of nonperforate films, perforate films, embossed films and nonembossed films.
- 25 36. The gathered, layered composite material according to claim 20, wherein the at least one additional layer is elastic.
- 30 37. The gathered, layered composite material according to claim 20, wherein the at least one additional layer is elongatable and nonelastic.



38. The gathered, layered composite material according to claim 20, wherein the at least one additional layer is nonelongatable and nonelastic.

5 39. The gathered, layered composite material according to claim 33, wherein the fabric or film is made of materials selected from the group consisting of polyethylene, polypropylene, noncrosslinked ethylene vinyl acetate copolymers, polyamides such as nylon 6 and nylon 6,6,
10 polyesters, polyvinylidene chloride, polyvinyl chloride, polyester polyurethanes, polyether polyurethanes, natural and synthetic rubbers, elastomeric polyester and polyether polyurethanes, elastomeric polyamides, elastomeric polyesters, styrene butadiene styrene block copolymers,
15 styrene ethylene butylene styrene block copolymers, styrene isoprene styrene block copolymers, ultralow density polyethylene, and blends, coextruded laminates, layered laminates of such materials, and combinations thereof.

20 40. The gathered, layered composite material according to claim 33, wherein the fabric is made of fibers selected from the group consisting of woodpulp, cotton, rayon, wool, linen, silk, ramie, jute, polyethylene, polypropylene, polyester, polyester polyurethane, polyether polyurethane, bicomponent
25 fibers and filaments, the bicomponent fibers such as polyethylene and polypropylene, polyethylene and polyester, polypropylene and polyester and low and high melting polyesters, and combinations thereof.

30 41. The gathered, layered composite material according to



05 JUN 1997

claim 20, wherein the first layer is tensioned in a single direction.

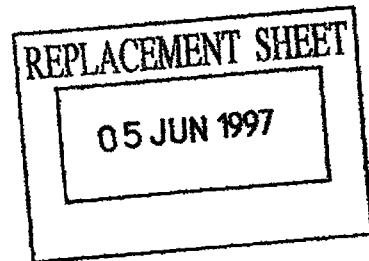
5 42. The gathered, layered composite material according to claim 20, wherein the first layer is tensioned in first and second directions, the second direction being substantially orthogonal to the first direction, wherein the amount that the first layer is tensioned in the second direction is substantially less than the amount that it will be narrowed,
10 when the tensioning and narrowing are subsequently relaxed.

43. The gathered, layered composite material according to claim 20, wherein the bonding means is selected from the group consisting of adhesive bonding, heat sealing,
15 mechanical crimping and combinations thereof.

44. The gathered, layered composite material according to claim 43, wherein the adhesive bonding means is a hotmelt adhesive.
20

45. The gathered, layered composite material according to claim 20, wherein the spaced apart positions are parallel lines, the lines being selected from the group, straight, curved, continuous, discontinuous and combinations thereof.
25

46. A sanitary napkin having a fluid pervious top layer, a fluid impervious bottom layer, and an absorbent core therebetween, wherein the top layer and/or the bottom layer is comprised of a gathered, layered composite material, the
30 material further comprising:



5 a first layer of a flexible, reversibly elongatable material, bonded at spaced apart positions, along a substantial portion of the first layer, to at least one additional layer of a flexible nontensioned material;

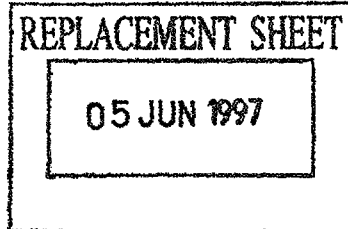
10 wherein both the first layer and the at least one additional layer are gathered, the gathers of one layer being aparallel to the gathers of the other layer.

15 47. A sanitary napkin, having a longitudinal centerline, a pair of lateral sides and a pair of transverse ends, the napkin comprising a fluid pervious top layer, a fluid impervious bottom layer, and an absorbent core therebetween;

20 the napkin having within the central portion a pair of deeply embossed channels, the channels including the top layer and at least part of the absorbent core; each channel curving concavely toward each pair of lateral sides, respectively;

25 the absorbent core being thicker in the central portion, and tapering to less thickness form the central portion to the transverse ends; and being further characterized by having the thickness of the central portion between the channels to be at least equal to the thickness of the central portion between the channels and the lateral sides; and

30 wherein the top layer and/or the bottom layer is comprised of a gathered, layered composite material, the material further comprising:



5

a first layer of a flexible, reversibly elongatable material, bonded at spaced apart positions, along a substantial portion of the first layer, to at least one additional layer of a flexible nontensioned material;

10

wherein both the first layer and the at least one additional layer are gathered, the gathers of one layer being aparallel to the gathers of the other layer.

15

48. A sanitary napkin, having a longitudinal centerline, a pair of lateral sides and a pair of transverse ends, the napkin comprising a fluid pervious top layer, a fluid impervious bottom layer, and an absorbent core therebetween;

20

and a pair of cuffs, each having a base portion and a distal end, each cuff longitudinally extending and attached, along its respective base portion, to one or a combination of the top layer, the bottom layer and respective lateral side; the longitudinally extending attachment being anywhere, between the longitudinal centerline; such that the distal ends of the cuffs extend at least outward from the lateral sides of the napkin;

25

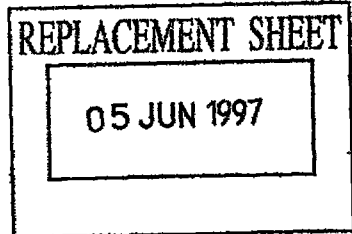
and wherein any or all of the top layer, the bottom layer and the cuffs is comprised of a gathered, layered composite material, the material further comprising:

30

a first layer of a flexible, reversibly elongatable material, bonded at spaced apart positions, along a



-66-



substantial portion of the first layer, to at least one additional layer of a flexible nontensioned material;

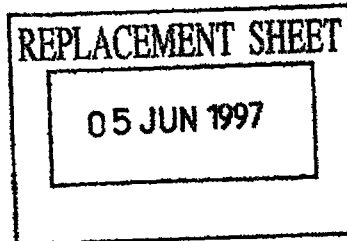
5 wherein both the first layer and the at least one additional layer are gathered, the gathers of one layer being aparallel to the gathers of the other layer.

49. A sanitary napkin, having a longitudinal centerline, a pair of lateral sides and a pair of transverse ends, the
10 napkin comprising a fluid pervious top layer, a fluid impervious bottom layer, and an absorbent core therebetween; and

a pair of wings, each having a base portion and a distal end,
15 each wing longitudinally extending and attached, along its respective base portion, to one or a combination of the top layer, the bottom layer and the respective lateral side; the longitudinally extending attachment being anywhere, between the lateral side and the longitudinal centerline; such that
20 the distal ends of the wings extend at least outward from the lateral sides of the napkin; and

and wherein any or all of the top layer, the bottom layer and the wings is comprised of a gathered, layered composite
25 material, the material further comprising:

a first layer of a flexible, reversibly elongatable material, bonded at spaced apart positions, along a substantial portion of the first layer, to at least one
30 additional layer of a flexible nontensioned material;



wherein both the first layer and the at least one additional layer are gathered, the gathers of one layer being aparallel to the gathers of the other layer.

5

50. A sanitary napkin having a fluid pervious top layer, a fluid impervious bottom layer, an absorbent core therebetween, and at least one insert; the insert being located between the top layer and the bottom layer; and
10 wherein any or all of the top layer, the bottom layer and the insert is comprised of a gathered, layered composite material, the material further comprising:

15 a first layer of a flexible, reversibly elongatable material, bonded at spaced apart positions, along a substantial portion of the first layer, to at least one additional layer of a flexible nontensioned material;

20 wherein both the first layer and the at least one additional layer are gathered, the gathers of one layer being aparallel to the gathers of the other layer.

51. The sanitary napkin according to claim 50, wherein at least one, of the first layer and the at least one additional
25 layer, of which the insert is comprised, is perforate.

52. The sanitary napkin according to claim 50, wherein at least one, of the first layer and the at least one additional layer, of which the insert is comprised, is nonperforate.

A NOVEL LAMINATED COMPOSITE MATERIAL, A METHOD OF MAKING
AND PRODUCTS DERIVED THEREFROM

ABSTRACT

The present invention is directed to a gathered, layered composite material comprised of a fabric, film, foam or
5 combination thereof that has a first layer of flexible reversibly elongatable material, bonded at spaced apart positions to at least one additional layer of a flexible material, wherein both layers are gathered, the gathers of one layer being aparallel to the gathers of the other layer.
10 The composite material may be made by first reversibly tensioning, the first layer and concomitantly reversibly narrowing the first layer, in a direction coplanarly orthogonal to that in which tension is applied. The tensioned and narrowed first layer is then bonded discrete
15 spaced apart positions to an at least one additional layer of a flexible nontensioned material, comprised of a fabric, film or foam or combination thereof. When these resulting tensioned and adhered layered materials are subsequently untensioned, they form a three dimensional layered composite
20 material, wherein both layers are gathered, the gathers of one layer being aparallel to the gathers of the other layer. The layered composites of this invention may be used in the manufacture of various products including, but not limited to, sanitary absorbent products such as diapers, sanitary
25 napkins, incontinence products, as well as bandages, wound dressings, surgical dressings, cushioning and bandages for the treatment of stasis ulcers, surgical drapes, underpads and the like.

30 Figure 9

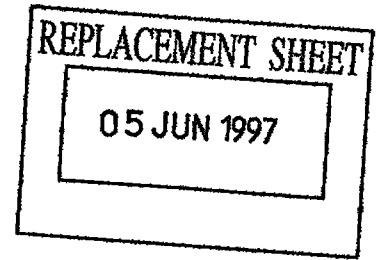


FIG. 1A

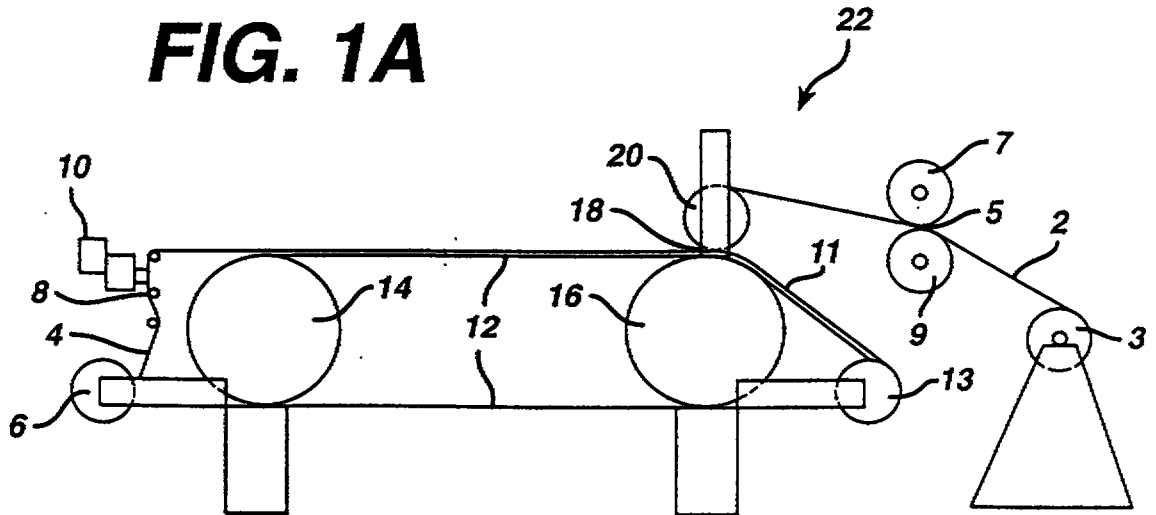


FIG. 1B

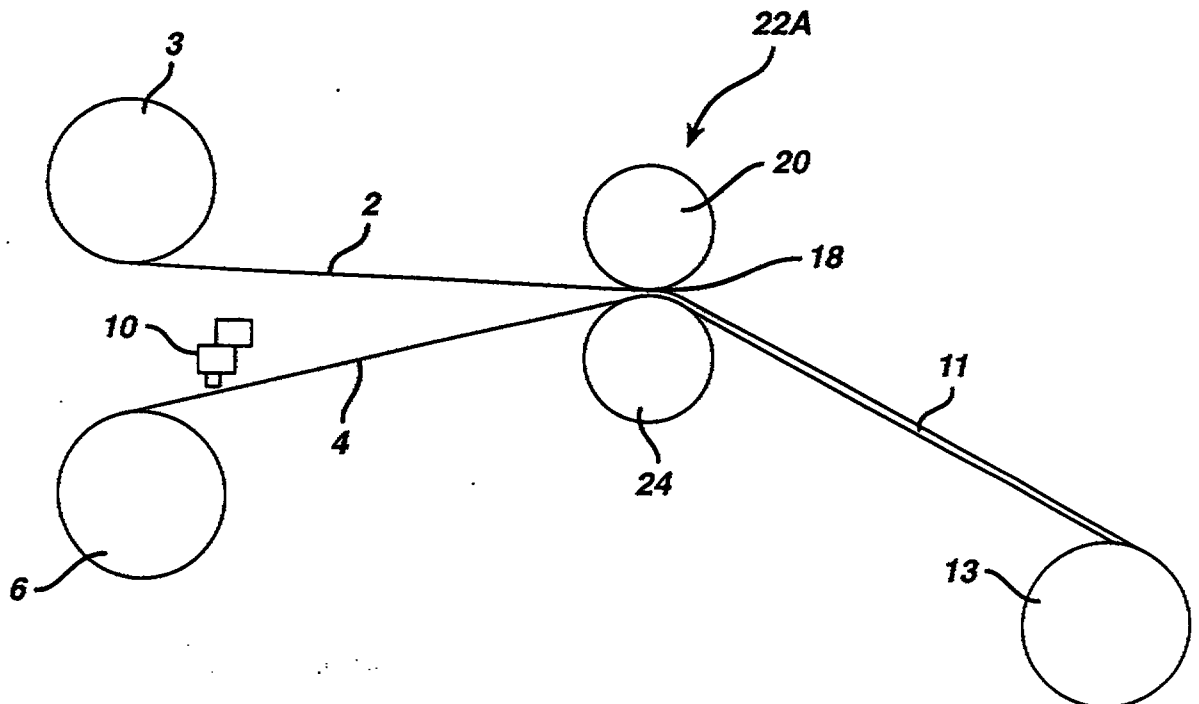


FIG. 2A

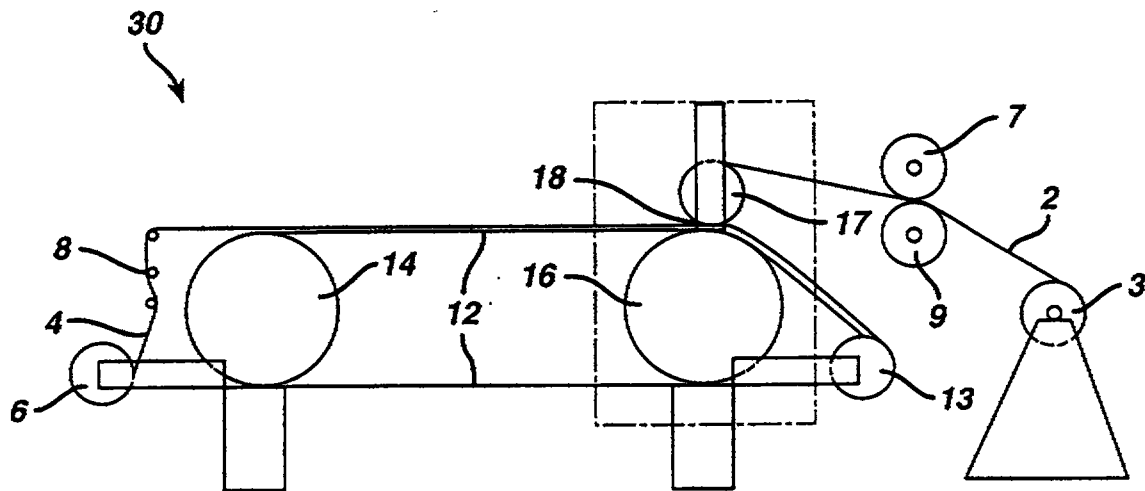


FIG. 2B

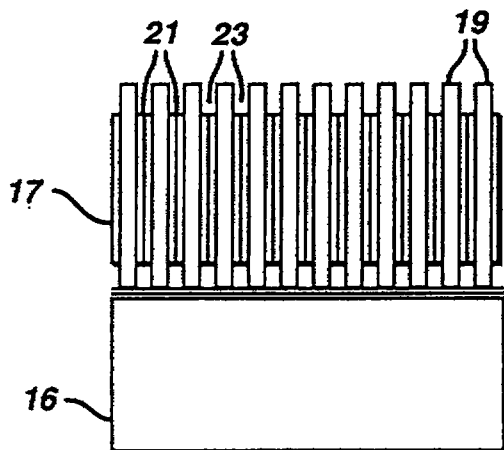
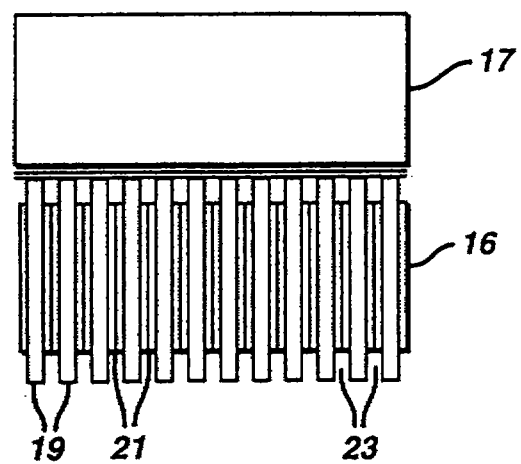


FIG. 2C



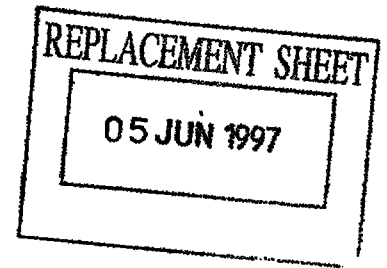


Fig. 2 - D

30A

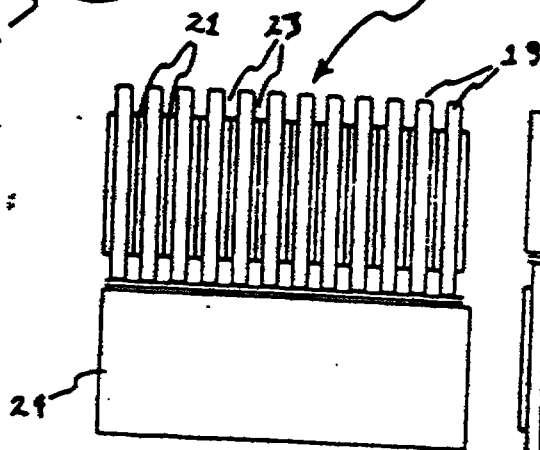
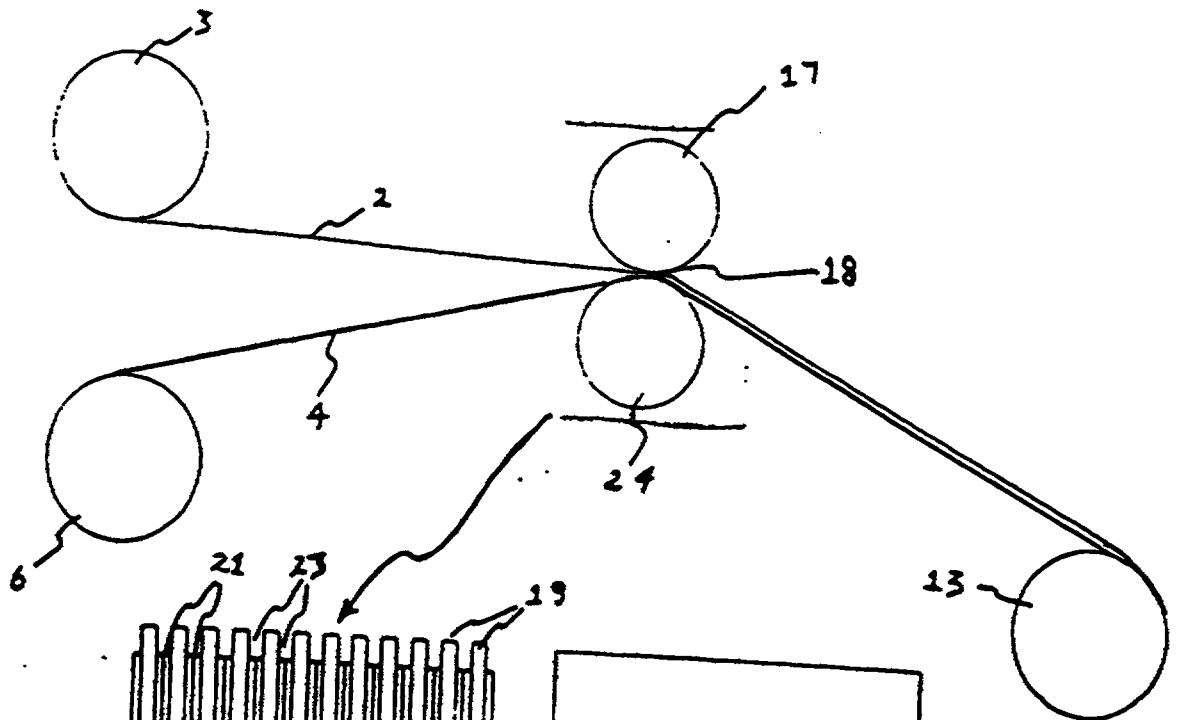


Fig. 2- E

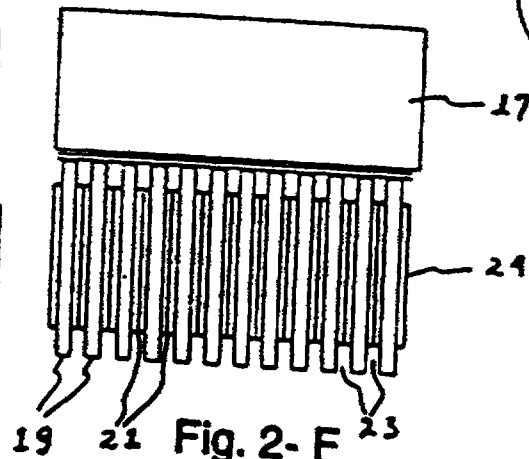


Fig. 2- F

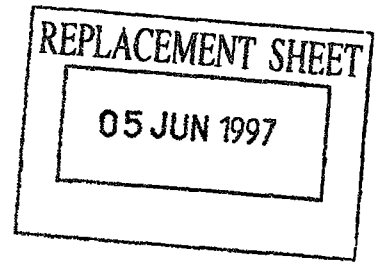


FIG. 3

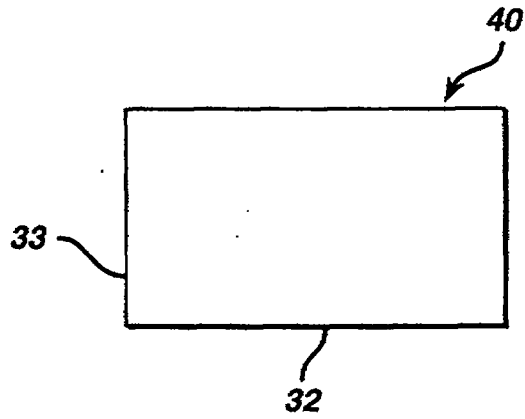


FIG. 4

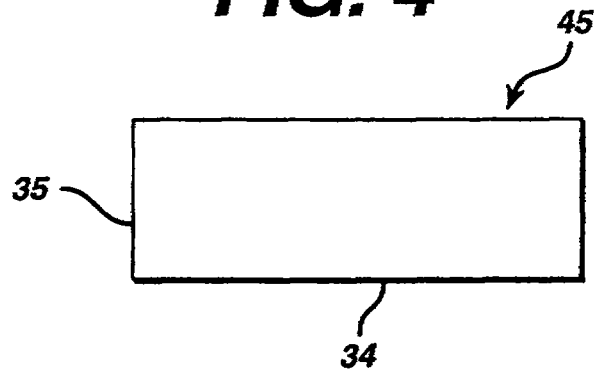


FIG. 5

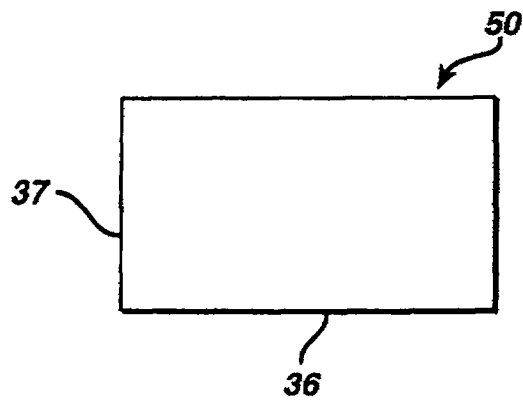


FIG. 7

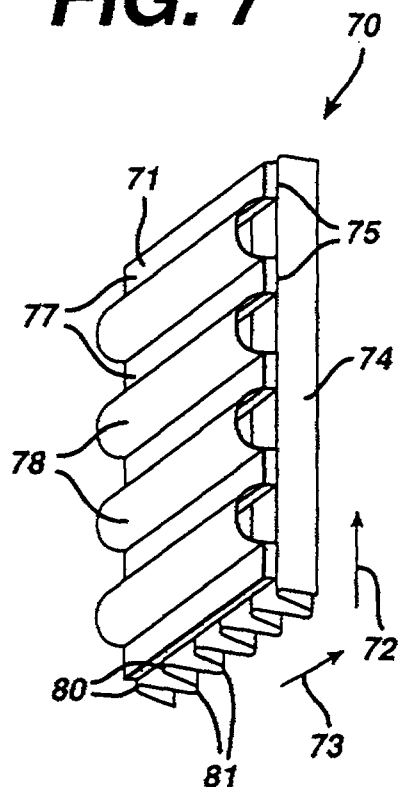


FIG. 8

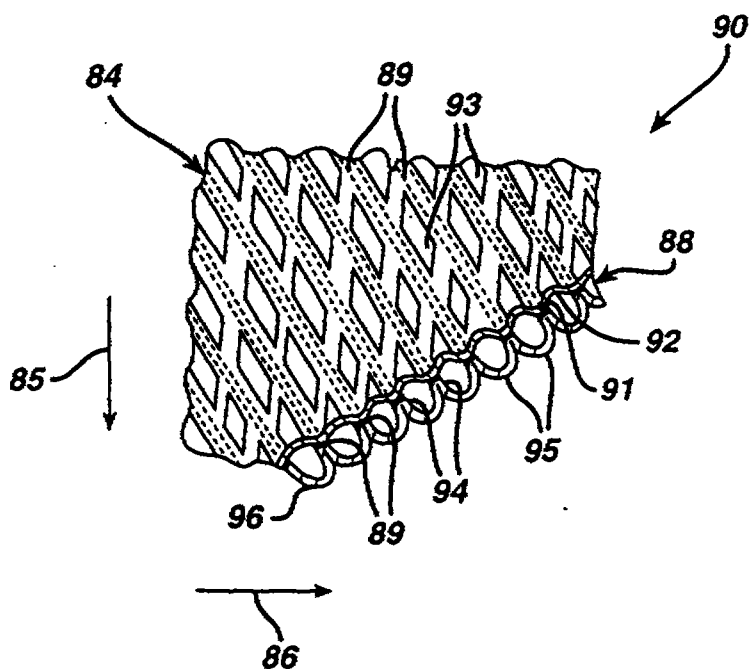
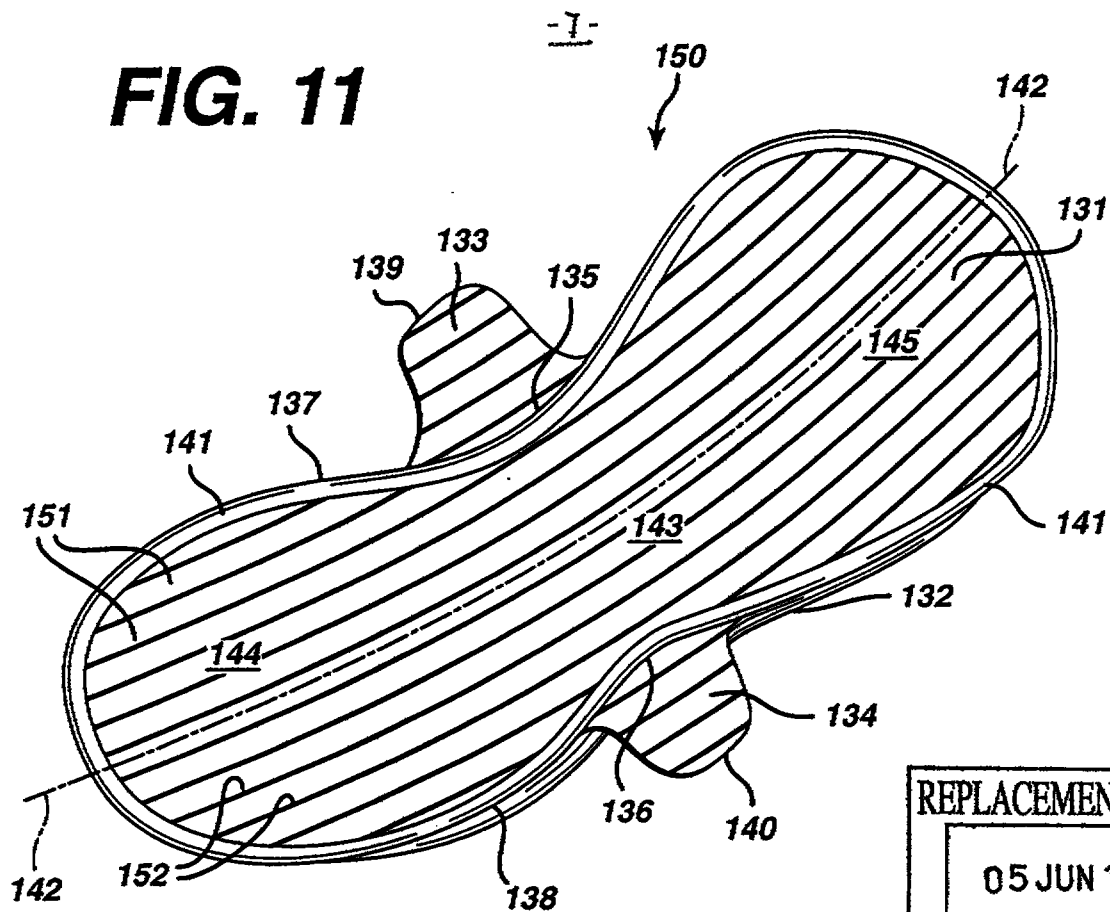


FIG. 11



REPLACEMENT SHEET

05 JUN 1997

FIG. 12

