

Brigard & Castro
Abogados

SUPERINTENDENCIA Y COMERCIO
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Trámite : 142 PATENTES / 1 REGISTRO/ 536 PETICION
Dependencia: 1001 DIVISION DE NUEVAS CREACIONES
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Señores
SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
DIVISION DE NUEVAS CREACIONES
E. S. D.

REF.: Expediente No. 00 075.409 solicitud de Patente a nombre de
KIMBERLY – CLARK WORLDWIDE, INC.

RAMIRO CASTRO DUQUE, vecino de Bogotá, portador de la tarjeta profesional No. 1003 del Consejo Superior de la Judicatura, obrando como apoderado de la Sociedad **KIMBERLY – CLARK WORLDWIDE, INC.**, según lo acredita el documento de poder protocolizado en la Secretaría General bajo el No. 17397, de acuerdo con el Artículo 44 de la Decisión 486 de la Comisión de la Comunidad Andina, me permito solicitar que se examine si la invención contenida en la solicitud en referencia es patentable.

De acuerdo con lo anterior, me permito anexar el recibo oficial de caja No. 02-67,130 por valor de \$318.000.

Señor Superintendente,



RAMIRO CASTRO DUQUE
C.C. No. 170.322 de Bogotá
Código 340
T.P. No.1003 del C.S.J.
Cra 7 No. 16-56 Piso 9

Octubre 08, 2002
CPB/hsr

128

Industria y Comercio

SUPERINTENDENCIA

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FECHA : OCTUBRE 7 DE 2002

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Radicacion : 01075409 00000005 Folios: 2
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CONSIGNACION

DEPOSITANTE	TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PGO	Vr. PAGO
BRIGARD & CASTRO LTDA	CONSIGNACION	BANCO POPULAR	030-00110-6	1323047	07/10/2002	1,693,000.00
BRIGARD & CASTRO LTDA	CONSIGNACION	BANCO POPULAR	030-00110-6	1323048	07/10/2002	10,540,000.00

CONCEPTO

CANT. CONTABILITICO	CONCEPTO	TOTAL CONCEPTO
1 50005-01-01 SOLICITUDES	85 EXAMEN DE PATENTABILIDAD DE INVEN	318,000.00
	TOTAL :	318,000.00

SON: TRESCIENTOS DIEZ Y OCHO MIL PESOS

RESPONSABLE : _____

RECIBO DE CAJA APLICADO AL EXPEDIENTE No. _____

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**SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
DIVISIÓN DE NUEVAS CREACIONES**

2020

Bogotá, D. C., 20 de Octubre de 2005

Doctor

RAMIRO CASTRO DUQUE

Representante **KIMBERLY – CLARK WORLDWIDE INC.**

ASUNTO	Radicación No.	00-75409
	Trámite	002
	Evento	001
	Actuación	430.
	Oficio	609.6
	Folios	108

Como resultado del examen de fondo, realizado con fundamento en el artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le comunica

1) Documentos estudiados:

- a) Para el presente estudio se tendrán en cuenta el capítulo descriptivo, comprendido en los folios 4 a 32 de la solicitud en estudio.
- b) Para el presente estudio se tendrán en cuenta los dibujos comprendidos en los folios 130 a 137 de la solicitud en estudio.
- c) Para el presente estudio se tendrá en cuenta el capítulo reivindicatorio que comprende 20 reivindicaciones en los folios 66 a 71 de la solicitud en estudio.
- d) Conforme lo establece los artículos 9, 10 y 11 de la decisión 486 de la Comisión de la Comunidad Andina, la presente solicitud en estudio fue presentada el 4 de octubre de 2000, y en el momento de la radicación NO se reclamó prioridad alguna

2) Objeto de la invención

- a) Las reivindicaciones 1 a 20 de la solicitud en estudio se refieren a
 - i) (1.-)Un artículo absorbente que comprende: a) una porción frontal; b) una porción posterior que tiene un primer extremo y un segundo extremo, la porción posterior que está dividida en una primera sección y una segunda sección, la primera sección localizada adyacente al primer extremo y la segunda sección localizada adyacente al segundo extremo, las primera y segunda secciones que son extensibles en por lo menos una dirección, y la segunda sección que tiene un primer borde lateral, un segundo borde lateral y primer y segundo elásticos de piernas cada uno colocado adyacente a uno de los primer y segundo bordes laterales; c) una porción de entrepierna que conecta la porción frontal a la porción

posterior, la porción de entrepierna que tiene un primer borde lateral, un segundo borde lateral y primer y segundo elásticos de entrepierna cada uno colocado adyacente a uno de los primer y segundo bordes laterales, los primer y segundo elásticos de entrepierna que cooperan con los primer y segundo elásticos de piernas para proporcionar un ajuste cercano contra un cuerpo de usuario; d) un absorbente asegurado a por lo menos una de las porciones frontal, posterior o de entrepierna; y e) un medio para agarrar en forma liberable la porción posterior a la porción frontal por lo cual se forma un artículo similar a pantaloncillo que tiene una abertura de cintura y un par de aberturas de piernas.

ii) (10.-) Un artículo absorbente que comprende...

iii) (15.-) Un artículo absorbente que comprende...

- b) Los anteriores productos buscan artículos absorbentes desechables más cómodos para los usuarios.
- c) Según la Clasificación Internacional de Patentes, la codificación para esta solicitud corresponde a: A 61F 13/15

3) Claridad de la Solicitud

- a) El artículo 30 de la Decisión 486 de la Comisión de la Comunidad Andina establece que

"Las reivindicaciones definirán la materia que se desea proteger mediante la patente. Deben ser claras y concisas y estar enteramente sustentadas por la descripción. Las reivindicaciones podrán ser independientes o dependientes. Una reivindicación será independiente cuando defina la materia que se desea proteger sin referencia a otra reivindicación anterior. Una reivindicación será dependiente cuando defina la materia que se desea proteger refiriéndose a una reivindicación anterior. Una reivindicación será dependiente cuando defina la materia que se desea proteger refiriéndose a una reivindicación anterior.- Una reivindicación que se refiera a dos o más reivindicaciones anteriores se considerará reivindicación dependiente múltiple."

El capítulo reivindicatorio no es claro toda vez que no se precisa la materia sobre la cual se solicita protección. Como se explicará en el punto 4), la presente solicitud no posee unidad de invención, por lo que no está definida la materia sobre la cual se solicita protección.

De acuerdo a lo anterior, el capítulo reivindicatorio no cumple con el requisito de claridad de acuerdo a lo establecido en el Art. 30 de la Decisión 486.

4) Evaluación de la Unidad de Invención

El artículo 25 de la Decisión 486 de la Comisión de la Comunidad Andina establece

"La solicitud de patente sólo podrá comprender una invención o un grupo de invenciones relacionadas entre sí, de manera que conformen un único concepto inventivo"

La presente solicitud carece de unidad de invención toda vez que configura **TRES** diferentes objetos. Aunque se dirigen a artículos absorbentes desechables la definición de la materia que caracteriza a cada una de las reivindicaciones independientes (1, 10 y 15) es muy diferente entre sí. Esto permite afirmar que no se trata del mismo producto. Todo el problema radica en configurar varias reivindicaciones independientes con materia diferente. El solicitante debe establecer una sola reivindicación independiente dirigida al producto en la forma más simple de la solicitud de invención. Partiendo de allí establecer reivindicaciones dependientes que amplíen esa forma más simple hasta su forma más compleja.

De acuerdo a lo anterior, la presente solicitud no cumple con el requisito de unidad de invención de acuerdo al Art. 25 de la Decisión 486.

5) Determinación del Estado de la Técnica

El artículo 16 de la Decisión 486 de la Comisión establece:

"El estado de la técnica comprenderá todo lo que haya sido accesible al público por una descripción escrita u oral, utilización, comercialización o cualquier otro medio antes de la fecha de presentación de la solicitud de patente o, en su caso, de la prioridad reconocida."

"Sólo para el efecto de la determinación de la novedad, también se considerará dentro del estado de la técnica, el contenido de una solicitud de patente en trámite ante la oficina nacional competente cuya fecha de presentación o de prioridad fuese anterior a la fecha de presentación o de prioridad de la solicitud de patente que se estuviese examinando, siempre que dicho contenido este incluido en la solicitud de fecha anterior cuando ella se publique o hubiese transcurrido el plazo previsto en el artículo 40."

Consultadas las bases de datos y los archivos con que cuenta la entidad, especialmente bajo las clasificaciones A 61 F 13/15 y las más cercanas a ellas, se encontró que antes del 4 de octubre de 2000 (fecha para determinar el estado de la técnica) habían sido publicados los documentos que se enumeran en la siguiente tabla los cuales se relacionan con artículos absorbentes desechables

De acuerdo con o establecido en el artículo 16 se determinó el estado de la técnica y se encontró el siguiente antecedente:

Nº	Documento	Título	Fecha de Publicación
D1	EP 0 321 985	Stretchable absorbent undergarment	1989.06.28
D2	WO 9611657	Shorts type disposable diaper	1996.04.25
D3	US 4205679	Disposable undergarment	1980.06.03
D4	US 4747846	Stretchable disposable absorbent undergarment	1988.05.31
D5	US 4699621	Form fitting self adjusting disposable garment	1987.10.13
D6	US 4834736	Disposable absorbent garment having elastic outer cover and absorbent insert structure...	1989.05.30
D7	US 5745922	Disposable garment...	1998.05.05

6) Evaluación de los requisitos de patentabilidad

El artículo 14 de la Decisión 486 de la Comisión de la Comunidad Andina establece:

"Los Países Miembros otorgarán patentes para las invenciones, sean de producto o procedimiento, en todos los campos de la tecnología, siempre que sean nuevas tengan nivel inventivo y sean susceptibles de aplicación industrial".

En cumplimiento con este artículo, se procedió a evaluar los requisitos de novedad, nivel inventivo y aplicación industrial con el fin de establecer la patentabilidad de la invención reivindicada en la solicitud en estudio.

a) Evaluación de la novedad y el del Nivel Inventivo

El art. 16 de la Decisión 486 de la Comisión de la Comunidad Andina establece:

"Una invención se considerará nueva cuando no está comprendida en el estado de la técnica." "El estado de la técnica comprenderá todo lo que haya sido accesible al público por una descripción escrita u oral, utilización comercialización o cualquier otro medio antes de la fecha de presentación de la solicitud de patente o, en su caso, de la prioridad reconocida."

"Sólo para el efecto de la determinación de la novedad, también se considerará dentro del estado de la técnica, el contenido de una solicitud de patente en trámite ante la oficina nacional competente, cuya fecha de presentación o de prioridad fuese anterior a la fecha de presentación o prioridad de la solicitud de patente que se estuviese examinando, siempre que dicho contenido esté incluido en la solicitud de fechas de prioridad cuando ella se publique o hubiese transcurrido el plazo previsto en el artículo 40."

El art. 18 de la Decisión 486 de la Comisión de la Comunidad Andina establece:

"Se considerará que una invención tiene nivel inventivo, si para una persona del oficio normalmente versada en el arte en la materia técnica correspondiente, esa invención no hubiese resultado obvia ni se hubiese derivado de manera evidente del estado de la técnica".

Todos los documentos citados en el cuadro del punto 5) relacionan en esencia las mismas partes enumeradas en el documento CO - 0075409 en el capítulo reivindicatorio. Se han encontrado varios documentos que relacionan la conformación objeto de protección pero sólo se indican los primeros siete. Resulta evidente para cualquier técnico tomar lo revelado en dichas anterioridades y llegar a lo que pretende el solicitante se le ampare.

b) Resumen

En conclusión los requisitos de patentabilidad de la presente solicitud se podrían ver afectados así:

Nº	Documento	Reivindicaciones afectadas	Requisito que afecta
D1	EP 0 321 985	1 - 20	Novedad
			Nivel inventivo
D2	WO 9611657	1 - 20	Novedad
			Nivel inventivo
D3	US 4205679	1 - 20	Novedad
			Nivel inventivo
D4	US 4747846	1 - 20	Novedad
			Nivel inventivo
D5	US 4699621	1 - 20	Novedad
			Nivel inventivo
D6	US 4834736	1 - 20	Novedad
			Nivel inventivo
D7	US 5745922	1 - 20	Novedad
			Nivel inventivo

7) Notificación

En cumplimiento del artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le indica que dentro del término de sesenta días contados a partir de la fecha de la notificación de la presente comunicación debe responder a la notificación. En caso de no dar respuesta al presente requerimiento, o si a pesar de la respuesta subsistieran los impedimentos para la concesión, se denegará la patente.

Notifíquese el presente oficio conforme a lo dispuesto por el numeral 5.2, literal e) del capítulo quinto del título primero de la Circular Única N° 10 de 2001


ALIX CARMENZA CÉSPEDES DE VERGEL
Jefe División de Nuevas Creaciones

El anterior requerimiento fue notificado por fijación en la lista, de fecha

27 JUL 2003

Concepto Técnico N°	EXAMINADOR TÉCNICO Código No.	EXAMINADOR JURÍDICO Código No.
1639	202003	

①

EUROPEAN PATENT APPLICATION

② Application number: 88121531.3

③ Int. Cl.⁴: A61F 5/44 , A41B 13/02

④ Date of filing: 22.12.88

⑤ Priority: 22.12.87 US 137284

⑥ Date of publication of application:
28.06.89 Bulletin 89/26

⑦ Designated Contracting States:
BE DE ES FR GB IT NL SE

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⑪ Stretchable absorbent undergarment.

⑫ A stretchable undergarment (28) comprises a liquid-pervious bodyside layer (4), liquid-impervious outer layer (10), an absorbent layer (8), and a stretchable layer (6). The stretchable layer (6) is stretch-bonded to the other layers and, upon relaxing the stretchable layer (6), forms a plurality of rugosities (14,18) in the bodyside layer (4), outer layer (10), and absorbent medium (8). The bonded layers are of a generally trapezoidal shape and have a front end portion (28) that diverges toward a rear end portion (32), wherein the front end portion (28) is from about 20% to about 80% of the width of the rear end portion (32), and the rear end portion (32) is about 20% to about 80% of the length of the bonded layers.

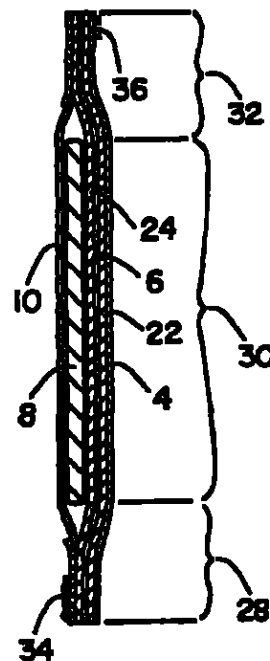


FIG. 16

STRETCHABLE ABSORBENT UNDERGARMENT

The present invention relates to absorbent articles or garments, and more particularly to a stretchable absorbent undergarment intended to be worn for absorbing and retaining liquids and waste material.

Currently, there are numerous kinds of wearable garments intended for use as, for example, infant diapers and adult incontinence garments. Some of these garments are reusable, while others are disposable. Regardless of the disposability of the garment, the garment is generally intended to provide several key features such as good absorbency, containment of liquids and waste materials, dry and wet integrity, dry and wet flexibility, surface dryness, low flowback properties, comfort, fit and discreteness.

Probably the single most important feature to the wearer is containment. One approach to achieving superior containment is to focus on improving the absorbent characteristics of the garment. Development of transfer layer structures and the incorporation of superabsorbent materials are two such examples. Even with these advances, containment continues to be the primary issue to the consumer. Looking beyond these absorbency characteristics, another approach is to define the manner with which the undergarment interacts with a body, and to identify the deficiencies of the conventional absorbent products. Several key areas impacting containment are discussed below.

To the degree the undergarment conforms and responds to the body and changing body geometries as movement occurs, its fit is affected. Naturally, containment will improve with a greater or more intimate fit between the undergarment and the body. Several methods, such as folding, elasticizing and molding, have been used in the preshaping of a predominantly planar garment to form a contoured three-dimensional garment for better fit. However, difficulties with each method exist. For example, folding results in a design or configuration which is subject to areas of gapping and fluid channeling along the fold lines. Elasticizing leg areas forms an improved snugging fit, which is generally only effective at the leg openings. Although a molded product appears to offer improved performance, it is currently limited to providing protection for the female body.

Another area influencing containment is pad deformation. The degree to which a garment can maintain its prewear and/or prewet shape directly impacts on its capacity to absorb and contain fluid. For example, it is known that wood pulp-based absorbents tend to become redistributed during

body movement, thereby decreasing absorbency in the areas of maximum wetting.

Many current absorbent products or garments are layered materials that are peripherally bonded, but allow shifting between layers. However, rapid absorption or transfer of fluid through multiple layers is enhanced by close contact between those layers. Thus, these absorbent products or garments that are only peripherally bonded create gapping or separation between layers that reduces the fluid transfer and absorbent rates, thereby degrading the containment characteristic of the product.

One of the recurring problems with current absorbent garments is that they sacrifice one or more of the earlier-mentioned key features in order to possess or increase the effect of others. For example, absorbency generally can be maximized with a combination of fluff and superabsorbent, but one of the problems with this combination is its integrity. When dry, fluff tends to be redistributed by movement or activities of the wearer, thereby decreasing its absorbency in the areas of maximum wetting. Similarly, after wetting, the combination tends to gather or cluster into separate masses of wetted fluff, which is very uncomfortable and visibly embarrassing to the wearer.

One solution to the above problem is to provide a mechanism that maintains the integrity of the absorbent material, such as by introducing amounts of binders, synthetic fibers or the like. Though this may increase dry and wet integrity, it generally causes a decrease in flexibility, which to the wearer translates into a relatively stiff-feeling mat or structure.

It is therefore an object of the present invention to provide a stretchable absorbent undergarment which helps to avoid the above problems. This object is solved by the stretchable absorbent undergarment as described in independent claims 1 & 7. Further advantageous features of this undergarment are evident from the dependent claims.

The present invention provides a stretchable absorbent undergarment for absorbing human liquids and waste materials and which has improved fit, integrity, surface dryness and minimal pad deformation. The overall stretchability of the entire undergarment provides an added flexibility as it relates to fit. The undergarment conforms to any body geometry and accommodates both a male and female fit. Since the entire undergarment, rather than a portion or peripheral edge only, responds to movement, it provides a self-adjusting fit during body movements. Also, the undergarment fits a wide range of sizes, and since the material lends

itself to an underwear-like fit, it imparts the psychological suggestion of normalcy rather than a diaper-like device.

The undergarment provides increased surface dryness due to the formation of rugosities caused by the stretchable layer. These rugosities provide more available surface area for absorbing fluids, thereby increasing the rate of absorbency. The intimate contact of the undergarment with the body in combination with the overall bulking caused by rugosities also positively affects its absorbency characteristics. The rugosities provide a distancing or separation of the fluid from the body; thus, the body surface is dryer and the wearer perceives increased fluid containment in the absorbent structure. Another positive effect is the minimizing of any wet collapse of the absorbent structure should wood pulp fibers be a component thereof.

In one form of the invention, there is provided a stretchable undergarment for absorbing human liquids and waste materials comprising a liquid-perVIOUS bodyside layer, a liquid-imperVIOUS outer layer, an absorbent layer, and a liquid-perVIOUS stretchable layer disposed between the liquid-perVIOUS bodyside layer and liquid-imperVIOUS outer layer. The stretchable layer is stretch-bonded to the other layers and forms a plurality of rugosities in the bodyside layer, outer layer and absorbent layer upon relaxation. The bonded layers are of generally trapezoidal shape and have a front end portion that diverges toward a rear end portion, with the front end portion being about 20% to about 80% of the width of the rear end portion, which is about 20% to about 80% of the length of the bonded layers.

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 an embodiment of the invention taken in conjunction with the accompanying drawings, wherein:

Figure 1 illustrates one embodiment of the composite before the layers are joined together;

Figure 2 is the embodiment of Figure 1 after the layers have been joined together;

Figure 3 illustrates another embodiment of the composite before the layers are joined together;

Figure 4 is the embodiment in Figure 3 after the layers have been joined together;

Figure 5 is a perspective view of the embodiment in Figure 4 with the top two layers peeled back in order to view the apertures in one of the layers;

Figure 5A is a multi-directional stretchable absorbent composite;

Figure 5B is an enlarged cross section through Figure 2;

Figures 6 and 7 illustrate another embodiment of the composite before and after, respectively, the layers have been joined together;

Figures 8 and 9 illustrate yet another embodiment of the composite before and after, respectively, the layers have been joined together;

Figures 10 and 11 illustrate still another embodiment of the composite before and after, respectively, the layers have been joined together;

Figures 12 and 13 illustrate another embodiment of the composite before and after, respectively, the layers have been joined together;

Figure 14 is a top plan view of an undergarment before the stretchable layer has been relaxed;

Figure 15 is similar to Figure 14 illustrating the effect on the undergarment after the stretchable layer is relaxed;

Figure 16 is a sectional view of Figure 14 taken along line 16-16 and viewed in the direction of the arrows;

Figure 17 illustrates the undergarment of Figures 14 and 15 as it would appear when worn;

Figure 18 illustrates a front view of the undergarment when worn;

Figure 19 is a view of the undergarment of Figure 15 in a partially curved condition it would assume during the placement on a wearer;

Figure 20 is a sectional view of Figure 19 taken along line 20-20 and viewed generally in the direction of the arrows;

Figure 21 is a schematic of an apparatus for making an undergarment;

Figure 22 is a photographic plan view of one side of a unidirectionally stretched composite or undergarment;

Figure 23 is similar to Figure 22 of the other side;

Figure 24 is a photographic plan view of one side of a multi-stretched composite or undergarment;

Figure 25 is similar to Figure 24 of the other side;

Figure 26 is similar to Figure 15 and illustrates a modification to the undergarment; and

Figure 27 is similar to Figure 19 illustrating the modification of Figure 26.

Definitions:

As used herein and in the claims, the term "elastic," "elastic characteristics," "stretch" and "stretchable" are used interchangeably to define a material or composite which can be elongated by at least 25% of its relaxed length, i.e., elongated to

at least 1-1.4 times its relaxed length (an elongation of 25%), and which will recover upon release of the applied force at least 10% of its elongation. According to this definition, upon release of the applied force at 25% elongation, the material or composite must recover to at least about a 15% elongation. For example, a material or composite is deemed to be "elastic" if a sample length of 100 centimeters can be elongated to a length of at least 125 centimeters, and upon release of the applied force recovers to a length of not more than about 115 centimeters. Many elastic or stretchable materials or composites can be elongated by more than 25% of their relaxed length, and many of these will recover to, or close to, their original relaxed length upon release of the applied force. This latter class of materials is generally preferred for purposes of the present invention. These materials can include not only webs of elastic or stretchable films, such as cast or blown films, but also nonwoven fibrous elastic webs such as melt-blown elastomeric fibrous nonwoven webs.

The term "bonding" can mean the joining, adhering, connecting, attaching or the like of two layers or composites, either directly or indirectly together. For example, three layers are directly bonded together if the bond is effective throughout the three layers. These three layers are also said to be bonded if, for example, the outermost two layers are directly bonded along their peripheries so as to capture or sandwich the middle layer therebetween.

The term "transfer layer" refers to a layer of material that primarily directs fluid flow in the Z-direction, which is the direction through the thickness of the layer.

The term "wicking layer" refers to a layer that primarily directs liquid flow in multiple directions in the X-Y plane, which is the plane defined by the length and width of the layer.

Referring to Figures 1 and 2, one embodiment of the stretchable absorbent composite 2 comprises liquid-permeable bodyside liner 4, liquid-permeable stretchable or elastomeric layer 6, absorbent medium 8 and liquid-impermeable outer cover 10. In this particular embodiment, elastomeric layer 6 is made permeable by a plurality of apertures 12 disposed therein.

Figure 1 illustrates composite 2 with the layers separated and the stretchable or elastomeric layer 6 in its relaxed, unstretched condition. In the manufacture of composite 2, which will be described in greater detail below, elastomeric layer 6 is stretched to a desired elongation, and then liner 4, elastomeric layer 6, absorbent assembly 8 and cover 10 are bonded together. After the bonding, composite 2 is relaxed so that elastomeric layer 6 will recover from its stretched state. In doing so,

liner 4, absorbent medium 8 and outer cover 10 are gathered, as illustrated in Figure 2, to form a plurality of rugosities 14 and a plurality of air pockets 9 on either side of elastomeric layer 6 within or inside composite 2. Naturally, rugosities 14 inherently form or create air spaces between one another. When elastomeric layer 6 is elongated in a single direction, such as the machine direction indicated by arrows in Figure 5, the rows 18 (Figs. 5 and 22, 23) of rugosities 14, and air pockets 9, are generally perpendicular to the direction, i.e., machine direction of elongation of elastomeric layer 6. If elastomeric layer 6 is multi-directionally elongated, for example, in the X- and Y-directions, then the finished stretchable absorbent composite 2 has a quilted-like or wormy pattern, as illustrated in Figs. 5A and 24, 25.

Figure 5B illustrates an enlarged cross-sectional view through composite 2 in Figure 2. Because elastomeric layer 6 is in its relaxed, unstretched condition, liner 4, absorbent 8 and cover 10 have been gathered into a plurality of rows 16 of rugosities 14. Since these layers, i.e., liner 4, absorbent 8 and cover 10, are gathered into rugosities 14, there is a greater amount of surface area per square cm (or sq. in.) than if the layers were flat or planar. Furthermore, each rugosity 14 has a plurality of smaller or finer wrinkles 18 in its opposite surfaces 20 which extend outwardly relative to elastomeric layer 6. Both rugosities 14 and wrinkles 18 are formed upon relaxing elastomeric layer 6, but they have been differentiated herein to distinguish the larger irregularities of rugosities 14 with the finer irregularities of wrinkles 18. Wrinkles 18 also serve the same purpose as rugosities 14 in providing a larger surface area per sq.cm.(or sq.in.) of composite 2, as compared to a flat or planar surface.

Since stretchable absorbent composite 2 has a greater surface area per sq. cm.(or sq.in.) due to rugosities 14, wrinkles 18, and air pockets 9, it has been discovered that the functions of the particular layers are surprisingly increased. For example, because liner 4 is gathered into a bulky condition, it has a greater surface area per sq.cm. (or sq.in.) which results in increased body surface dryness. Naturally, the greater the surface area of a liquid-receiving layer, the greater amount of liquid the layer can act upon. Similarly, absorbent 8, because of rugosities 14, wrinkles 18, and pockets 9, has an improved capacity per unit area for receiving, absorbing and retaining liquid. Again, because of the increased surface area per sq. cm. (or sq. in.) of absorbent medium 8, it is better able to handle or manage greater amounts of liquid, as compared to a flat or planar absorbent of the same finished dimensions.

With reference to outer cover 10, the rugosities

14 and wrinkles 18 provide a cover that is quieter during body movement and present a cloth-like appearance.

Liquid permeable bodyside liner 4 can be a nonwoven web or sheet of polyolefin fibers, such as polypropylene, polyester, polyethylene, Rayon, Chisso and the like. Liner 4 can also be a nonwoven web of synthetic or natural fibers or a blend thereof, a plastic film with perforations or an expanded plastic webbing material or a scrim material. Preferably, liner 4 is spunbonded polyethylene or spunbonded polypropylene having a basis weight of about 5.67 grams to 28.35 grams (about 0.2 to about 1.0 ounces per square yard). More preferably, liner 4 is spunbonded polypropylene having a basis weight of about 5.67 grams to about 28.35 grams (about 0.2 to about 1.0 ounces per square yard.) The material of which liner 4 will be made for any specific embodiment or variation can vary depending upon the exact properties or characteristics desired of liner 4. Generally, it is desired that liner 4 be hydrophobic and have high fluid transfer rates, such as a penetration rate of about 0.05 to about 8.0 ml/sec/cm², and preferably about 0.5 to about 2.5 ml/sec/cm². Liner 4 also exhibits good hand properties.

A wide variety of materials can be employed as elastomeric layer 6 and include not only webs of elastic films, such as cast or blown films, but also nonwoven fibrous elastic webs such as, for example, meltblown or spunbonded elastomeric fibrous nonwoven webs. Elastomers may be incorporated into any one of the layers, for example, a meltblown liner, staple conform absorbent, or film. Other materials, such as self-adhering elastomeric materials and extrudable elastic films that shrink and become elastic when cooled, are also suitable for use as elastomeric layer 6. A useful material for making elastomeric layer 6, and most preferably for making meltblown elastomeric fibers, is a block copolymer having the general formula A-B-A', wherein A and A' are each a thermoplastic polymer endblock or segment which includes a styrenic moiety and B is an elastomeric polymer midblock such as a conjugated diene or lower alkene. Materials of this general type are disclosed in U.S. Patent No. 4,333,782, issued June 8, 1980 to H. A. Pieniak. Similar materials are disclosed in U.S. Patent No. 4,418,123, issued November 29, 1983 to William L. Bunnelle. Commercially available A-B-A' block copolymers having thermoplastic polystyrene endblocks or segments and a saturated or essentially saturated poly(ethylene-butylene) midblock B or segment, sometimes referred to as an S-EB-S polymer, are available under the trade designation KRATON G, for example, Kraton G-1860, Kraton G-1852, Kraton GX-1857 and Kraton G-2740X, from The Shell Chemical Company. Other

examples of elastomeric materials for use in the present invention include polyester elastomeric materials such as, for example, those available under the trade designation Hytrel from E. I. DuPont de Nemours and Company; polyurethane elastomeric material such as, for example, those available under the designation Estane from B. F. Goodrich and Company; and polyamide elastomeric material such as, for example, those available under the trade designation Pebax from the Rilsan Company.

Suitable elastic films, as distinguished from an elastic nonwoven web of elastomeric fibers, may also be utilized in accordance with the invention, for example, elastic film sold under the trade name Polytrope by A. Schulman Corporation of Akron, Ohio.

Elastomeric layer 6 is elongatable or stretchable from about 10% to about 800% of its relaxed length, and has good recovery such as at least about 10%. Elastomeric layer 6 also includes apertures 12 that allow rapid fluid passage or transfer therethrough in the direction toward absorbent medium 8 and eliminates or minimizes liquid flow in the reverse direction. Generally, apertures 12 are provided in any manner resulting in the desired fluid transfer properties or rates. Elastomeric layer 6 can also be liquid-permeable due to inherent pores in the material. For example, a meltblown process provides pores in the meltblown product and the addition of a surfactant, if necessary, makes the meltblown product hydrophilic. A preferred basis weight for elastomeric layer 6 is about 10 grams per square meter to about 200 grams per square meter, and a more preferred basis weight is about 80 grams per square meter to about 150 grams per square meter.

Absorbent medium 8 can be made of any suitable absorbent material, for example, a cellulosic material such as an air-formed batt of wood pulp fibers or a batt of meltblown fibers such as polypropylene, polyethylene, polyester and the like. Absorbent medium 8 may also be a bonded carded web of synthetic or natural fibers, a composite of meltblown fibers of polypropylene, polyethylene, polyester mixed with a cellulosic material, or a blend of cellulosic material with staple textile fibers such as Rayon and the like. Absorbent medium 8 may also contain superabsorbent materials to increase its absorbent capacity. Examples of suitable superabsorbent materials include grafted starch, starch polyacrylic acid grafted methyl cellulose, modified polyvinyl alcohols, polyacrylic acid salts that are cross-linked to form absorbent polymers and the like. Absorbent medium 8 may also include layers of different absorbent structure, such as a meltblown layer of polypropylene and a layer of fluff with a superabsorbent material. Absorbent medium 8 may also be made of a foam-type material

or a coform material.

In one preferred embodiment, absorbent medium 8 comprises a blend of 70% by weight polyester and 30% by weight of a binder, such as Chisso, having a basis weight of about 70 grams per square meter and mixed therewith a superabsorbent with a basis weight of about 16 grams per square meter.

In another preferred embodiment, absorbent medium 8 is a blend of 60% by weight fluff pulp and 40% by weight polyethylene, having a basis weight of about 150 grams per square meter, with a superabsorbent having a basis weight of about 16 grams per square meter mixed therewith.

Outer cover 10 can be made of any suitable liquid-impermeable material and can also be made of a liquid-impermeable, air-permeable material. Outer cover 10 is preferably made of a polyethylene or polypropylene film having a thickness between about .007 mm (about 0.3 mil) to about .038 mm (about 1.5 mils) preferably about .015 mm (about 0.6 mils). Outer cover 10 can also be a meltblown or film material made of polyethylene, polypropylene or polyolefin copolymers such as ethylene vinyl acetate, ethylene methyl acrylate, ethylene ethyl acrylate, polyvinyl chloride, Nylon and the like. Other acceptable materials include a single spunbonded layer of the above types of materials, two layers of spunbonded and meltblown materials or a three-layer material of spunbonded, meltblown and spunbonded material. Suitable foam materials may also be used as outer cover 10 and include such foams as polyester, polyurethane, and EVA blended with polyester or polyurethane.

Outer cover 10 also has good hand properties.

Although Figures 1 and 2 illustrate composite 2 having elastomeric layer 6 between liner 4 and absorbent medium 8, the two can be interchanged such that absorbent medium 8 is adjacent liner 4 and elastomeric layer 6 is adjacent cover 10.

Referring now to Figures 3 and 4, another embodiment of stretchable absorbent composite 2 is illustrated wherein transfer layer 22 has been added between liner 4 and elastomeric layer 6. One of the purposes of transfer layer 22 is to provide rapid fluid transfer in the Z-direction, which is generally the direction perpendicular to the plane of stretchable absorbent composite 2. By thus providing rapid liquid transfer in the Z-direction, the absorbent rate of stretchable absorbent composite 2 is increased. Transfer layer 22 also preferably has low rewet properties and improved wet resiliency. One method of decreasing rewet properties is by distancing the liner from the absorbent, such as by means of air pockets 9. A method for increasing wet resiliency is the use of synthetic fibers or foams.

Rapid liquid transfer in the Z-direction, which

can also be termed the vertical direction with reference to Figures 3 and 4, can be accomplished in one manner by orienting the fibers of transfer layer 22 in the Z-direction. This orientation can be accomplished by an air-laying process.

Transfer layer 22 is preferably a nonwoven web made of thermoplastic fibers, such as polyethylene, polypropylene, polyester and the like. Transfer layer 22 can be a bonded carded web, a meltblown web or a spunbond web of thermoplastic fibers or blends thereof. Specifically, transfer layer 22 can be a bonded carded web comprising 70% by weight of polyester fibers and 30% by weight of a suitable binder, such as Chisso, low-melt powders, and the like, and having a basis weight of about 50 grams per square meter. A preferred basis weight range is about 30 to about 70 grams per square meter. Transfer layer 22 can also be a coform material, such as a carded web of polyester bonded to a spunbonded polypropylene carrier sheet and, if desired, a binding agent such as Chisso, low-melt powders, and the like. Specifically, a coform structure comprising 75% by weight polyester as a carded web bonded to a 25% by weight spunbonded polypropylene carrier sheet. The percentage weights of polyester and polypropylene can be varied as necessary or desired.

As with the embodiment of stretchable absorbent composite 2 in Figures 1 and 2, the embodiment illustrated in Figures 3 and 4 can have transfer layer 22, elastomeric layer 6 and absorbent medium 8 positioned in a different order than illustrated. Any order is acceptable as long as they are between liner 4 and outer cover 10. Preferably, the layers are positioned as illustrated in Figures 3 and 4.

Referring now to Figures 6 and 7, another embodiment of stretchable absorbent composite 2 is illustrated wherein wicking layer 24 has been added between elastomeric layer 6 and absorbent medium 8. Wicking layer 24 serves to rapidly transfer liquid in the X- and Y-directions, which are in the plane of composite 2 so as to provide rapid absorption by absorbent medium 8. The rapid transfer of liquid in the X- and Y-direction is provided by orienting the fibers of wicking layer 24 in the horizontal direction, as viewed in Figures 6 and 7. In other words, the fibers in wicking layer 24 are generally perpendicular to the fibers in transfer layer 22. This horizontal or X- and Y-orientation of fibers can be attained by various processes, such as wet-laying and carding.

Wicking layer 24 can generally be made of the same type of materials as transfer layer 22.

Wicking layer 24, elastomeric layer 6, and absorbent 8 can be arranged in any order between liner 4 and outer cover 10. However, Figure 6 illustrates the preferred order of liner 4, transfer

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layer 22, elastomeric layer 8, wicking layer 24, absorbent medium 8 and outer cover 10.

Referring now to Figures 8 and 9, still another embodiment of stretchable absorbent composite 2 comprises liner 4, elastomeric layer 8, wicking layer 24, absorbent medium 8 and outer cover 10. Elastomeric layer 8 and wicking layer 24 can be interchanged in position between liner 4 and absorbent medium 8, as illustrated in Figures 10 and 11.

Figures 12 and 13 illustrate a variation on Figures 6 and 7 wherein layers 22, 24 are interchanged.

Referring now to Figure 14, stretchable absorbent undergarment 26 is illustrated and is generally trapezoidal in shape. Undergarment 26 in Figure 14 is in a flat or planar configuration, i.e., elastomeric layer 8 is still in its stretched condition so that the remaining layers are not gathered for purposes of clarity in description. In describing undergarment 26, the length refers to the longer dimension, and includes front end portion 28, intermediate portion 30 and rear end portion 32.

Figure 16 is a cross-sectional view of Figure 14 and illustrates outer cover 10, absorbent medium 8, wicking layer 24, elastomeric layer 8, transfer layer 22 and bodyside liner 4. In this particular form, only intermediate portion 30 includes all six layers. Although front end portion 28 and rear end portion 32 do not include absorbent medium 8, the present invention contemplates that all of undergarment 26, that is portions 28, 30 and 32, will comprise all six layers. Furthermore, though undergarment 26 in Figures 14-16 includes the six mentioned layers, it can have a fewer number of layers corresponding to the embodiment of stretchable absorbent composite 2 illustrated in Figures 1-4 and 8-11. Thus, undergarment 26 can comprise the four layers in Figure 2, the five layers in Figure 4, the six layers in Figure 8, etc.

Continuing to refer to Figures 14 and 16, undergarment 26 has fastening means at front end portion 28 and rear end portion 32, such as a hook and loop fastening means, i.e., Velcro, with loops 34 disposed on front end portion 28 of outer cover 10, and hooks 36 disposed on rear end portion 32 of bodyside liner 4. Naturally, loops 34 and hooks 36 can be interchanged between front end portion 28 and rear end portion 32, and if preferred, only fastening tabs 38, which extend outwardly from rear end portion 32 as viewed in Figure 14, can have fastening means disposed thereon. Alternative fastening means include suitable adhesives, snap fasteners or the like, all of which should be re-fastenable, so as to allow undergarment 26 to be removed and replaced any number of times. The fastening tabs 38 can also be eliminated, as at dotted line 37 in Figures 14, 15, 17, 18 and 19, so that undergarment 26 is of a true trapezoidal

shape. Hooks 36 would then be placed at the corners of rear end portion 32.

Referring now to Figure 15, stretchable absorbent undergarment 26 has been relaxed to allow elastomeric layer 8 to gather the remaining layers into rugosities 14. In the relaxed, gathered state, undergarment 26 has an overall length of about 50.8 cm to about 127. cm. (about 20 inches to about 50 inches), an overall rear end width as measured between the remote ends of fastening tabs 38 of about 25.4 cm. to about 78.2 cm. (about 10 inches to about 30 inches), a front end width as measured along the narrowmost edge of front end portion 28 of about 10.16 cm. to about 38.1 cm. (about 4 inches to about 15 inches) and an angular range 40 of about 5° to about 45° as measured between side edges 42 and the vertical, as viewed in Figure 14.

Referring now to Figures 17 and 18, stretchable absorbent undergarment 26 is illustrated as it would be worn by a user. In the side profile view of Figure 17, front end portion 28 rests against the stomach or abdomen of the wearer with front edge 44 of front end portion 28 being at or just slightly below the waistline, and with central portion 46 of rear end portion 32 being slightly above the waistline and against the small of the back. As thus worn, front edge 44 is generally horizontally disposed. Rear edge 48 extends generally downwardly from central portion 46, which is at the small of the back of the wearer, to front end portion 28 at an angle 50 of about 10° to about 80° with the horizontal, as viewed in Figure 17. In fitting stretchable absorbent undergarment 26 to the wearer, intermediate portion 30 is placed generally at the crotch area, and front end portion 28 is pulled, i.e., stretched, to fit against the stomach or abdomen, as described above. Rear end portion 32 is then positioned, i.e., stretched, against the small of the back of the wearer, with fastening tabs 38 then releasably fastened to front end portion 28. When properly fitted, virtually all of stretchable absorbent undergarment 26 is under a certain amount or degree of stretch or tension produced by the proper placement, i.e., stretching, of front end portion 28, rear end portion 32 and attachment of fastening tabs 38 to portion 28. Because of this, there are a plurality of force vectors 52 directed generally from front end portion 28 towards central portion 46 that provides an upward pull or tugging fit of intermediate portion 30 at the crotch of the user. Although force vectors 52 are directed angularly upwardly at an angle less than 90°, they nevertheless have Y- or upwardly directed component force vectors, as viewed in Figure 17. One of the key and unique features of stretchable absorbent undergarment 26 is that it maintains undergarment 26 snugly in place, both before and after a

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void.

Because of the generally trapezoidal shape of undergarment 28, when it is fitted about the legs, the leg openings tend to form a generally ellipsoidal shape due to the undergarment following the natural contours of the body.

Referring now to Figures 18, 19 and 20, it can be seen that undergarment 28, when properly fitted, results in a plurality of gross channels 54 at least in intermediate portion 30. Gross channels 54 result from intermediate portion 30 being conformably fitted within the crotch area of the user. Because the crotch area is generally more narrow in width than intermediate portion 30, upon properly fitting undergarment 28, intermediate portion 30 tends to be gathered when fitted in place. Channels 54 act as surge tanks for liquid discharge to hold and maintain the liquid away from the wearer's body until it is completely transferred through liner 4, transfer layer 22, elastomeric layer 6 and wicking layer 24 into absorbent medium 8. Also, because channels 54 run in a generally longitudinal direction relative to the length of undergarment 28, they tend to provide somewhat of a wicking action in moving the liquid along the surface area of intermediate portion 30. This function of channels 54 works in concert with rugosities 14 and wrinkles 18 in spreading or wicking the liquid and transferring it from the user's body into absorbent medium 8.

Gross channels 54 can also be manufactured into undergarment 28 by selective bonding of spaced apart points or lines thereon.

With reference to Figure 26, the layers of undergarment 28 can be of various sizes and shapes. For example, in Figure 26, absorbent medium 8 is similar to, but smaller than, the other layers. This leaves a boundary 39 of the other layers about absorbent medium 8. When elastomeric layer 6 is stretch bonded to all the layers, the stretch bonded boundary 39 about absorbent medium 8 increases the gasketing effect about the legs and decreases possible gapping between undergarment 28 and the body. Another example would be outer cover 10 being smaller than the other layers, but larger than absorbent medium 8 to allow the side portions of cover 10 to overlap absorbent medium 8 to form baffles therearound. This modification results, after the stretch bonding process, in absorbent medium 8 being curved or cupped to form a trough or concave-shape facing the body, thereby providing a conformable fit and improved waste containment. Liner 4, wicking layer 24, transfer layer 22, and elastomeric layer 6 can be variously sized and shaped to provide other changes for any desirable purpose or need. Figure 27 illustrates the effect of a smaller size absorbent medium 8 at the crotch area. Gross channels 54 are present, as are

rugosities 14, but there are now finer rugosities 19 about the leg opening areas to increase gasketing. Rugosities 19 are finer or smaller since absorbent medium 8 is absent at that area.

As described above, it is now apparent that stretchable absorbent undergarment 28 provides an individualized fit over the entire surface area it covers on the user. Undergarment 28 is also a virtually one-size-fits-all undergarment in that if the elastic or stretch characteristics of elastomeric layer 6 are properly selected, undergarment 28 can fit most any size user. For example, if elastomeric layer 6 has at least about 100% stretch or elongation in the machine direction, which is the direction perpendicular to the length dimension of undergarment 28, then rear end portion 32 and tabs 38, if used, can be stretched to accommodate a range of waist sizes from about 50.8 cm. to about 134.6 cm. (about 20 in. to about 54 in.) As described earlier, rear end portion 32 stretches across the small of the back, rides downwardly over the hips and attaches to front end portion 28, thereby providing an upward snugging force that results in an edge seal at the leg openings 56 to prevent leakage.

The overall elasticity or stretchability of absorbent undergarment 28 provides increased flexibility as it relates to fit. For example, stretchable absorbent undergarment 28 conforms to virtually any body geometry, thereby accommodating both male and female torsos. The entire stretchable absorbent undergarment 28, rather than only a portion or peripheral edge portion thereof, fully responds to movement of the wearer, thereby providing a self-adjusting fit during use. Undergarment 28 further lends itself to an underwear-like fit which imparts the psychological suggestion of normalcy to the user, rather than a diaper-like device.

Because stretchable absorbent composite 2 and stretchable absorbent undergarment 28 contain thermoplastic components in their respective layers, they provide both a dry and wet integrity and resilience, both of which have functional and perceptual benefits. Furthermore, because of the bulking or gathering of resilient materials created by elastomeric layer 6, there is imparted to composite 2 and undergarment 28 the ability or capacity to maintain an original shape, which is a key factor in achieving superior containment. As the post-use shape and bulk resembles the prewear appearance of composite 2 and undergarment 28, there is a reduction in the visual and tactile impact of an incontinent episode. These improved post-use aesthetics also impart a psychological comfort and normalcy to the incontinent user.

Due to the intimate contact of the layers in composite 2 and undergarment 28 in combination with the overall bulking or gathering thereof, the

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absorbency characteristics of composite 2 and undergarment 28 are positively affected; for example, there is an increase in the rate of fluid transfer from the surface of the wearer to the absorbent medium 8, and a minimizing of any wet collapse or clumping of cellulosic material should wood pulp fibers be a component of absorbent medium 8.

The use of transfer layer 22 and wicking layer 24 provides an increase in absorbent rates at the bond points and controlled flowback properties. A more detailed description of how the absorbent rates are increased at the bond points and the flowback properties minimized can be found in U.S. Patent 4,397,844, filed February 4, 1982, which is incorporated by reference herein.

Other unique features of stretchable absorbent composite 2 and stretchable absorbent undergarment 28 are provided by rugosities 14 and 19, wrinkles 18 and gross channels 54. These three features result or create an increase in absorbency rate because of the greater amount of surface per unit area. Separation of liquid from the body is provided because of rugosities 14 and 19, wrinkles 18 and gross channels 54 which, with air pockets 9, result in increased air circulation between the body surface and the absorbed liquid, thereby providing or maintaining the body surface drier and more comfortable to the wearer. Composite 2 and undergarment 28 are disposable.

Referring now to Figure 21, apparatus 57 includes pattern roll 58 having a plurality of projections 62 selectively disposed thereon, and anvil 60 adjacent pattern roll 58 to form nip 64 therebetween. Both pattern roll 58 and anvil 60 are selectively rotatable in the direction of the arrows, and are selectively thermally controlled to provide a selected temperature on their respective outermost surfaces. Furthermore, either pattern roll 58 or anvil 60, or both, are moveable toward the other to vary selectively the pressure applied at nip 64. As mentioned earlier, projections 62 are selectively disposed on pattern roll 58 in any desired pattern, as further described below.

Apparatus 57 also comprises liner-transfer layer roll 66 that provides a two-layer web comprising liner 4 and transfer layer 22, which can be a conform material earlier described above and preformed separately on roll 66. Elastomeric layer roll 68 provides elastomeric layer 6, wicking layer roll 70 provides wicking layer 24, absorbent medium roll 72 provides absorbent medium 8 and outer cover roll 74 provides outer cover 10. The various roll supplies can be interchanged so as to vary the arrangement of the layers, as illustrated in Figures 1-13.

In order to stretch elastomeric layer 6 before passing through nip 64, the rate of rotation of elastomeric layer roll 68 is selectively decreased

below that of the selected rates of rotation of the other rolls 66, 70, 72 and 74. Because elastomeric roll 68 rotates at a slower speed, elastomeric layer 6 is stretched in the machine direction during its travel from roll 68 through nip 64. If desired, elastomeric layer 6 can also be stretched simultaneously, or only, in the cross-direction by use of stretching rolls 76 or any other known means, such as a tenter frame. Generally, stretching rolls 76 are curved or bowed so as to stretch elastomeric layer 6 in the cross-direction while being pulled thereacross. Control of the direction of stretch or elongation of elastomeric layer 6 is a useful feature not only in tailoring the properties and the shaping of the finished composite 2 or undergarment 28, but also in the handling and manipulating of composite 2 or undergarment 28 during the manufacturing processes. Naturally, the basis weight and stiffness of elastomeric layer 6 and the other selected layers, and the degree and direction of elongation of layer 6, may be selected to provide the desired properties in the finished composite 2 or undergarment 28. The stretching of elastomeric layer 6 in the machine direction only, or the cross-direction only, results in rows 18 of rugosities 14, as illustrated in Figures 5, 22, and 23. Similarly, the stretching or elongation of elastomeric layer 6 in both the machine and cross-direction results in the quilted configuration illustrated in Figures 5A, 24, and 25. If desired or necessary, one or all of rolls 76 can be provided with aperturing means, such as sharp or pointed projections, for aperturing elastomeric layer 6, whether it is being uni- or multi-directionally stretched.

As mentioned earlier, projections 62 can be selectively disposed on the outermost surface of pattern roll 58, and in doing so, allows the immobilization of selected areas of the stretchable absorbent composite 2 or stretchable absorbent undergarment 28 so as to control and vary the elastic properties therethrough, thereby resulting in a better overall snug fit of undergarment 28. For example, referring to Figure 14, the number of bond points per unit area in rear end portion 32 and front end portion 28 can be greater than the number of projections per unit area in intermediate portion 30. This would result in intermediate portion 30 having greater elasticity or stretch properties than end portions 28, 32, so as to provide a snug and comfortable fit in the crotch area. Similarly, only selected zones of rear end portion 32 and/or front end portion 28 can have a greater number of bond points per unit area, thereby selectively controlling the elasticity or stretchability thereof. The immobilization effect can be controlled by either increasing or decreasing the number of bond points per unit area or the surface area of each individual bond point in a unit area.

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As the bonded layers exit nip 84, they pass between anvil 78 and cutting roll 80, which has a plurality of blades 82 selectively disposed thereon. Blades 82 are selectively positioned to cut the bonded layers in any configuration, such as a generally trapezoidal configuration.

Although pattern roll 58 with projections 82 is one method of bonding the layers together thermally, other bonding methods are contemplated by the method of the present invention and include ultrasonic bonding, adhesive bonding and other suitable bonding methods. Once the bonded layers pass through nip 84, the elastomeric layer is allowed to relax and to gather the other layers.

In a general embodiment of composite 2 or undergarment 28, there is a thermoplastic liner 4, thermoplastic transfer layer 22, thermoplastic elastomeric layer 6, thermoplastic wicking layer 24, thermoplastic absorbent medium 8, and thermoplastic outer cover 10. With this general embodiment, the temperature at which pattern roll 58 and anvil roll 80 are maintained falls within a range of 0 to about 204.4°C (about 0 to 400°F). The nip pressure at nip 84 is generally between 0 to about 1.05 kg/mm² (0 to about 1500 psi) and the bond area, as a percentage of the total surface area, is between about 1% to 50%. The roll speed of pattern roll 58 and anvil 80 can also vary between 0 to about 304.8 meter (about 0 to 1,000 ft.) per minute. As roll speed is increased or decreased, the required temperatures as a function of the thermoplastic materials making up the various layers.

In a specific form, pattern roll 58 is maintained at a temperature between about 128.7°C to about 165.8°C (about 260°F to about 330°F) and anvil 80 is maintained at a temperature between about 23.9°C to about 98.9°C (about 75°F to about 210°F). The pressure at nip 84 is about .02 kg/mm² to about .08 kg/mm² (about 30 to about 80 psi), the roll speed is about 4.8 meters to about 9.2 meters (about 15 ft to about 30 ft) per minute, and the bond area is about 10% to 20%. These particular parameters apply to a liner 4 made of spunbonded polypropylene having a basis weight of about 13.6 grams per square meter (about 0.4 oz. per square yard) wicking layer 24 being a carded web of about 25% by weight polyester and 75% by weight polypropylene with a basis weight of about 50 grams per square meter; elastomeric layer 6 being made of Kraton G-2740X having a basis weight of about 70 grams per square meter; absorbent medium 8 being a mixture of about 75% by weight polyester and 25% by weight of binder and having mixed therewith a superabsorbent having a basis weight of about 16 grams per square meter, the overall absorbent medium 8 having a basis weight of about 70 grams per square meter; and

outer cover 10 being a film of polyester having a thickness of about .015 mm, (about 0.6 mils).

In another form, the temperature of pattern roll 58 is about 85.8°C to about 121°C (about 150°F to about 250°F), and the temperature of anvil 80 is about 23.9°C to about 98.9°C (about 75°F to about 210°F). The pressure at nip 84 is about .02 kg/mm² to about .08 kg/mm² (about 30 to about 80 psi), the roll speed is about 4.8 meters to 9.2 meters (about 15 to about 30 feet) per minute, and the bonded area is about 10% to about 20%. These parameters apply to a composite 2 or undergarment 28 comprising a liner 4 of spunbonded polyethylene having a basis weight of about 13.6 grams per square meter (about 0.4 ounces per square yard); wicking layer 24 being a carded web of about 70% by weight polyester and 30% by weight of a suitable binder, having an overall basis weight of about 50 grams per square meter; elastomeric layer 6 being made of Kraton G-2740X having a basis weight of about 70 grams per square meter; absorbent medium 8 being a web of about 80% by weight fluff pulp and 40% by weight of polyethylene and having mixed therewith a superabsorbent having a basis weight of about 16 grams per square meter, the overall basis weight of absorbent medium 8 being about 70 grams per square meter; and outer cover 10 being a polyethylene film having a thickness of about .015 mm (about 0.6 mils).

In another form, pattern roll 58 has a temperature of about 121°C to about 154°C (about 250°F to about 310°F), and anvil 80 has a temperature of about 15°C to about 32°C (about 60°F to about 90°F). The pressure at nip 84 is about .014 kg/mm² to about .028 kg/mm² (about 20 psi to about 40 psi), the roll speeds about 3 meters to about 6 meters (about 10 to about 20 feet) per minute, and the bond area between about 15% to about 25%. These parameters apply to a composite 2 or undergarment 28 comprising a liner 4 of spunbonded polypropylene having a basis weight of about 13.6 grams per square meter (about 0.4 ounces per square yard); a transfer layer 22 being a carded web of about 50% by weight polyester and about 50% by weight polypropylene and having a basis weight of about 30 grams per square meter; elastomeric layer 6 being made of Kraton G-2740X having a basis weight of about 70 grams per square meter; absorbent medium 8 being a web of about 60% by weight wood fluff pulp and about 40% by weight of polyethylene and having a superabsorbent mix therewith having a basis weight of about 16 grams per square meter, the overall basis weight of absorbent medium 8 being about 165 grams per square meter; and outer cover 10 being a polyethylene film having a thickness of about .015 mm (about 0.6 mils).

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While this invention has been described as having a preferred embodiment, it will be understood that it is capable of further modifications. This application is therefore intended to cover any variations, uses or adaptations of the invention following the general principles thereof, and including such departures from the present disclosure as come within known or customary practice in the art to which this invention pertains and fall within the limits of the appended claims.

Claims

1. A stretchable absorbent undergarment (26) for absorbing human liquids and waste materials, comprising:

a liquid-pervious bodyside layer (4)

a liquid-impervious outer layer (10)

an absorbent layer (8) being disposed between said liquid-pervious bodyside layer (4) and said liquid-impervious outer layer (10),

a stretchable layer (6) being disposed between said liquid-pervious bodyside layer (4) and said liquid-impervious outer layer (10),

said stretchable layer (6) being stretch-bonded to said other layers (4,8,10) and forming a plurality of rugosities (14,18) in said bodyside layer (4), said outer layer (10), and said absorbent layer (8) upon relaxation thereof,

said bonded layers being of a generally trapezoidal shape and having a front end portion (28) that diverges toward a rear end portion (32), said front end portion (28) being about 20% to about 80% of the width of said rear end portion (32), said rear end portion (32) being about 20% to about 80% of the length of said bonded layers.

2. The undergarment of claim 1 wherein said front end portion (28) is about 25% to about 80% of the width of said rear end portion (32).

3. The undergarment of claim 1 or 2 wherein said rear end portion (32) is about 25% to about 50% of the length of said bonded layers.

4. The undergarment of one of the preceding claims, further comprising a liquid transfer layer (22) between said bodyside layer (4) and said absorbent layer (8) for transferring liquid generally in the Z-direction through said bodyside layer (4) and said liquid transfer layer (22) and into said absorbent layer (8).

5. The undergarment of one of the preceding claims, further comprising a liquid wicking layer (24) between said bodyside layer (4) and said absorbent layer (8) for wicking liquid generally in the X- and Y-directions prior to absorption in said absorbent layer (8).

6. The undergarment of one of the preceding claims, wherein said stretchable layer (6) is made pervious with a plurality of apertures (12).

7. A stretchable absorbent undergarment (26) for absorbing human discharge, comprising:

a liquid-pervious bodyside layer (4)

a liquid-impervious outer layer (10)

an absorbent layer (8) disposed between said liquid-pervious bodyside layer (4) and said liquid-impervious outer layer (10),

a liquid delivery layer (22,24) disposed between said liquid-pervious bodyside layer (4) and said liquid-impervious outer layer (10),

a stretchable layer (6) disposed between said liquid-pervious bodyside layer (4) and said liquid-impervious outer layer (10),

said stretchable layer (6) being stretch-bonded to said other layers and forming a plurality of rugosities (14,18) in said bodyside layer (4), said outer layer (10), said absorbent layer (8), and said liquid delivery layer (22,24) upon relaxation thereof.

8. The undergarment of claim 7 wherein said bonded layers are of a generally trapezoidal shape.

9. The undergarment of claims 7 or 8 wherein said liquid delivery layer is a transfer layer (22) for transferring liquid generally in the Z-direction.

10. The undergarment of claims 7 or 8 wherein said liquid delivery layer is a wicking layer (24) for wicking liquid generally in the X- and Y-directions.

11. The undergarment of one of claims 7 to 10, wherein said stretchable layer (6) is stretched in multiple directions during bonding to said other layers.

12. The undergarment of one of the preceding claims wherein said bonded layers are selectively bonded at predetermined areas to control the elasticity thereof.

13. The undergarment of one of the preceding claims wherein the bonded area is from about 1% to about 50% of the total area of said undergarment.

14. The undergarment of one of the preceding claims wherein said layers are of a different size or shape.

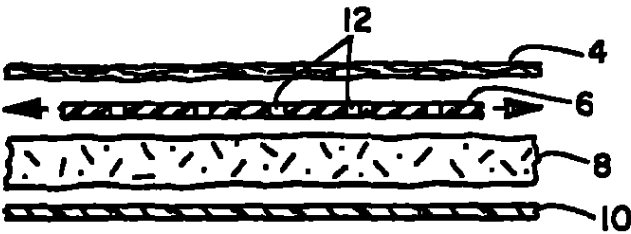


FIG. 1

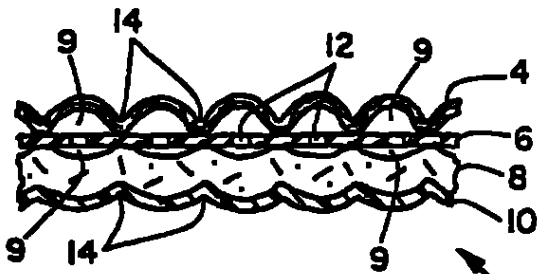


FIG. 2

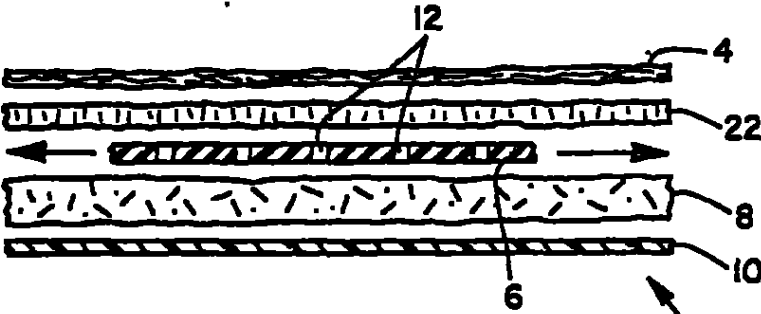


FIG. 3

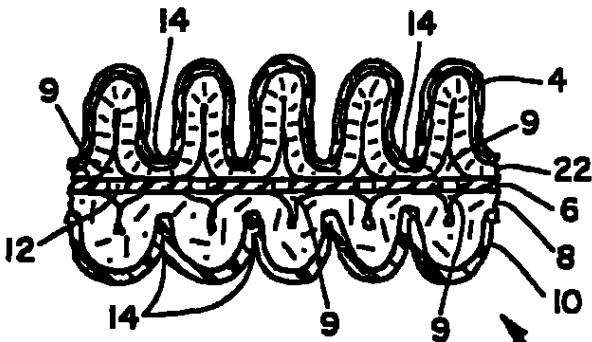


FIG. 4

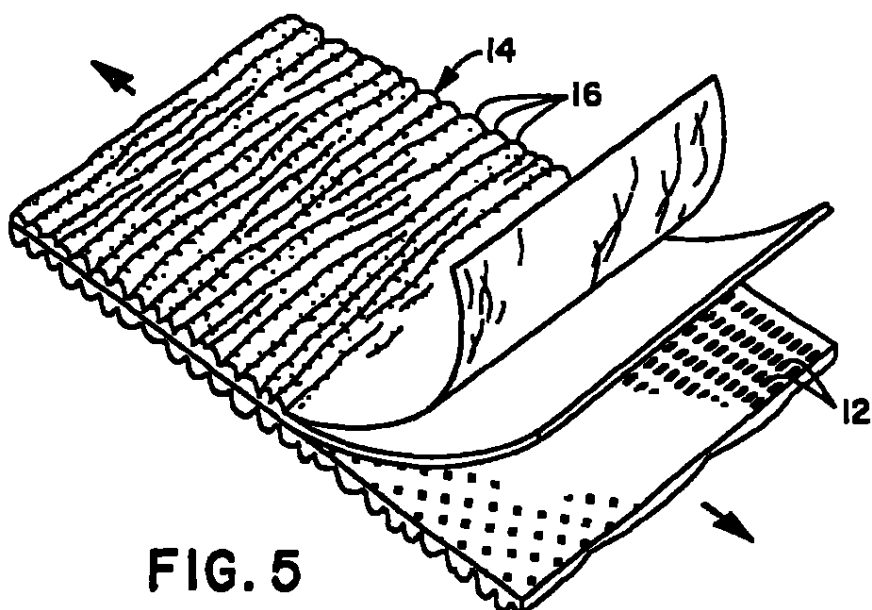


FIG. 5

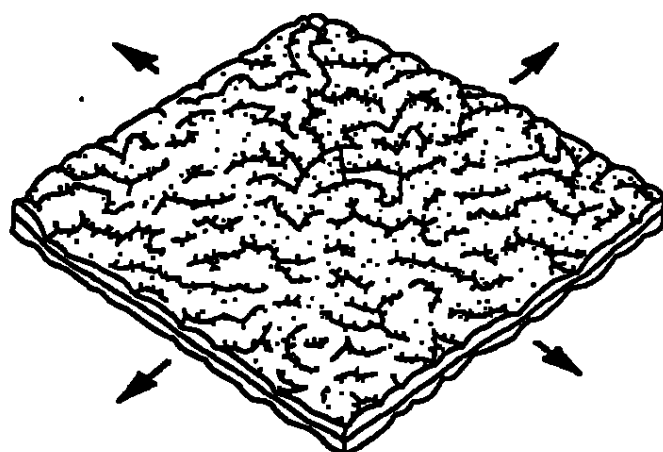


FIG. 5A

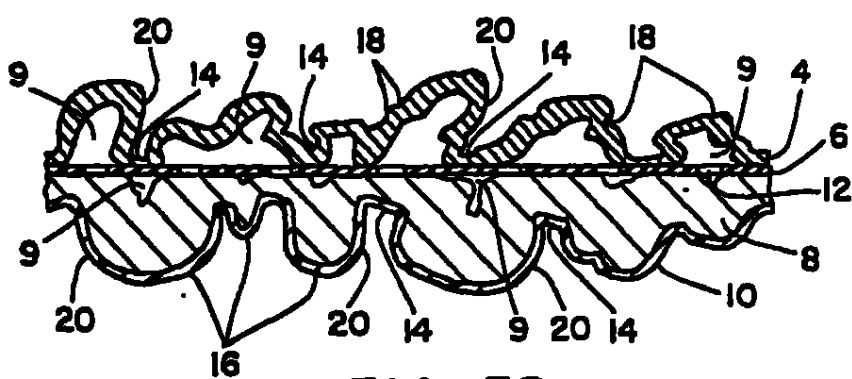


FIG. 5B

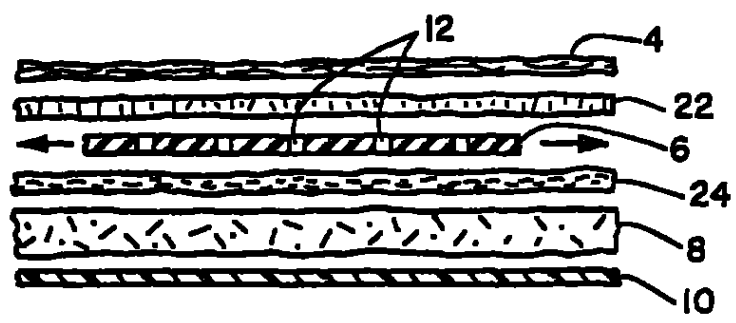


FIG. 6

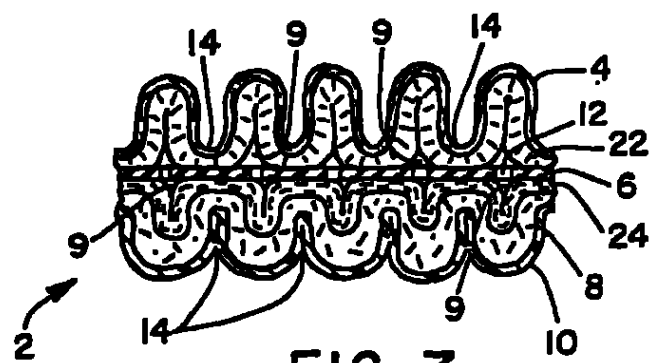


FIG. 7

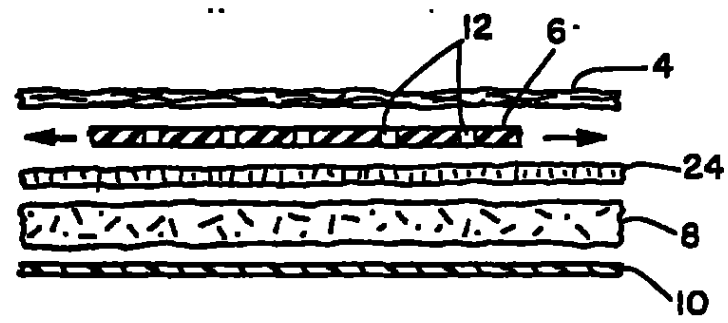


FIG. 8

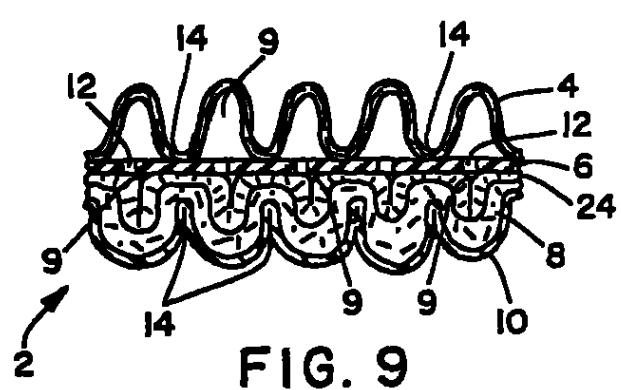


FIG. 9

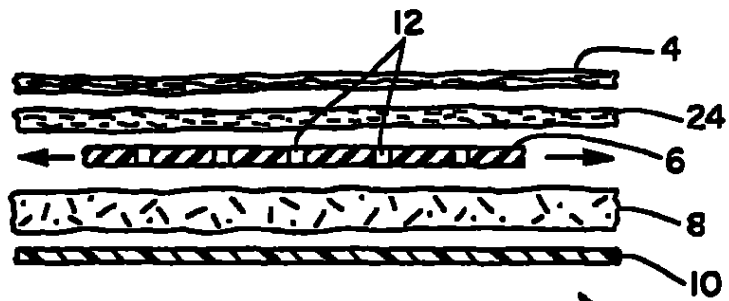


FIG. 10

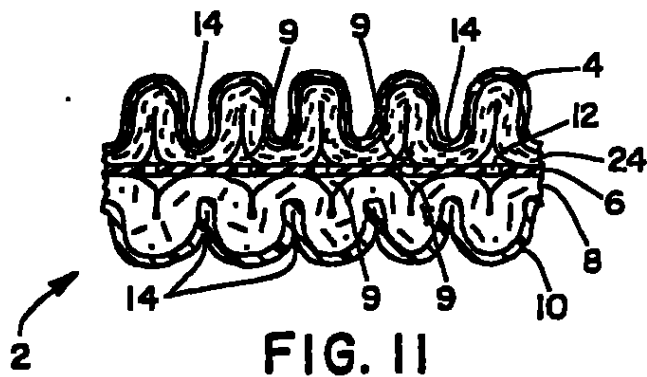


FIG. 11

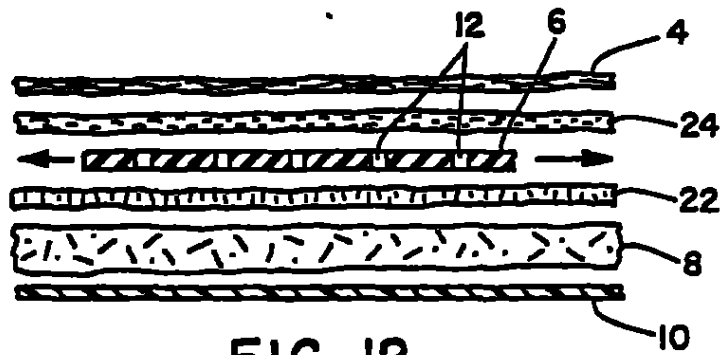


FIG. 12

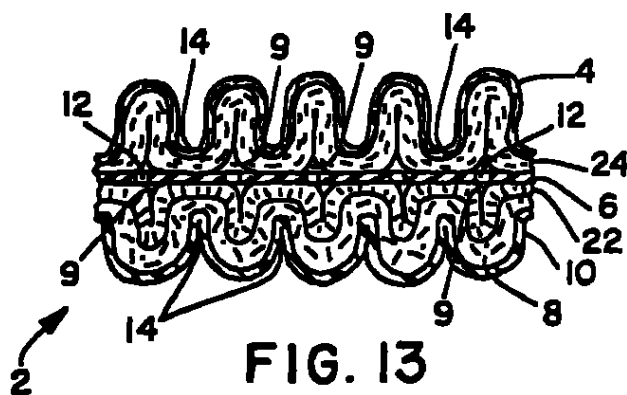


FIG. 13

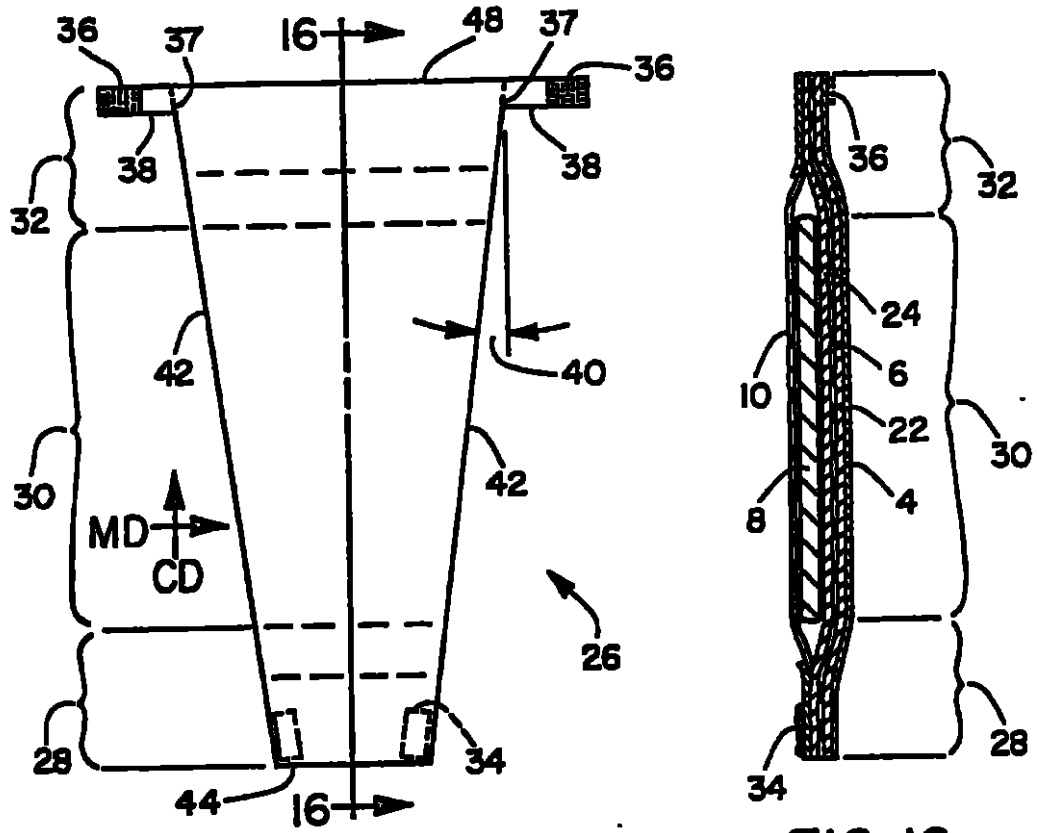


FIG. 14

FIG. 16

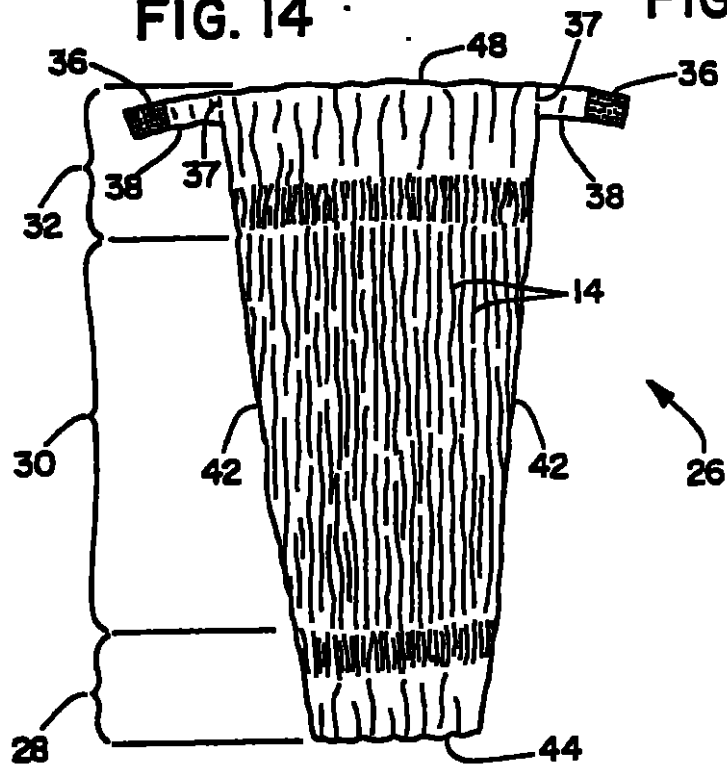


FIG. 15

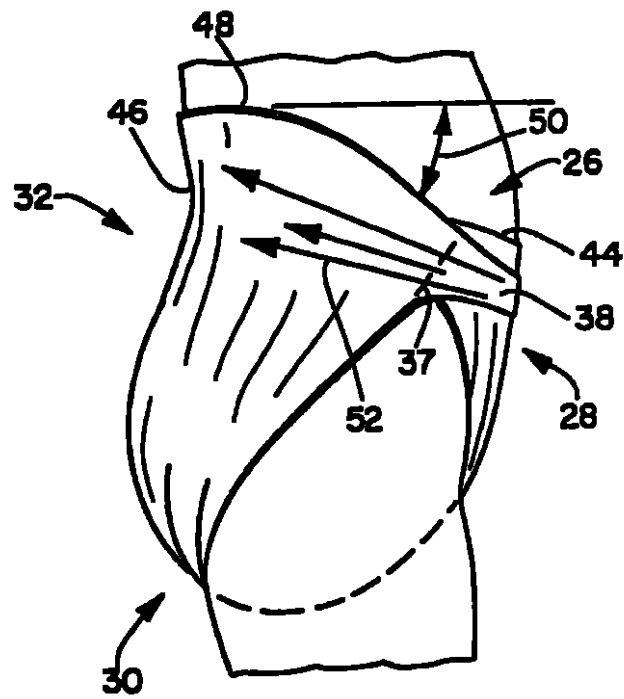


FIG. 17

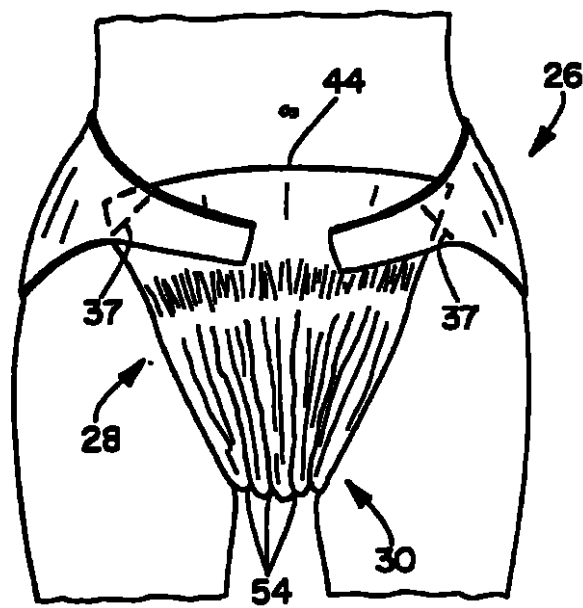


FIG. 18

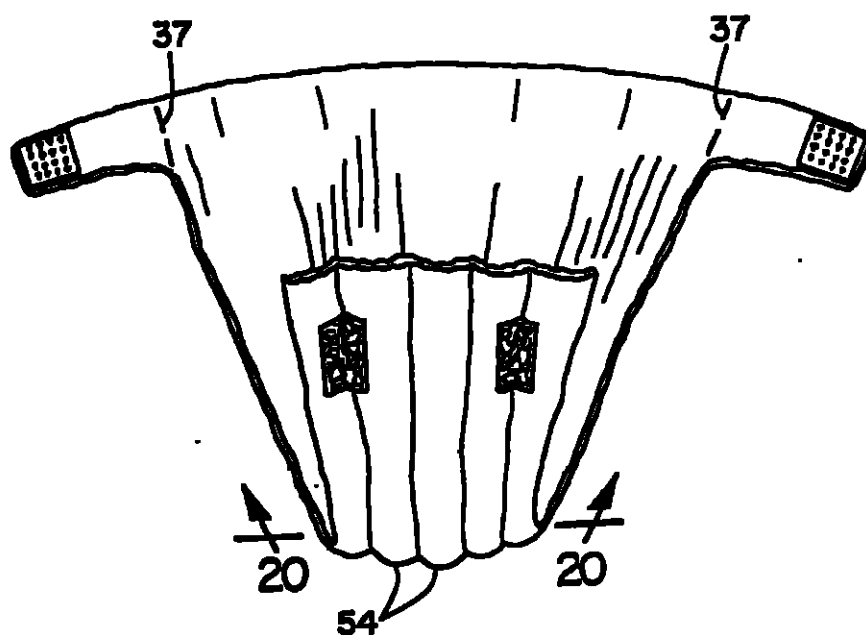


FIG. 19

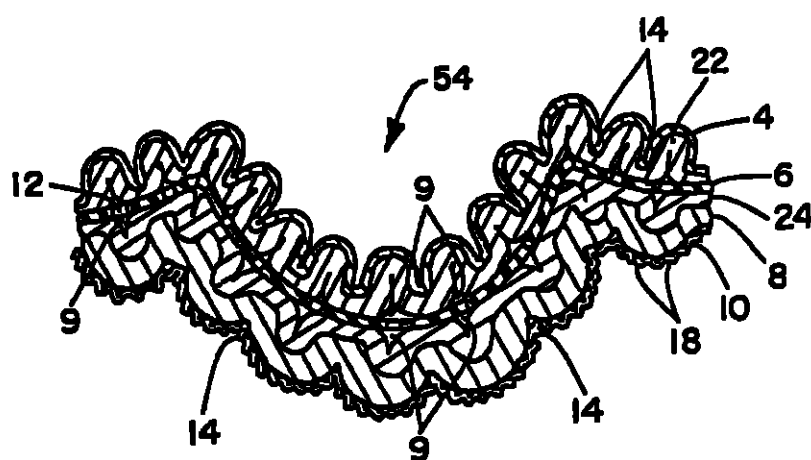
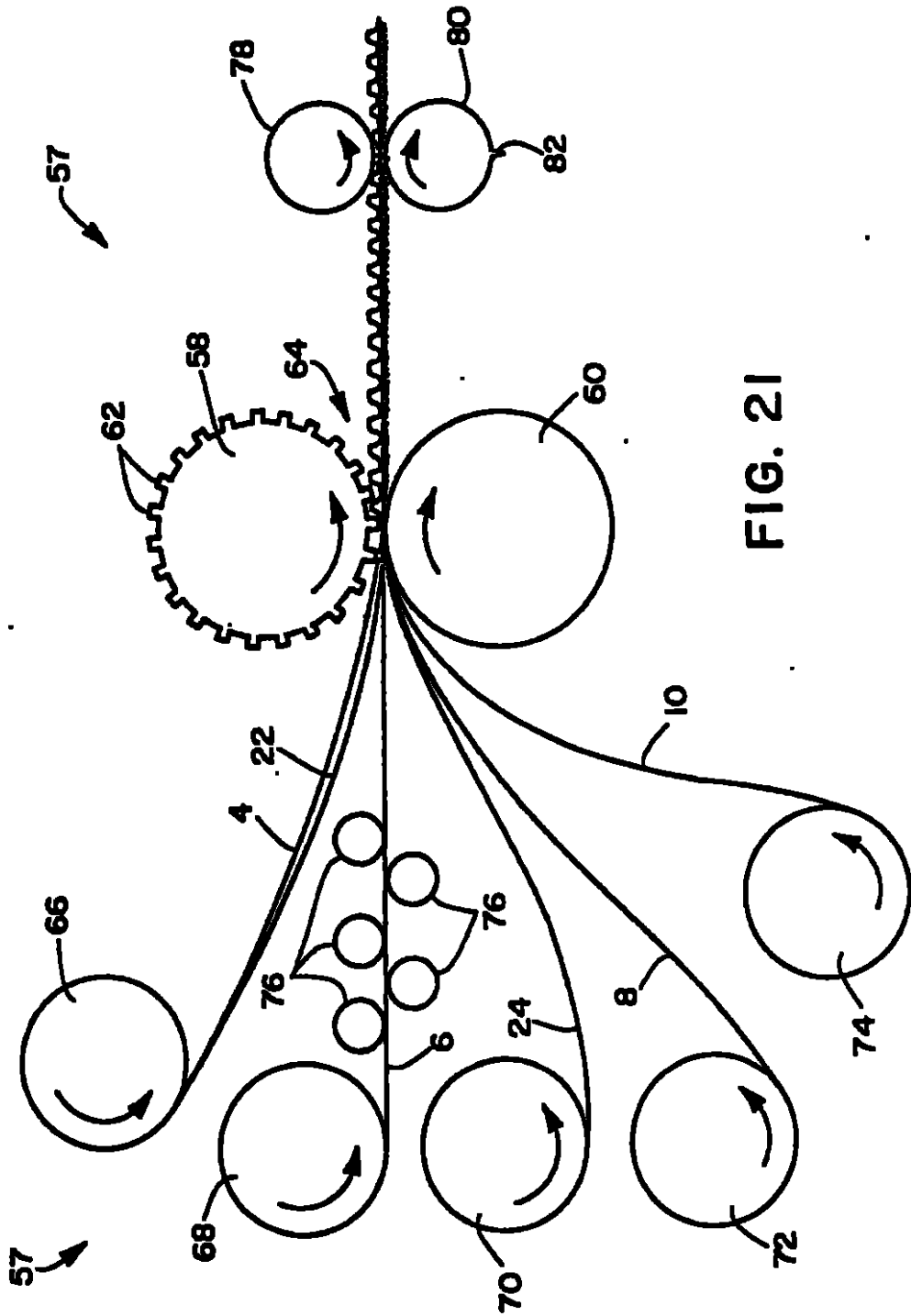


FIG. 20



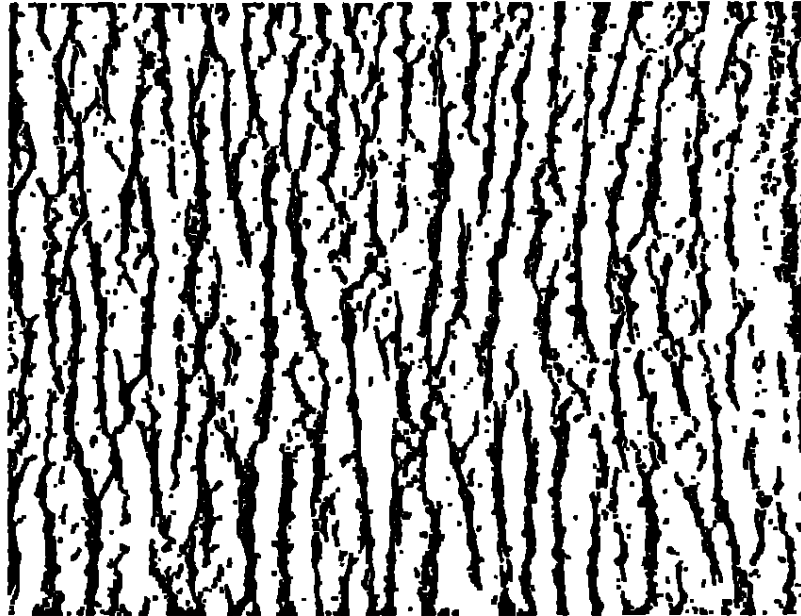


FIG. 22

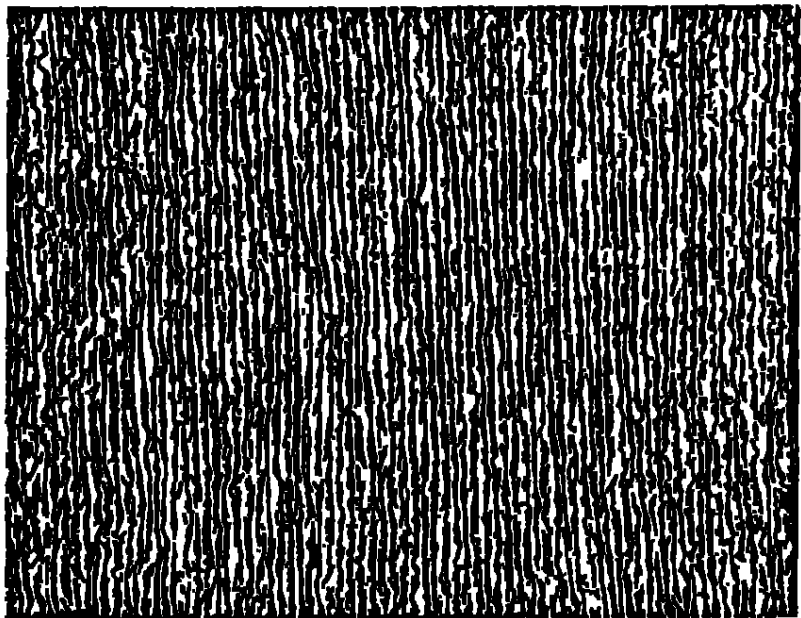


FIG. 23

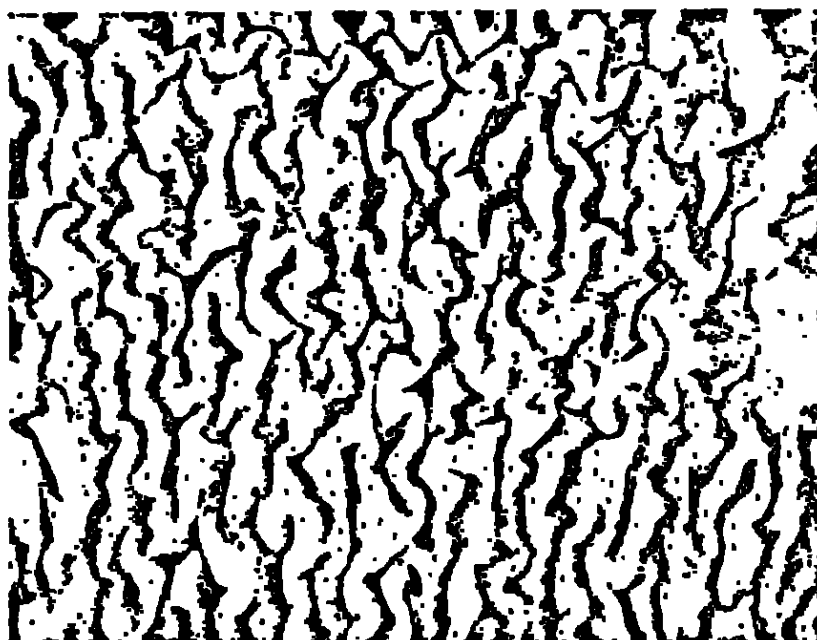


FIG. 24

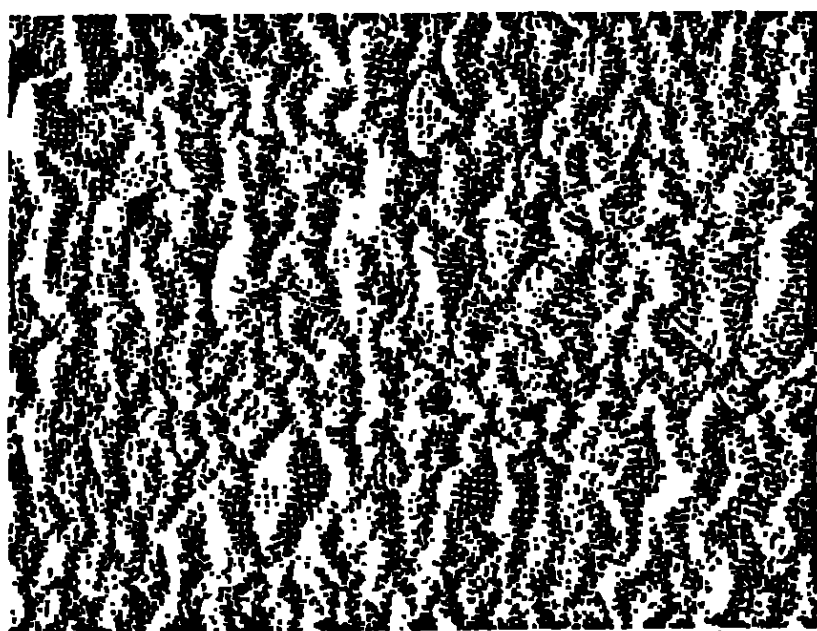


FIG. 25

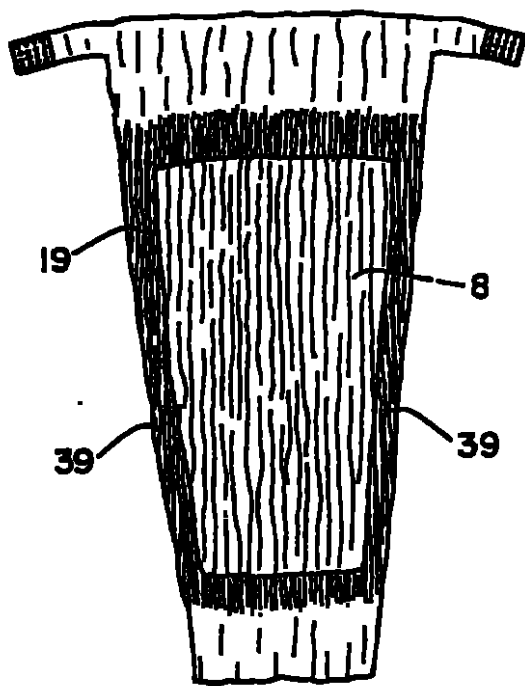


FIG. 26

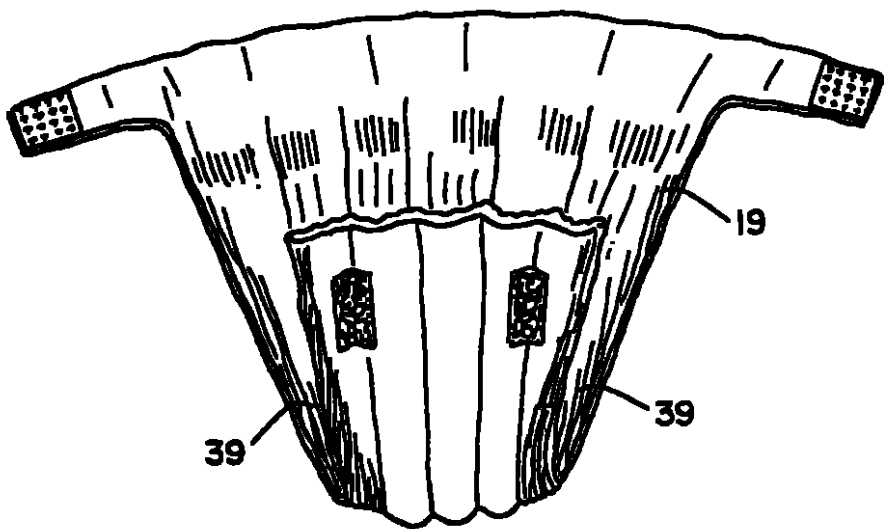


FIG. 27

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION

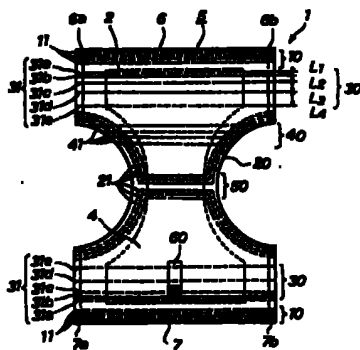
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(54) Title: SHEETS TYPE DISPOSABLE DIAPER

(57) Abstract

The sheet type disposable diaper (1) of the present invention is characterized by a plurality of elastic members (10) provided at the waist opening portion (40) located below the body-receiving portion (20) and in the vicinity of the side opening portion of the waist, thereby forming a constriction portion in the width direction of the diaper. The sheet type disposable diaper (1) is also characterized by a plurality of elastic members (21) provided at the body-receiving portion (20) in such a manner that the interval of the elastic mem-
bers (21) increases narrower towards the waist opening portion (10) and that the elongation of the elastic members (21) increases towards the waist opening portion (10).



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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00
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SPECIFICATION
SHORTS TYPE DISPOSABLE DIAPER

Technical Field

This invention relates to a shorts type disposable diaper suitable for use as a diaper for infants and adults, underwear for those suffering from incontinence of urine, or training pants. More particularly, it relates to a shorts type disposable diaper which fits the wearer's body and surely prevents leakage while it is worn.

Background Art

Various types of shorts type disposable diapers having a waist opening portion and a pair of leg opening portions have been proposed. As an example of recent proposals, Japanese Patent Application Laid-Open 4-166150 discloses a shorts type disposable diaper in which a plurality of elastic members are provided at a body-surrounding portion which is located between the waist opening portion and the pair of leg opening portions and at which an absorbent member is provided, forming substantially continuous gathers along the entire circumference of the body-surrounding portion. The shorts type disposable diaper disclosed fits the wearer's body very well owing to the elastic members of

the body-surrounding portion and surely prevents leakage of discharged waste materials while it is worn.

However, demands for shorts type disposable diapers having further improved leakproofness have recently been increasing. That is, after a wearer discharges the waste materials, even the above-mentioned shorts type disposable diaper gets out of the right position due to the weight of the discharged waste materials, partly swells out into poor appearance, and loses a good fit, tending to hinder wearer's movement and to cause leakage of the discharged waste materials. Therefore, it has been demanded to develop a shorts type disposable diaper which does not slide down and causes no leakage even after a wearer discharges solid waste materials.

The extensibility (elongation) of the elastic members provided at the body-surrounding portion may be increased so as to prevent sliding of a disposable diaper. However, increased elongation imposes excessive pressure on the wearer's body and considerably reduces comfort. Japanese Patent Application Laid-Open 4-371146 proposes a shorts type disposable diaper having a plurality of elastic members arranged in the body-surrounding portion in such a manner that the interval of the elastic members becomes narrower to-

wards waist opening portion, but the diaper of this type still fails to completely satisfy the above requirement.

Disclosure of the Invention

It is therefore an object of the present invention to provide a shorts type disposable diaper which, even after waste materials are discharged, does not slide down to cause leakage due to the weight of the waste materials, maintains good fit and appearance without swelling in part.

As a result of extensive investigations, the inventors of the present invention have found that the above object of the present invention can be accomplished by a shorts type disposable diaper having gathers formed at the site which is located in the vicinity of the urination portion for a wearer (the first finding) and a shorts type disposable diaper having elastic members at the body-surrounding portion disposed in such a manner that the interval of the elastic members becomes narrower towards the waist opening portion and that the elongation of the elastic members increases towards the waist opening portion (the second finding).

The present invention has been completed based on the first finding and provides a shorts type dis-

posable diaper comprising an absorbent body which comprises a liquid permeable topsheet, a liquid impermeable backsheet, and an absorbent member interposed between the topsheet and the backsheet,

the absorbent body having a front waist body portion located on the stomach side of a diaper wearer when the diaper is worn and a rear waist body portion located on the back side of the wearer, the front and rear waist body portions being joined and sealed together at opposing lateral side edges thereof to form a waist opening portion and a pair of leg opening portions,

each of the waist opening portion and the pair of leg opening portions being provided with an elastic member which forms substantially continuous gathers along the entire circumference of the waist opening portion and the leg opening portions, and a plurality of elastic members being provided at a body-surrounding portion which is located between the waist opening portion and the pair of leg opening portions and at which the absorbent member is provided, forming substantially continuous gathers along the entire circumference of the body-surrounding portion,

the diaper being characterized in that a plurality of elastic members are provided at a urination

point located below the body-surrounding portion and in the vicinity of the urination portion of the wearer, thereby forming continuous gathers in the width direction of the diaper (hereinafter referred to as a first invention).

The present invention has also been completed based on the second finding and provides a shorts type disposable diaper comprising an absorbent body which comprises a liquid permeable topsheet, a liquid impermeable backsheet, and an absorbent member interposed between the topsheet and the backsheet,

the absorbent body having a front waist body portion located on the stomach side of a diaper wearer when the diaper is worn and a rear waist body portion located on the back side of the wearer, the front and rear waist body portions being joined and sealed together at opposing lateral side edges thereof to form a waist opening portion and a pair of leg opening portions,

each of the waist opening portion and the pair of leg opening portions being provided with an elastic member which forms substantially continuous gathers along the entire circumference of the waist opening portion and the leg opening portions, and a plurality of elastic members being provided at a body-surrounding

portion which is located between the waist opening portion and the pair of leg opening portions and at which the absorbent member is provided, forming substantially continuous gathers along the entire circumference of the body-surrounding portion,

the diaper being characterized in that the elastic members provided at the body-surrounding portion are disposed in such a manner that the interval of the elastic members becomes narrower towards the waist opening portion and that the elastic members provided at the body-surrounding portion have an increasing elongation towards the waist opening portion (hereinafter referred to as a second invention).

Brief Description of the Drawings

Fig. 1 is a perspective view of a preferred embodiment of the shorts type disposable diaper according to the present invention.

Fig. 2 is a plan view of the shorts type disposable diaper of Fig. 1 in an unfolded condition.

Detailed Description of the Invention

An embodiment of the shorts type disposable diaper according to the present invention (inclusive of the first and second inventions) will be described in detail by referring to Figs. 1 and 2.

Fig. 1 is a perspective view of a preferred

embodiment of the shorts type disposable diaper of the present invention, and Fig. 2 is a plan view of the shorts type disposable diaper shown in Fig. 1 in its unfolded condition.

The shorts type disposable diaper 1 of the embodiment shown in Figs. 1 and 2 comprises an absorbent body 5 which comprises a liquid permeable topsheet 2, a liquid impermeable backsheet 3, and an absorbent member 4 interposed between the topsheet 2 and the backsheet 3. Opposing lateral side edges of a front waist body portion 6 corresponding to the front waist side of a wearer and those of a rear waist body portion 7 corresponding to the rear waist side of a wearer are joined and sealed together thereby forming a waist opening portion 10 and a pair of leg opening portions 20. Elastic members 11 and 21 are provided along the entire circumference of the waist opening portion 10 and the pair of leg opening portions 20, respectively, to form substantially continuous gathers. Further, a plurality of elastic members 31 are provided at a body-surrounding portion 30 which is located between the waist opening portion 10 and the pair of leg opening portions 20 and at which the absorbent member 4 is located, thereby forming substantially continuous gathers along the entire circumference of the body-

surrounding portion 30.

Going into details, the lateral side edge 6a of the front waist body portion 6 and the lateral side edge 7a of the rear waist body portion 7 are joined and sealed together, and the lateral side edge 6b of the front waist body portion 6 and the lateral side edge 7b of the rear waist body portion 7 are joined and sealed together to form the joint portions 8 on each side.

The topsheet 2, the backsheet 3, and the absorbent member 4 each has an hourglass shape with its central portion narrowed. These members can be fabricated of the following materials.

The topsheet 2 is made of a liquid permeable sheet which transmits excretions to the absorbent member 4 and preferably feels like underwear. Such a liquid permeable sheet preferably includes woven fabric, nonwoven fabric, and porous film. Leakage of urine, etc. due to oozing from the periphery of the topsheet 2 can be prevented by a water-repellent treatment comprising coating the peripheral portion of the topsheet 2 with a hydrophobic compound such as silicone oil or paraffin wax, or coating the entire surface of topsheet 2 with a hydrophilic compound such as an alkyl phosphate followed by washing the peripheral portion with warm water.

A liquid impermeable and vapor permeable sheet obtained by stretching a filler-containing thermoplastic resin film is preferably used as the backsheet 3. Materials having a feeling close to underwear, such as a composite material composed of film and nonwoven fabric or a composite material of film and woven fabric, are used.

A combination comprising comminuted pulp as a main component and an absorbent polymer is preferably used as a material of the absorbent member 4. Additionally, a heat-treated mixture of a thermoplastic resin, cellulose fiber and an absorbent polymer is also preferred. The absorbent polymer may be present in any of the upper, middle and lower layers of the absorbent member and may be present as an admixture with pulp. The absorbent polymers preferably include those capable of absorbing and retaining 20 or more times its own weight of liquid and gelling on liquid absorption. Such absorbent polymers include a saponified starch-acrylic acid (or a salt thereof) graft copolymer, crosslinked sodium carboxymethyl cellulose, and an acrylic acid (or a salt thereof) polymer.

Four elastic members 11 are provided at the waist opening portion 10 of each of the front and rear waist body portions 6 and 7 at regular intervals. The

elastic members 11 on the front waist body portion 6 and those on the rear waist body portion 7 are connected together by the sforansaid joining and sealing to form substantially continuous gathers along the entire circumference of waist opening portion 10.

Any of the elastic members conventionally employed in disposable diapers can be used as the elastic member 11 with no particular limitation. The elastic member 11 preferably has a band form. The elongation of the elastic member preferably ranges from about 80% to 140%. The term "elongation" as used herein has such a definition that when an elastic member having a length of e.g., 10 cm can be extended to 20 cm, that is, twice its own length, the elongation is 100%.

It is preferable that the elastic member 11 at the waist opening portion 10 has a stress at 10% elongation of about 50 to 150 g.

Three elastic members 21 are provided at the leg opening portion 20 of each of the front and rear waist body portions 6 and 7 at regular intervals. The elastic members 21 on the front waist body portion 6 and those on the rear waist body portion 7 each cross the absorbent member 4 at the crotch portion of the diaper and are connected together by the above-mentioned joining and sealing to form substantially con-

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tinuous gathers along the entire circumference of the leg opening portion 20.

Any of the elastic members conventionally employed in disposable diapers can be used as the elastic member 21 with no particular limitation. The elastic member 21 preferably has a band form. The elongation of the elastic member 21 (elongation at the leg opening portion) preferably ranges from about 60% to 100%.

It is preferable that the elastic member 21 at the leg opening portion 20 has a stress at 30% elongation of about 40 to 100 g.

The elastic members 21 cross the absorbent member 4 at the crotch portion 50 of the diaper in which the elongation of the elastic members is about 30 to 50%. The stress at 30% elongation of the elastic member at the crotch portion 50 is preferably about 40 to 100 g. If the stress were less than 40 g, the absorbent member at the crotch portion would be contracted to have reduced absorbent capacity. If the stress exceeded 100 g, the absorbent member would be deformed to have poor appearance.

Five elastic members 31 are provided at the body-surrounding portion 30 of each of the front and rear waist body portions 6 and 7, and those on the front waist body portion 6 and those on the rear waist

body portion 7 are connected by the aforesaid joining and sealing to form substantially continuous gathers along the entire circumference of the body-surrounding portion 30.

The elastic member 31a which is closest to the waist opening portion 10 preferably has a stress at 30% elongation of from about 50 to 150 g, still preferably from about 50 to 100 g, while the elastic member 31e which is closest to the leg opening portion 20 preferably has a stress at 30% elongation of from about 40 to 100 g.

A fastening tape 60 to be used for the disposal of the diaper is provided on the outer surface of backsheet 3 of the rear waist body portion 7. A used diaper can be disposed hygienically by means of the fastening tape 60.

The joint portion 8 is formed by a known sealing technique, such as heat sealing, radiofrequency sealing, ultrasonic sealing, and the like.

The characteristic features of the first invention will be described below. As shown in Figs. 1 and 2, the shorts type disposable diaper according to this preferred embodiment has a plurality of elastic members 41 provided at a urination point 40 located below the body-surrounding portion 30 and in the vicinity of the

urination portion of the wearer, thereby forming continuous gathers in the width direction of the diaper. More specifically, four elastic members are provided on the front waist side at regular intervals.

The term "in the vicinity of the urination portion" as used herein means the portion corresponding to the urination portion of a wearer and the surrounding portions thereof. Specifically, it means the lower area of front waist body portion 6 which is located between the pair of leg opening portions 20.

Any of the elastic members conventionally employed in disposable diapers can be used as the elastic member 41 with no particular limitation. The elastic member 41 preferably has a string form and an elongation of about 50 to 80%.

While the number of the elastic members 41 adopted in this embodiment is 4, it is preferably 3 to 6. The stress at 30% elongation of the elastic member 41 is preferably about 40 to 100 g, still preferably about 50 to 90 g. If the stress were less than 40 g, the front waist body portion unavoidably would have a partially swollen shape. If the stress exceeded 100 g, the absorbent member would be deformed to have poor appearance.

The interval of the elastic members 41 is not

particularly limited and may be selected arbitrarily as far as the advantageous effects of the present invention are not impaired.

Since the shorts type disposable diaper of this embodiment has elastic members in the urination point 40, it has an improved fit at the urination point 40 and thereby as a whole. Even with the weight of the waste materials, the diaper does not get out of the position while it is worn and thereby effectively prevent leakage.

A hip length to width ratio of the above-described disposable diaper is preferably about 1.10 to 1.30, still preferably about 1.15 to 1.30. If the ratio were less than 1.10, the hip length would be too short to cover the navel of the diaper wearer, easily causing leakage from the waist opening portion. If the ratio exceeded 1.30, the shorts type diaper would have a loose fit and tends to slide down.

The term "hip length" as used herein is intended to denote the length from the bottom edge to the upper edge of the waist opening portion 10 with all the elastic members extended to their full length. The term "hip width" as used herein is intended to denote the length between the opposing lateral side edges with all the elastic members extended to their full length.

The characteristic features of the second invention will be described below. The elastic members 31 provided at the body-surrounding portion 30 are disposed in such a manner that the interval of the elastic members 31 becomes narrower towards the waist opening portion 10 and that the elastic members 31 provided at the body-surrounding portion have an increasing elongation towards the waist opening portion 10.

Any of the elastic members conventionally employed in disposable diapers can be used as the elastic member 31 with no particular limitation. The elastic member 31 preferably has a string form and an elongation of about 80 to 120%.

The elastic members 31 are preferably disposed at such an interval that the $L_1:L_2:L_3:L_4$ (see Fig. 2) ratio is 1:1.0 to 1.5:1.5 to 2.0:2.0 to 2.5.

The elongation of the elastic members 31 preferably increases in the upward direction (from the crotch portion to the waist opening portion 10) by about 5 to 15%. The total change of increase in elongation is preferably about 40%.

Since the shorts type disposable diaper according to this embodiment has the elastic members provided at the body-surrounding portion and disposed in such a

manner that the intervals getting narrower and the elongation increases as they approach the waist opening portion 10, the whole diaper exhibits a good fit and does not slide down while it is worn even with the weight of the waste materials imposed. As a result, it effectively prevents leakage of the waste materials without applying excessive pressure to the wearer's body, that is, without impairing wearer's comfort.

The shorts type disposable diaper according to the present invention is by no means limited to the aforesaid particular embodiments. For example, included in the present invention is an embodiment in which the elastic members at the waist opening portion 10 and elastic members at the urination point 40 have the same feature as those at the body-surrounding portion, i.e., the interval getting narrower and the elongation increasing as they approach the waist opening portion 10.

Industrial Applicability

The shorts type disposable diaper according to the present invention (the first invention) has elastic members at the urination point to form gathers in the width direction of the diaper, by which the diaper has an improved fit at the urination point. Therefore, even after a wearer discharges the waste materials, the diaper does not get out of the position, does not

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partly swell out, does not deteriorate the appearance, and, as a result, does not cause leakage of the waste materials.

The shorts type disposable diaper according to the present invention (the second invention) has elastic members disposed at the body-surrounding portion in such a manner that the interval gets narrower and the elongation increases towards the waist opening portion. Therefore, dense gathers are provided in portions which are subject to stretching and contraction to the accompaniment of a wearer's movement, while loose gathers are provided in portions which are not so deformed. Accordingly, the diaper has an improved fit without impairing wearer's comfort, and even after a wearer discharges the waste materials the diaper does not get out of the position and, as a result, causes no leakage of body wastes.

Hence, the shorts type disposable diaper according to the present invention (inclusive of the first and second inventions) exhibits an excellent fit without impairing wearer's comfort, does not get out of the position due to the weight of the waste materials, and causes no leakage.

CLAIMS

1. A shorts type disposable diaper comprising an absorbent body which comprises a liquid permeable topsheet, a liquid impermeable backsheet, and an absorbent member interposed between the topsheet and the backsheet,

the absorbent body having a front waist body portion located on the stomach side of a diaper wearer when the diaper is worn and a rear waist body portion located on the back side of the wearer, the front and rear waist body portions being joined and sealed together at opposing lateral side edges thereof to form a waist opening portion and a pair of leg opening portions,

each of the waist opening portion and the pair of leg opening portions being provided with an elastic member which forms substantially continuous gathers along the entire circumference of the waist opening portion and the leg opening portions, and a plurality of elastic members being provided at a body-surrounding portion which is located between the waist opening portion and the pair of leg opening portions and at which the absorbent member is provided, forming substantially continuous gathers along the entire circumference of the body-surrounding portion,

the diaper being characterized in that a plurality of elastic members are provided at a urination point located below the body-surrounding portion and in the vicinity of the urination portion of the wearer, thereby forming continuous gathers in the width direction of the diaper.

2. The shorts type disposable diaper according to claim 1, wherein a hip length to width ratio of the diaper is about 1.10 to 1.30.

3. The shorts type disposable diaper according to claim 1, wherein the elastic member provided at the body-surrounding portion and closest to the waist opening portion has a stress at 30% elongation of from 50 to 150 g, and the elastic member provided at the body-surrounding portion and closest to the leg opening portions has a stress at 30% elongation of from about 40 to 100g.

4. The shorts type disposable diaper according to claim 1, wherein the elastic member provided at the urination point has a stress at 30% elongation of from about 40 to 100 g.

5. The shorts type disposable diaper according to claim 1, wherein an elastic member is provided at the crotch portion along the width direction of the diaper, and the elastic member has a stress at 30%

elongation of from about 40 to 100 g.

6. The shorts type disposable diaper according to claim 1, wherein the elastic members provided at the body-surrounding portion are disposed in such a manner that the interval of the elastic members becomes narrower towards the waist opening portion and that the elastic members provided at the body-surrounding portion have an increasing elongation towards the waist opening portion.

7. The shorts type disposable diaper according to claim 1, wherein a fastening tape to be used for disposal of the diaper is provided on the outer surface of the backsheet of the rear waist body portion.

8. A shorts type disposable diaper comprising an absorbent body which comprises a liquid permeable topsheet, a liquid impermeable backsheet, and an absorbent member interposed between the topsheet and the backsheet,

the absorbent body having a front waist body portion located on the stomach side of a diaper wearer when the diaper is worn and a rear waist body portion located on the back side of the wearer, the front and rear waist body portions being joined and sealed together at opposing lateral side edges thereof to form a waist opening portion and a pair of leg opening por-

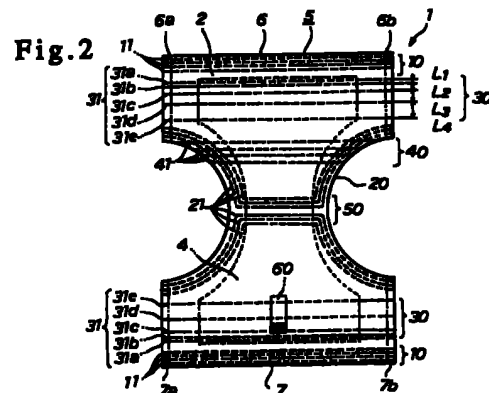
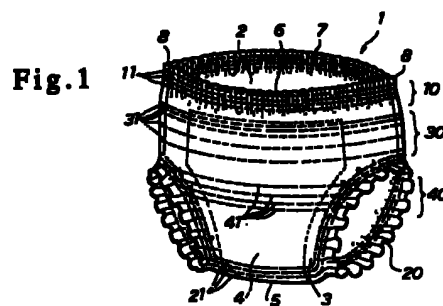
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tions,

each of the waist opening portion and the pair of leg opening portions being provided with an elastic member which forms substantially continuous gathers along the entire circumference of the waist opening portion and the leg opening portions, and a plurality of elastic members being provided at a body-surrounding portion which is located between the waist opening portion and the pair of leg opening portions and at which the absorbent member is provided, forming substantially continuous gathers along the entire circumference of the body-surrounding portion,

the diaper being characterized in that the elastic members provided at the body-surrounding portion are disposed in such a manner that the interval of the elastic members becomes narrower towards the waist opening portion and that the elastic members provided at the body-surrounding portion have an increasing elongation towards the waist opening portion.

9. The shorts type disposable diaper according to claim 8, wherein the elongation of the elastic members provided at the body-surrounding portion increases in the upward direction from the crotch portion to the waist opening portion by about 5 to 15%.



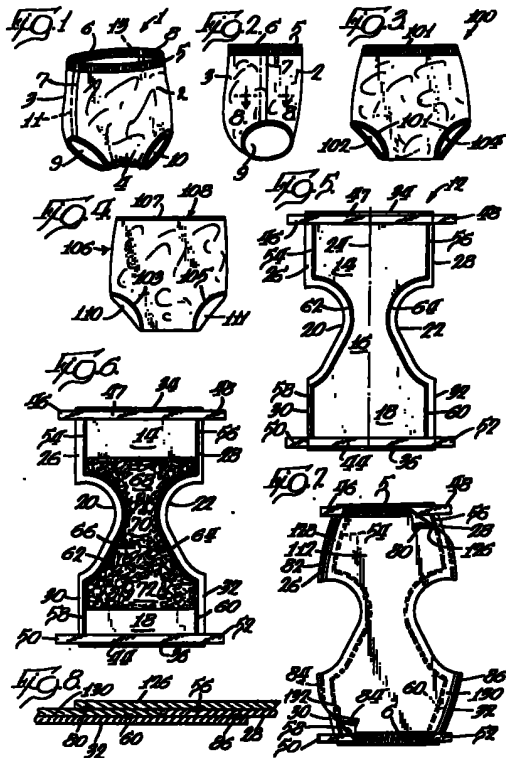
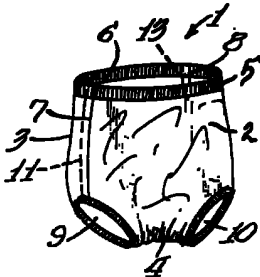
[54] DISPOSABLE UNDERGARMENT
[75] Inventors: Virginia L. Naples, Oak Forest; Ralph H. Naples, Jr., Palmdale Heights, both of IL.
[73] Assignee: Johnson & Johnson, New Brunswick, N.J.
[21] Appl. No.: 88,374
[22] Filed: Apr. 28, 1979

Related U.S. Application Data
[30] Continuation-in-part of Ser. No. 70,970, Jul. 23, 1976, abandoned.
[31] Int. Cl. _____ A61F 15/16
U.S. Cl. _____ 158/207
[32] Field of Search _____ 158/207, 287, 288, 290, 158/205 R, 250 W

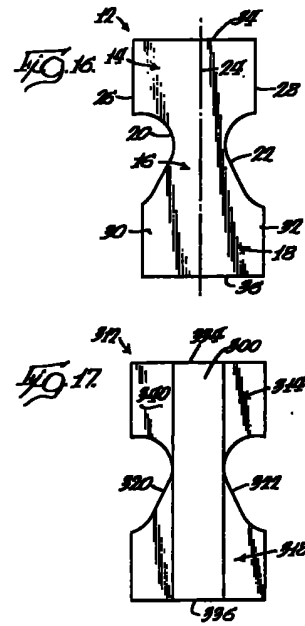
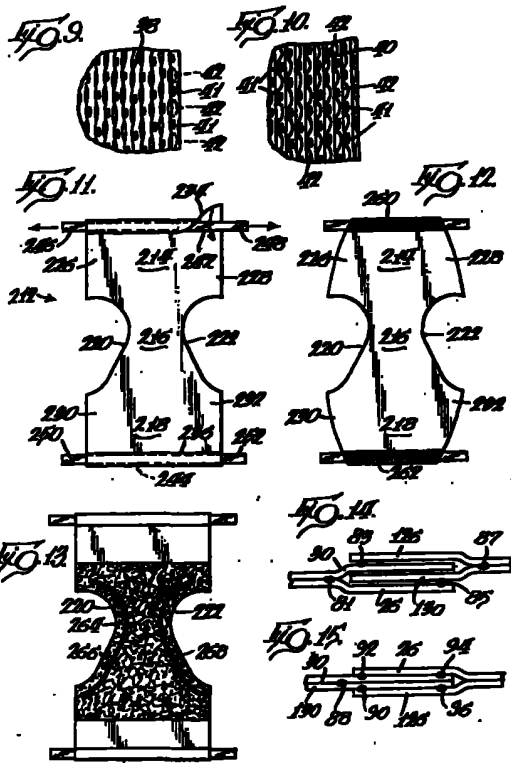
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ABSTRACT
A sanitary, multi-layer disposable undergarment such as a sanitary napkin for use in sanitary infants or for use by incontinent adults or children is provided. The undergarment is constructed from a non-woven, absorbent fabric and comprises a front portion, a rear portion, a crotch portion, a side-lying waste portion and a side-lying leg opening. The undergarment has an inner ply of absorbent fabric adapted to contact an infant's skin, a water-impermeable or moisture resistant outer ply and an intermediate liquid-absorbent layer or panel disposed therebetween. The inner and outer plies preferably are constructed from a non-woven fabric which has been uniaxially compressed to provide small pleats (micropleats) perpendicular to the machine direction and which has first been compressed in the cross direction to provide the desired stretch characteristics. The inner and outer plies are formed from automatically laser-cut shaped blanks having longitudinally extending side cut-outs which blanks are cut from the micropleated, cross-compressed web so that the micropleats are disposed in the longitudinal direction of the blank to provide the desired stretch in the leg and crotch area.

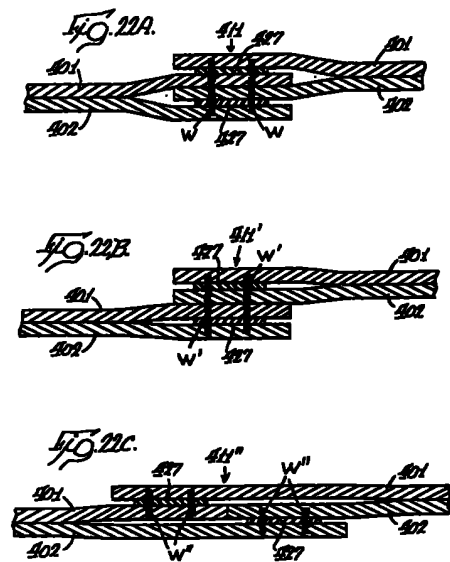
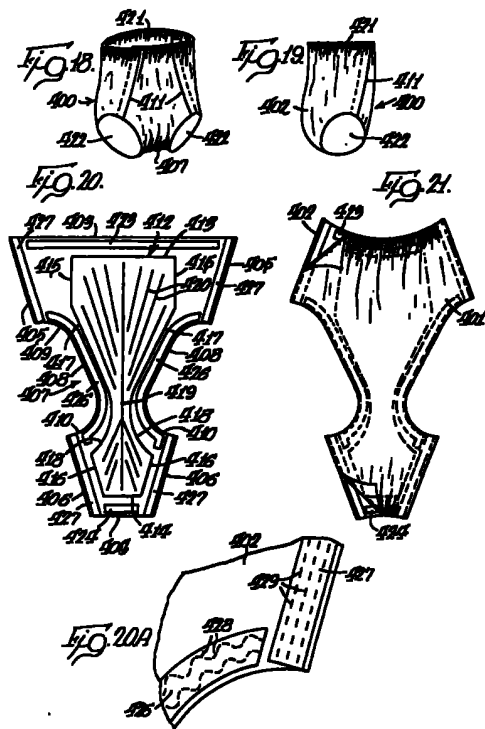
40 Claims, 28 Drawing Figures



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stony smaller plants interspersed in the transverse direction of the filaments by larger plants. When and in the presence of this heterostem, the microphotometer transversely through filaments is turned 90° from the main direction, and we can go from from F1020, 9 and 10, a plant pattern in the transverse direction. Thus, in the plant pattern, the plant 40 is smaller across the filaments than each of the relatively larger plants having longitudinal stems. A relatively smaller plant both in the longitudinal and in the transverse directions. Stems of smaller size, and the plant pattern in the transverse direction is more than a plant of substantially the same size by a relatively smaller plant. One surface of the microphotometer was parallel position 40 and the other surface in tilted position 30 having a relatively smaller plant. Moreover, the plant pattern have about 1 to about 20 size of microphotometer per line.

[illegible]

smaller than the radius of curvature n and n is not a unit
 Foot and back pencils or pencils 14 and 15 of each
 of the two blades are substantially the same width and
 are asymmetric, having opposite distances from opposite
 side edges of each portion to the longitudinal center line
 of the blade. That is, the distance from the side edge of
 front portion longitudinal side margin 26 to the longitudi-
 nal center line 26 of blade 11 is greater than the dis-
 tance from the side edge of opposed front portion longi-
 tudinal side margin 28 to center line 26. Similarly, the
 distance from the side edge of back portion side margin
 26 to longitudinal center line 26 is less than the distance
 from the side edge of opposed back portion side margin
 28 to center line 26.

Shaded in another way, the distance from the side edge margin 30 to center line 34 is greater than the distance from the main edge of margin 30 to center line 34 and the distance from the side edge of margin 30 to center line 34 is less than the distance from the side edge of margin 32 to center line 34. Blank 13 can also be constructed as having front panel or portion 34 and the back or rear panel or portion 36 asymmetrically positioned with respect to the longitudinal center line 35 of the blank. Such an arrangement provides the unique case constructive illustrated in FIG. 8 and described hereinafter.

Mark 12 additionally defined from waistband edge 34 and back waistband edge 36.

In order to provide the desired amount in the waistband, block 23 is cut from a subabdominal, cross-contoured, non-contoured fabric web, so that the abdominal portion of the fabric web is substantially parallel to, and substantially covers, the 26 of the block and the cross-contoured portion of the fabric web is substantially normal to the direction of subabdominal. The blocks are cut in this manner for optimum comfort and fit in the leg area.

Referring now to FIGS. 5, 6 and 20, in constructing any 1, block 23 is positioned on this ribbed pattern 20 (FIG. 5) of one face of the subabdominal, cross-contoured fabric from downwaistly and pulled around 60 (FIG. 20) around during subabdominal on the other face of the fabric web generally.

Sale #46 or electronic transfer tape such as an electric universal transfer tape (Sag- L-1000) ribbon designed for use with "Universal Transfer Tapes" from Eastman-Kodak Co., New Haven, Conn. This is disposed along each waistband connector edge 29 of neck 17 and strip 44 of a film chemically resistant to detergent along back waistband connector edges 28. Strips 44 and 47 are stretched and then mounted in place on the blank by, for example, electrostatic double-sided transfer tape, such as No. 433 high-tack pressure-sensitive tape available from the Minnesota Mining and Manufacturing Co., St. Paul, Minnesota.

Alternatively, and preferably, strength is provided to the webbed by utilizing edge or structural bands of thermoplastic elastomeric materials such as homopolymers, elastomeric block copolymers of styrene and isoprene or a similar class. Examples of the general type are commercially available from Shell Chemical Company under the designation "Elastar". Similarly, elastomeric strips of the polybutadiene type disclosed in U.S. Pat. No. 3,292,059 to Adams and elastomeric strips of the type disclosed in U.S. Pat. No. 3,639,919 to Adams can also be utilized. Also suitable are flexible but shapable polyurethane strips of the type shown in U.S.

Indian blanks 12 and 113 are unperforated, without bands or strips. 24, 26, 30 and 39 are depicted along the transverse axis of the blank respectively parallel to the outer margins 26, 28, 30 and 32, respectively, of blank 12. The two blanks are then arranged together along the glaze line depicted in FIG. 2. For ease of manufacture preferably prior to firing the heat-treated waferband areas 2 and 4. Side runs 7 and 8 of penny 1 can be fused or dissolved by leaching.

The fit in the leg area can be further enhanced by stretching or otherwise suitably disposing bands of low-stretch elastic G2 and G4 as shown in FIG. 3. Suitable for this purpose are aforementioned thermoplastic elastomeric compositions commercially available from Shell Chemical Company under the designation "Kroton".

Glass Nos 34 and 35 are examined, and different longitudinal cross strand slices margin 26 and 30 of block 13, respectively. Similarly glass Nos 33 and 39 are dropped and different longitudinal bulk panel slice margin 30 and 32, respectively, to secure another blank over block 13 when a multilayer gummed is manufactured. The same set of glass Nos is used to secure both blanks together, thus there is no need for an additional set of glass bars on the superimposed block. Blocks 32 and 44 of a hot-melt elastomeric material or the like (e.g., elastomeric block copolymers of styrene and isoprene) can be

- laid down along the margin of cutting out-cuts 20 and 21 to provide a guiding effect and to enhance fit in the leg area. Cuts 22 and 23 are guiding bands 63 and 64 can be of the same material or different, depending on the assembly methods that are used and the sit-

When blocks 113 and 112 are covered together, the electronic grips which act as movement sensors also provide sufficient strainability in the leg area as well as providing a liquid-impermeous barrier around the leg apertures. Increased bands of an electronic composition such as gum rubber and the like, suitably secured to

The construction of the two blinks, i.e., the blink which significantly defines the outer surface of the training passivity of this invention, probably has different features: permeability characteristics from those of the blank which defines the innermost layer of the training passivity. The former can be provided with an inherent resistance barrier which can be spread on or incorporated into the web from which the blank is cut during the manufacturing process by appropriate use of films, in the same manner as the blank of the present invention, but black and/or reflective. The latter, i.e., the blank which defines the outermost layer of the training passivity, is preferably permeable. Again, the chemical non-compatibility and mechanical characteristics of the blank, blacked, and/or reflective during web construction.

At element 36, neither lateral line lobe is displaced in the cranial nerve as was seen in element 13. As shown in FIG. 4, the middle lobe of element 36 has a lower lobe 65 cm in length. It is schematically the same configuration as cranial nerve 36 of block 13. Absence lower lobe also has an upper lobe 66 which extends over a part of brain panel 14 of block 13, cranial nerve 70 which is horizontally consecutive but vertically non-consecutive with cranial nerve 16 of block 13 and lower panel 72 which extends over a part of both panel 18 of block 13. However, it is to be noted that the absent lower lobe can have any desired configuration and can be, for example, schematically consecutive with block 13 or can be located simply in the cranial nerve as

If shortest inner layer 65 is disposed to the crown area or portion 16 of blank 11 between blank 112 is superimposed thereon, it is not necessary to adhere the shortest inner layer 65 to the blank 11. However, adhesive can be used if additional assurance is desired.

cracked, a road blank subsequently examined in comparison to blank 12 is superimposed over blank 12. For purposes of clarity the second blank will be hereafter identified as blank 112 and the blank elements corresponding to the same elements of blank 12 will be identified by 100-series legends having the same last two digits. The blank is superimposed so that the pebbly surface of blank 112 faces and is contained in the same

anterior of black 122 extends as a prolongation to the adjacent pulpy surface of black 12. Where blacks 12 and 122 are superimposed, margin 26 of black 12 extends beyond adjacent margin 126 of black 122 and margin 26 of black 12 extends beyond adjacent margin 126 of black 122. Similarly, margin 126 of black 122 extends over margin 26 of black 12 and margin 122 of black 12 extends over margin 26 of black 12.

Elastic straps 47 and 48 are pre-stretched on block 13 and secured in form gathered over waistband section 6 and Spout waistband section 1. Tabs 46, 49, 50 and 51 are

also probably cut off. When strips 47 and 48 are thus separated, movement by heat sealing is the method of choice. The preferred method of heat-sealing is by intermittent heat-seal system which provides edges strong and lasting standing in the folded position.

in FIG. 3, tubing party 200 is made of similarly contoured blocks as training party 1 but the thermoplastic heat-shrinkable elastic material 201 utilized in the waistband of party 1 is also utilized to provide self-fit-
 20 in the leg apertures 202 and 204 of training party 200. FIG. 4 depicts training party 200 which is similar to training party 1 but wherein contoured heat-shrinkable elastic material 201 is used to encircle stomach in the

This space 7 and 8 can be stored in several ways. The preferred construction is shown in FIG. 8. I wish

[illegible]

any attempt to provide a side snap is only 7 and 8, which are not used. As we can see from FIGS. 1, 4, 7 and 8, while the blades that are utilized to form a trailing point having the preferred cam construction are approximately as illustrated in detail heretofore, the gaps between the blades of the cam are not uniform. For example, as shown in FIGS. 25, 26, 27, 28, 29, 30 and 31, the gaps between the blades are not uniform. For example, in FIG. 25, the gaps between the blades are not uniform. For example, in FIG. 25, the gaps between the blades are not uniform. For example, in FIG. 25, the gaps between the blades are not uniform.

Referring to FIGS. 34 and 35, the gusset side seam can alternatively be constructed by alternately lap-
ping margins 24, 26, 226 and 228 or by lapping margins
26 and 226 over unstitched edges 24 and 228, it being
understood that margins 26 and 226 could overlap unstitch-
ed edges 24 and 228 and the order of lapping

When the epoxy is worn, the clearest surface mark on surface 2B in FIG. 9 of one of the blades from the tubing

62 and from the patty inner surface and similar ribbed surface of the outer blank form the outer surface of the patty. The pulled surfaces such as surface 48 in FIG. 10 face one another.

In an alternative embodiment, as shown in FIG. 11, the 64 twisting patty of this invention can be converted from a single blank 713 of non-pullable, cross-compressed

fabric which is provided with side margins 224, 226, 228 and 232 as well as opposed oblique cut-outs 229 and 231. Elasticized cuffs 242 and 244 are laid down on the

[54] STRETCHABLE DISPOSABLE ABSORBENT UNDERGARMENT

[72] Inventors: Louis G. Boland, Norman George L. Boland, Larry Robert A. Brown, Appleton, WI of WI.

[73] Assignee: Kimberly-Clark Corporation, Menasha, WI.

[21] Appl. No.: 54,838

[22] Filed: Apr. 3, 1987

[31] Int. Cl. 4: A61F 15/16

[32] U.S. Cl.: 604/283.1; 604/284

[33] Field of Search: 604/283.1, 283.2, 284, 604/283, 284, 278

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Primary Examiner—John D. Yanko
Attorney Agent or Firm—John L. Chisholm

[57] ABSTRACT

An automatically form-fitting, generally self-adjusting disposable absorbent slip-on undergarment that may be easily rolled and removed by the wearer during use, with a locking panel or band around the waist.

The present invention comprises a stretchable absorbent undergarment having an absorbent insert structure situated and suspended therein while allowing substantially unrestricted freedom of movement of the outer cover. The outer cover has elastic side panels connecting the front and rear panels and the leg and waist opening flaps, including normally retractable side means having breakable elements for removing the garment from the wearer upon soiling, without removal of the wearer's outer clothing.

15 Claims, 5 Drawing Sheets

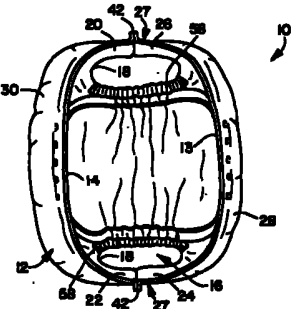
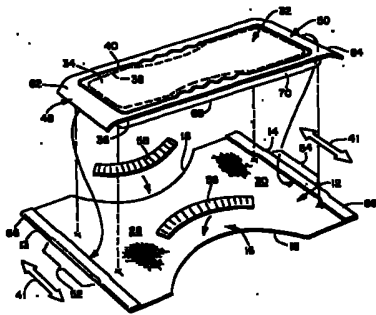


FIG. 1

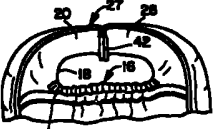


FIG. 2

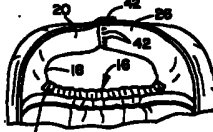


FIG. 3

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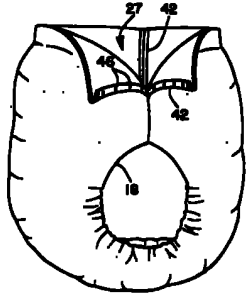


FIG. 4

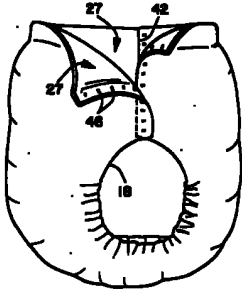


FIG. 5

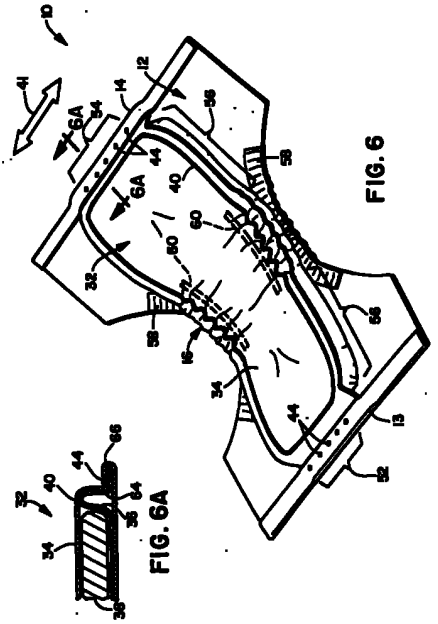


FIG. 6

FIG. 6A

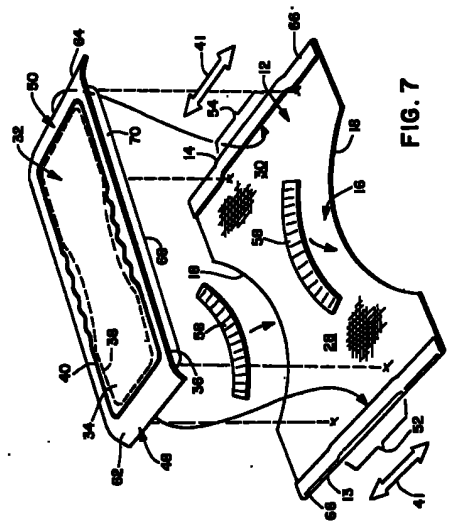


FIG. 7

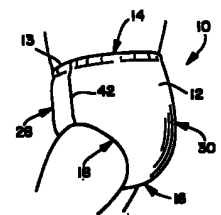


FIG. 8

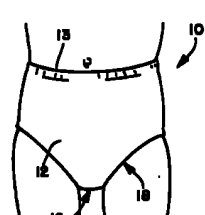


FIG. 9

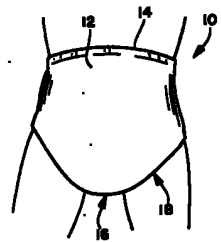


FIG. 10

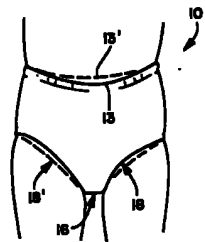


FIG. 11

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STRETCHABLE IMPERFORABLE UNDERGARMENT

TECHNICAL FIELD

The present invention relates, generally, to the field of disposable garments useful for the absorption and containment of urine and other bodily excretions. More particularly, the present invention relates to pull-on undergarments, such as disposable training pants, briefs, and the like.

BACKGROUND OF THE INVENTION

Disposable garments are generally well known in the art and have become an important and an essentially indispensable sanitary protection item, most particularly in the field of infant and child care where disposable diapers provide for the absorption and containment of urine and other bodily excretions. Present commercially available disposable diapers are generally sanitary, practical and portable, and comprised of a porous absorbing layer and a fluid impervious backing sheet with an absorbent material disposed therebetween. These presently available disposable diapers have not a particularly good and have become ever increasingly popular. However, even though the present available disposable diapers have achieved a certain degree of efficiency and effectiveness, several draw-backs remain that have been identified by persons of ordinary skill in the art. These drawbacks have strongly urged their desire to be able to obtain disposable diapers that are substantially neat and attractive when on their infant or child. The commercially most difficult have been identified as including a thin, flat, and a neat fitting waist and legs that do not allow leakage of urine or feces. It has also been found that persons do not want their children looking rumpled, bulky or messy. In addition, these persons have expressed the desire to have a disposable diaper that fits snugly around the waist and to have disposable diapers provided in more than one size. Another draw-back identified by these persons has been the problem associated with skin irritation caused by urine, feces or moisture trapped next to the skin. They have again been very vocal in their desire to obtain disposable diapers that avoid or solve this problem.

The typical disposable diaper has a three-layer composite structure comprising a liquid permeable bodystock layer, a liquid impervious outer cover and an absorbent pad sandwiched between the layer and the cover. Materials now in general use for the three principal elements of a disposable diaper include various types of nonwoven fabrics for the bodystock layer, a thin thermoplastic film for the outer cover and absorbent stuff for the absorbent pad.

Disposable diapers of the type presently on the market are that open-sided garments that are intended to be fit around an infant by a parent while the infant is lying down. The rear panel of the diaper is placed underneath the infant, and the front panel is placed between the infant's legs, after which the sides are overlapped and held together by pressure-sensitive adhesive tapes. A diaper is meant for use when the child is young and dependent upon a parent for this essential purpose. Examples of present disposable diapers are taught in U.S. Pat. Nos. 4,394,247 to Minami, et al., U.S. Pat. No. 3,195,874 to Krichinsky, and U.S. Pat. No. 4,029,462 to Weiss, et al.

Prior art diaper constructions disclosed in the references listed below have sought to provide waste containment with a reusable diaper holder receiving an absorbent structure.

1. U.S. Pat. No. 3,458,084 to Potholoy and U.S. Pat. No. 3,770,590 to Holzman, et al.;
 2. U.S. Pat. No. 4,455,128 to Minami;
 3. U.S. Pat. No. 4,341,125;
 4. U.S. Pat. No. 4,397,666 to Daniels, et al.;
 5. U.S. Pat. Nos. 4,397,761, 4,494,340 and 4,597,762.
- Other patents, e.g., U.S. Pat. No. 4,168,404 to Krichinsky, have utilized elastic field of disposable training pants intended to an absorbent layer in an attempt to provide enhanced conformability to the body surface.

U.S. Pat. Nos. 4,321,693 to Jones, et al. and 4,664,157 to Draper disclose disposable stretchable coverings with a stretchable field of elastic material for absorbing and containing body waste.

Even where prior art designs have attempted to use impermeable elastic film borders, there has been inadequate recognition of the functional problems associated with an elastic outer cover. Further, easily worn disposable holders or overwraps, designed to be waterproof and stretchable, do not offer a truly disposable capability. U.S. Pat. No. 4,610,811 to Shuchman, et al., assigned to the instant assignee, the entire disclosure of which is incorporated by reference herein and relied upon, discloses a disposable undergarment, such as a child's pull-on training pants, having a multi-layer web and sealed with an elastic side seam. The training pants includes a closed leg and waist opening but otherwise has conventional components. The side seams join together closed side panels of the pants, allowing the child to enter and leave the pants unaided during toilet training.

Should the pants "accidentally" become soiled, the side seams are normally capable to allow removal of the pants without requiring removal of any outer clothing from the child. The outer cover of the pants comprises a nonwoven material with a stretched cloth field intended to further enhance the transition from infant diapers to reusable cloth undergarments which are worn after the toilet training period.

U.S. Pat. Nos. 4,610,480 and 4,610,669 both disclose a training pants wherein a tear seam allows the pants to be separated for removal from the child when soiled. Likewise European Patent Application No. 0,004,011 A1, published Mar. 24, 1982, discloses a tear strip allowing the pants to be separated for removal upon soiling.

Although the above-mentioned prior art diapers and training pants are provided with elasticized leg and/or waist openings, there is still a tendency for the garment to move away from the body at the hip and lower abdominal regions. Thus, there remains a need for an substantially form-fitting, generally self-adjusting training pants or other disposable undergarment that may be worn and used unaided, either by a child in toilet training or by an incontinent adult, and then easily removed when soiled without a tear.

SUMMARY OF THE INVENTION AND ADVANTAGES

According to the instant invention, there is provided an substantially form-fitting, generally self-adjusting three-dimensional disposable absorbent undergarment comprising a liquid-impermeable nonwoven outer cover which is elastic nonwoven web is joined to one or more permeable nonwoven webs, including a pair of leg openings, front and rear waist sections together

defining a waist opening, a stretch section situated between the leg openings, opening front and rear panels separated by the stretch section and a pair of side panels extending between and interconnecting the leg and waist openings and the front and rear panels, respectively. An absorbent insert structure is substantially responsible on the front and rear panels and the stretch section, including a liquid-impermeable border and a liquid permeable bodystock layer with an absorbent core disposed therebetween. Absorbent means are provided for absorbing and containing the absorbent insert into the outer cover while allowing substantially unrestricted functional stretchability thereof. Nonetheless, the side seams extend between and interconnect the leg and waist openings of each of the side panels, including manually stretchable stress release means for opening and separating the side seams and removing the garment from the wearer when the same becomes soiled.

In a preferred embodiment, the insert is situated in the outer cover at selected waist attachment means, defining one or more free-open areas underlying the absorbent insert wherein the functional stretchability of the outer cover in the free-open areas is substantially unrestricted. Further, the outer cover may be readily stretchable in an essentially cross-body direction from about 20% to about 200% and have a nonrestrictive free-open area effectively extending at least the entire longitudinal length of the rear panel.

In another preferred embodiment, the absorbent structure may be integrated to the outer cover while the outer cover is in a stretched condition. An advantage of the instant invention is a disposable absorbent garment having a form-fitting, generally self-adjusting fit due to an elasticized outer cover having an longitudinal stretch properties of the outer cover. Another advantage of the instant invention is that the absorbent structure is held in registration with the body for absorbing and containing waste without sagging or shifting out of place, reducing leakage from the diaper.

Another advantage of the instant invention is a pull-on absorbent garment that may be used unaided by a child during toilet training or by an incontinent adult and then easily removed upon soiling without also removing the outer clothing. A further advantage of the instant invention is the convenient cloth-like comfort and feel of the garment while providing a smooth pleasing undergarment-like appearance when worn.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an internal perspective view of the invention.

FIG. 2 is a partial internal perspective view of the invention.

FIG. 3 is a partial internal perspective view of the invention.

FIG. 4 is an external perspective view of FIG. 2.

FIG. 5 is an external perspective view of FIG. 3.

FIG. 6 is an internal view of the invention shown prior to closure of the side seams (shown).

FIG. 6A is a sectional view of cross-section 6A-6A of FIG. 6.

FIG. 7 is an exploded perspective view of the invention showing integration of the absorbent insert structure into the outer cover.

FIG. 8 is a side view of the disposable absorbent undergarment of the present invention shown secured around a baby.

FIG. 9 is a front view of the disposable absorbent undergarment of the present invention shown secured around a baby.

FIG. 10 is a back view of the disposable absorbent undergarment of the present invention shown secured around a baby.

FIG. 11 is a front view of the disposable absorbent undergarment of the present invention showing the disposition of the garment on the baby after being worn for a period of time.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1, according to the instant invention, there is provided an substantially form-fitting, generally self-adjusting disposable absorbent undergarment, generally shown at 10, such as a disposable training pants or incontinent garment, worn and leg an elasticized outer cover, generally indicated at 20, including opening front 22 and rear 24 waist sections together defining a waist opening. A stretch section, generally indicated at 26, is situated between a pair of leg openings 18 at adjacent portions of said stretch section 26. The portions 26, 22, 24, 26 are defined generally between the opposed waist sections 22, 24 and each of the marginal leg openings 18, respectively, with longitudinally opposed pairs of side seams 28, 30 and 32, 34 being disposed with one another about the body of a wearer, defining a pair of side panels, generally indicated at 36. Also, the outer cover 20 preferably has a generally hourglass profile with the leg openings 18 cut out from the stretch section 26 thereof, defining a front panel 20 having a laterally opposed front pair of the rear panels 24, 26 in conjunction therewith and a rear panel 20 having another laterally opposed rear pair of the rear panels 24, 26 in conjunction therewith. The front 22 and rear 24 panels are separated from one another by the stretch section 26 which is unsecured due to the converging leg cut-out openings 18.

With reference to FIG. 7, there is depicted an absorbent structure, generally indicated at 20, substantially responsible on the front 22 and rear 24 panels and the stretch section 26 of the outer cover 20 for absorbing and containing bodily excretions. The absorbent structure 20 includes a liquid-permeable bodystock layer 24, for example, a commercially available polypropylene-based, open-celled polypropylene web that may have a bulk weight of from about 0.1 to 0.3 oz./y², a liquid-impermeable border 26, for example, a commercially available plastic film of polypropylene or the like, and an absorbent core 28 disposed therebetween. As shown in FIGS. 6 and 7, the absorbent structure 20 is in the form of a separate insert, typically of substantially non-stretchable material, attached and integrated into the suitably stretchable outer cover 20 using, e.g., integrally formed bonds of the type generally denoted by reference numerals 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100, 102, 104, 106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190, 192, 194, 196, 198, 200, 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, 222, 224, 226, 228, 230, 232, 234, 236, 238, 240, 242, 244, 246, 248, 250, 252, 254, 256, 258, 260, 262, 264, 266, 268, 270, 272, 274, 276, 278, 280, 282, 284, 286, 288, 290, 292, 294, 296, 298, 300, 302, 304, 306, 308, 310, 312, 314, 316, 318, 320, 322, 324, 326, 328, 330, 332, 334, 336, 338, 340, 342, 344, 346, 348, 350, 352, 354, 356, 358, 360, 362, 364, 366, 368, 370, 372, 374, 376, 378, 380, 382, 384, 386, 388, 390, 392, 394, 396, 398, 400, 402, 404, 406, 408, 410, 412, 414, 416, 418, 420, 422, 424, 426, 428, 430, 432, 434, 436, 438, 440, 442, 444, 446, 448, 450, 452, 454, 456, 458, 460, 462, 464, 466, 468, 470, 472, 474, 476, 478, 480, 482, 484, 486, 488, 490, 492, 494, 496, 498, 500, 502, 504, 506, 508, 510, 512, 514, 516, 518, 520, 522, 524, 526, 528, 530, 532, 534, 536, 538, 540, 542, 544, 546, 548, 550, 552, 554, 556, 558, 560, 562, 564, 566, 568, 570, 572, 574, 576, 578, 580, 582, 584, 586, 588, 590, 592, 594, 596, 598, 600, 602, 604, 606, 608, 610, 612, 614, 616, 618, 620, 622, 624, 626, 628, 630, 632, 634, 636, 638, 640, 642, 644, 646, 648, 650, 652, 654, 656, 658, 660, 662, 664, 666, 668, 670, 672, 674, 676, 678, 680, 682, 684, 686, 688, 690, 692, 694, 696, 698, 700, 702, 704, 706, 708, 710, 712, 714, 716, 718, 720, 722, 724, 726, 728, 730, 732, 734, 736, 738, 740, 742, 744, 746, 748, 750, 752, 754, 756, 758, 760, 762, 764, 766, 768, 770, 772, 774, 776, 778, 780, 782, 784, 786, 788, 790, 792, 794, 796, 798, 800, 802, 804, 806, 808, 810, 812, 814, 816, 818, 820, 822, 824, 826, 828, 830, 832, 834, 836, 838, 840, 842, 844, 846, 848, 850, 852, 854, 856, 858, 860, 862, 864, 866, 868, 870, 872, 874, 876, 878, 880, 882, 884, 886, 888, 890, 892, 894, 896, 898, 900, 902, 904, 906, 908, 910, 912, 914, 916, 918, 920, 922, 924, 926, 928, 930, 932, 934, 936, 938, 940, 942, 944, 946, 948, 950, 952, 954, 956, 958, 960, 962, 964, 966, 968, 970, 972, 974, 976, 978, 980, 982, 984, 986, 988, 990, 992, 994, 996, 998, 1000.

cover for antenatal binding. Accordingly, polypropylene and other polyolefins have been found to be suitable materials for use in the liner, bladder and outer cover.

The outer cover 12 generally comprises an air-permeable, i.e., "breathable", elastomeric nonwoven fabric which is an elastic nonwoven web joined to one or more permeable nonwoven webs. Preferably, the laminate is sufficiently stretchable from about 20 to about 200 percent in an essentially cross-body direction 41. The longitudinally opposed ends 26, 28, 30, 32, 34, which are comparable with one another to form the distal side panels 26, are joined together by a pair of side seams 40 substantially from the waist to the leg openings. The full-length elastomeric of the side panels 27 can be selected to further provide distal tensioning to the relatively stretchable garment during walking and over extreme bodily movements and positions of the wearer. Thus the undergarment is form-fitting and self-adjusting, it does not gap or collapse at the hip and waist regions.

Preferably, the waist sections 23, 34 of the outer cover 12 have the least 32 stretched and integrated elastomeric by attachment means according to the present invention as will be set forth more fully below.

With respect to the attachment means of the present invention as shown in FIGS. 6 and 6A, it is important to maintain the number of bands and total band area used in integrating the relatively inextensible elastomeric liner to the stretchable outer cover or, where forming bands, the number of bands used to bond the outer cover to itself. The Applicants have discovered that the number of bands correspondingly affects the stretch elongation in the elastomeric component that is bonded. Not only does a lower number of bands result in less stretch loss, but the greater the spacing apart of band points, the less stretch elongation is affected. Accordingly, bonding patterns should be selected that significantly reduce the amount of stretch loss by means of the density and spacing of the band points. Specifically, the lower the number and density of the bands 46 for stretching and integrating the liner 22 along the waist sections 23, 34, the less stretch is inhibited in said waist sections. For example, if the waist section is stretchable in a cross-body direction and the liner is attached between two points lying on a line extending also in said cross-body direction, then the stretchability of the outer cover waist section along that line is restricted between those two points of attachment by the least stretchable element present between those points, usually the liner or bladder of the liner. Similarly, the liner may also be stretched and integrated at the crotch section.

Therefore, the present of the present invention includes attachment means for stretching and integrating an elastomeric liner structure, and for stretching and containing body wastes, into a relatively stretchable elastomeric outer cover and for positioning the liner in a fully retractive, while allowing substantially unrestricted functional stretchability thereof, maintaining the total garment substantially form-fitting and generally self-adjusting. These objectives have been achieved by utilizing a full-length, form-fitting, form-fitting system in combination with the above components, such as that taught in expanding U.S. patent application Ser. No. 63,528, the entire disclosure of which is hereby incorporated by reference and relied upon.

The inner undergarment 22 is generally constructed and assembled as shown by FIGS. 6-7. The bands 46 stretch and integrate the opposed longitudinal ends 43, 45 of the elastomeric liner 22 to said outer cover 12 at selected front 28 and rear 34 waist sections 26, 32 along said front 28 and rear 34 waist sections, respectively, defining one or more free-open zones 36 underlying said liner 22 wherein the functional stretchability of said outer cover in said free-open zones 36 is substantially unrestricted. It will be understood that where the liner 22 is integrated only at the waist attachment means 23, 34, i.e., not at the crotch section 38, the free-open zones 36 underlie the entire length of the liner 22. Alternatively, the free-open zones 36 also include those portions of the waist sections 23, 34 not included in the waist attachment means 23, 34. It will also be understood that the liner 22 may be integrally held by the outer cover 12 in registration with the body of the wearer without additional bonding in the free-open zones 36 to the front 28 or rear 34 panels or the crotch section 38. Moreover, stretch resistance of the outer cover, even in the waist attachment means 23, 34 can be influenced by the liner invention as further set forth below.

Although the free-open zones 36 can be provided in either of the front 28 and rear 34 panels, it is the stretch properties of the rear panel 34, which are more important. It should be noted, that cross-body stretch in the crotch section 38 of the outer cover 12 during use is substantially impeded as the liner 22 is held at or near the leg openings 38 of the crotch section 38 does not significantly affect the overall cross-body stretch properties of the outer cover. The breathable outer cover 12, among other functions, holds the liner 22 in proper bodily registration and, within the prior art, is not built required to provide a rigid water containment barrier.

Referring to FIG. 7, the elastomeric liner 22 may further comprise at least one but preferably a pair of front 28 and rear 34 waist attachment flaps 23 and 34 respectively situated at the opposed longitudinal ends 43, 45 of the liner 22. The flaps 23, 34 extend longitudinally from and contiguous with the liner 24 beyond the bonded ends of the elastomeric composite 22, the flaps being bonded or otherwise attached to said front 28 and rear 34 waist sections, respectively, in said waist attachment means 23, 34. The front 28 and rear 34 waist sections preferably have folded waist bands 46 along the waist opening wherein the waist attachment flaps 23, 34 are stretched and bonded. The waist bands 46 comprise longitudinally folded edges of elastomeric portions of said waist sections 23, 34.

According to the invention, therefore, the waist attachment flaps 23, 34 (FIGS. 6A and 7) may comprise elastomeric of the liner 24 and liner 34 or any composite expansion of either the liner 24 or liner 34 alone. The flaps 23, 34 typically comprise nonwoven and/or plastic film materials that are not inherently stretchable relative to the outer cover; however, the flaps 23, 34 themselves need not be configured with the liner or bladder material.

Referring again to FIGS. 6 and 7, additional elastomeric or bonding between other areas of the outer cover 12 and elastomeric liner 22 may be provided for further containment and fit. Specifically, supplemented leg elastic 48 may be applied to convenient portions of the crotch section 38 around the lower curves of the leg openings 38 to gather the garment 20 about the thigh of the

wearer. Crotch elastic 48 may be applied to the liner 24 to cause the liner to more closely conform to the contours of the wearer's perineal region.

The leg elastic 48 preferably comprises a breathable elastomeric nonwoven laminate of the type described in expanding U.S. patent application Ser. No. 547,948, the entire disclosure of which is hereby incorporated by reference and relied upon. The leg elastic members 48 function cooperatively with the stretchable outer cover 12 for gathering the leg openings 38 about the wearer and can be applied in varying tension relative to the elastic, antenatal or pressure banding. Leg bands (not shown) may alternatively be formed at the crotch leg openings 38 in addition to the waist sections 23, 34, resulting in increased tension due to the increased thickness of the elastomeric material of the outer cover at the folded crotch legs. Moreover, additional elastic members (not shown) of, e.g., FULLASTIC® (a trademarked elastomeric film material sold by E. S. Fuller Company of Minneapolis, Minn.), can be incorporated within the waist bands 46 and any leg bands (not shown) to provide elastic gathering. Although the waist opening leg bands have been discussed in conjunction with waist bands 46 and optional waist elastic members 48, a nonwoven elastomeric laminate material of the type described for the leg elastic 48 could be applied as a further step (not shown) along the waist opening.

As can be seen in FIG. 7, the liner 22 closely surrounds the bottom 49, and sides 70 of the elastomeric zone 38 (shown in phantom) with the liner 24 extending from and extending the top surface of the elastomeric zone 38, imparting a generally rectangular box-shaped configuration to the liner 22. The bottom 49 of the liner 24 may include one or more internal bonded areas adjacent the bottom 49 of the elastomeric zone 38 to accommodate swelling of the area during use with, for example, a hygienic material. The perimeter band 46 between the liner 34 and liner 24 integrally secured the elastomeric zone 38 may comprise either elastomeric bands or, preferably, a continuous antenatal band.

The perimeter band 46 may be unitary along the intermediate portions of the zone 38, leaving a notched edge and greater flexibility thereof.

Significantly, the elastomeric structure 22 may be integrated into the outer cover 12 in the waist attachment means 23, 34 while the outer cover is stretched in the cross-body direction 41. Preferably, the longitudinal length of the free-open zones 36 in the front 28 and rear 34 panels is at least about 2.5 inches or the longitudinal length of the side seams 27.

A preferred method of integrating the elastomeric liner structure 22 into the relatively stretchable breathable elastomeric undergarment comprises the steps of: providing the outer cover with opposed front 28 and rear 34 waist sections, a central crotch section 38, front 28 and rear 34 panels between the crotch and the waist sections precluding the outer cover from being about 20% in a cross-body direction 41 parallel to the waist sections while compressing the liner 22 upon an inner surface of the outer cover, then bonding the longitudinally opposed ends 43, 45 of the liner to the waist sections in the selected waist attachment means 23, 34, defining one or more free-open zones 36 allowing substantially unrestricted functional stretchability of the outer cover 12 underlying the free-open zones 36. One aspect of the present invention method comprises the step of integrally folding over the outermost edges of the

waist sections 23, 34 having waist bands 46 integrating the longitudinally opposed ends 43, 45 of the elastomeric liner thereby and bonding the opposed ends 43, 45 of the liner within the waist bands 46 at the waist attachment means 23, 34. As disclosed above, however, the waist opening may be distributed by a breathable elastomeric nonwoven laminate bander strip rather than elastomeric waist bands. Finally, the side panels 27 are closed and joined together at the side seams 41 by the elastic ends or folded bands 46. In use, the garment 20 is slipped on the body in the same way as a reusable cloth undergarment and may be slipped down over the hips by the wearer when using the toilet. Should the garment become soiled, the side seams 27 may be manually separated by tearing away the bands 46, then removing the garment 20 from the wearer.

With respect to the physical properties required of the stretchable side seams 41 bonding system, the Applicants have found that the elastomeric bands 46 should provide the zone 41 with a peak strength of from about 600 grams to about 2,500 grams depending upon the outer cover material and the ability or strength of the user, e.g., a parent, to tear open the side seams 41. The side seams 41 should have a shear strength greater than about 3,750 grams per square inch. The instant invention, during use, maintains the dimensional integrity of the garment with minimal sagging of the waist or gapping and bleeding at the hips.

FIGS. 1-3 show various configurations of the side seams 41 which may be currently being (FIG. 1), in variously being (FIG. 2) or overlapping (FIG. 3). The side seams 41 as shown in FIGS. 4 and 5 in the zone 41 would be manually separated, in the case of the latterly being side seams (FIG. 4) and the overlapping seams (FIG. 5). Alternatively, the side seams 41 could comprise perforations (not shown) in the side panels 27.

FIGS. 6-11 show a disposable diaper 30 of the instant invention as it would be worn by a baby wherein the diaper 30 shows a waist 32 and a rear 34 and a crotch section 38 when viewed from different perspectives.

FIG. 11 illustrates the dimensional integrity of the diaper, as shown by the minimal extent the diaper moves or rips from an initial position as indicated by the dashed line 37 and 37' after being worn by an infant for a period of time.

Turning now to the outer cover 12 of the present invention, which is preferably made from a relatively stretchable elastomeric nonwoven laminate material having a stretchability of from about 20 percent to about 200 percent. The term stretchability as used herein is defined by the following relationship:

$$\text{Stretchability} = \frac{\text{Final dimension} - \text{Initial dimension}}{\text{Initial dimension}} \times 100\%$$

Thus the outer cover 20 is also resilient, the outer cover returns essentially to its initial dimension when the stretching force is removed.

One suitably stretchable material is disclosed in U.S. patent application, Ser. No. 703,896 in the name of Tony J. Woodard and Michael T. Horvath, assigned to the assignee of the present application, entitled "Polyethylene-containing stretchable Composites and Methods for their Formation into Elastomeric Products", the disclosure of which is incorporated herein by reference and relied upon. That application provides elastomeric elastomeric composites which, after extru-

material which has been formed without use of such working processes which produce a structure of individual fibers which are interwoven in an identifiable repeating pattern. Specific examples of nonwoven webs would include, without limitation, a meltblown nonwoven web, a spunbonded nonwoven web, an apertured film, a nonwoven web, elastomeric netting or a coated web of single fibers.

It is to be clearly understood that the descriptions of materials for making a material suitable for outer cover 12 and the descriptions of materials suitable for the outer cover 13 are exemplary only and not meant to be limiting.

The topolide fiber 34 may be elastic, a bonded coated web, a powder-bonded coated web or a pattern bonded, apertured web of synthetic fibers such as polypropylene, polyester and the like.

Various materials are contemplated for use as the elastomer cover 36, including fibrous materials, foams, particulates, etc. In general, the most economical liquid elastomer material for use in disposable diapers has been an elastomer film. The elastomer film most commonly used is ethylene film such as conventional wood pulp, commonly known in the art as "pulp fluff" or simply "fluff".

Conventional wood pulp (fluff) is produced as an elastomer film, but other elastomers such as cotton fluff can be used. The preferred fluff is contains plus fluff wood pulp (i.e., made according to the cotton process commonly known in the art) which has been bleached, such as can be purchased from International Paper Company. Other preferred fluffs may be purchased from Kimberly-Clark Corporation, such as C1-54. Various liquidwood fluffs may also be blended with the elastomer fluff to form the elastomer composite. A water-soluble hydrogel material, preferably in particulate form, may be used in a number of various arrangements within the elastomer composite in order to increase the bulkiness and enhance the capacity of the composite 36. It should be understood that additional elements could be provided in conjunction with these already set forth, without departing from the contemplated scope of the present invention and the description herein is not intended to be in any way limiting.

We claim:

1. An essentially free-flying, generally self-aligning, three dimensional disposable elastomer undergarment comprising:

a. a fusible elastomeric nonwoven outer cover wherein an elastic nonwoven web is joined to one or more gelatinous nonwoven webs, defining a waist opening, leg openings, a central crotch section, front and rear panels separate by mid crotch section, and a pair of side panels extending between and interconnecting said leg and waist openings and said front and rear panels, respectively;

as elastomer insert structure substantially superimposed upon said front and rear panels and said crotch section, including a liquid permeable bodyplate

layer, a liquid impermeable barrier and an elastomer composite disposed therebetween;

attachment means for attaching and integrating said elastomer structure into said elastomeric outer cover with allowing substantially unrestricted functional extensibility thereof and nonstretchable side seams extending between and interconnecting said leg and waist openings of each of said side panels, including mutually overlying stress release means for opening and separating said side seams and removing said garment from a wearer when the seams become critical.

2. The invention of claim 1 wherein said insert includes opposed longitudinal ends respectively attached to said front and rear waist sections in elastomer front and rear waist attachment means, defining one or more free-span areas underlying said insert wherein the functional extensibility of said outer cover in said free-span areas is substantially unrestricted.

3. The invention of claim 1 wherein said outer cover comprises externally facing and body facing surfaces and wherein said side seams comprise laterally projecting pairs of marginal side edges of said front and rear panels and wherein said stress-release means comprises at least one stress-release band joining together each of said pair of side edges.

4. The invention of claim 3 wherein said outer cover comprises externally facing and body facing surfaces and wherein said side seams comprise overlapping pairs of marginal side edges of said front and rear panels and wherein said stress-release means comprises at least one stress-release band joining together each of said side seams.

5. The invention of claim 3 wherein said outer cover comprises externally facing and body facing surfaces and wherein said side seams comprise overlapping pairs of marginal side edges of said front and rear panels and wherein said stress-release means comprises at least one stress-release band joining together each of said side seams.

6. The invention of claim 3, 4 or 5 further comprising a plurality of said stress-release bands.

7. The invention of claim 6 wherein said stress-release bands comprise antagonistic bands generated either manually or automatically.

8. The invention of claim 1 wherein said insert is not superposed on said side panels and said side seams are defined by a longitudinally extending series of perforations.

9. The invention of claim 6 wherein said insert is attached to said outer cover while said outer cover is in a stretched condition.

10. The invention of claim 1 wherein said stress-release means comprises antagonistic bands having a peak strength from about 600-2500 grams.

11. The invention of claim 10 wherein said stress-release means have a shear strength greater than about 1,700 grams per square inch.

[54] FORM-FITTING SELF-ADJUSTING
DISPOSABLE GARMENT WITH
ANCHORED WAIST AND LEG ELASTICS
[75] Inventors: Robert A. Stevens, Appleton; John C.
Wiles, Nampa, both of Wn.
[72] Assignee: Kimberly-Clark Corporation,
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[21] Appl. No.: 773,748
[22] Filed: Sep. 6, 1986
[31] Int. Cl.⁴ A61F 15/16
[32] U.S. Cl. 604/265 A; 604/267;
604/265 B; 604/267
[36] Field of Search 604/253, 265, 266, 267,
604/268, 270, 272

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Primary Examiner—C. Fred Rasmussen
Assistant Examiner—Dorcas Whitten
Attorney, Agent, or Firm—John L. Chisholm
[57] ABSTRACT
An anatomically form-fitting, self-adjusting disposable
diaper with a stretchable outer cover (20), an absorbent
structure (22) and fixed position fasteners (70) (72) (74)
(76), elastic (68) in the front waist and/or elastic (62) in
the back waist and/or leg elastic (62) in the crotch
sanction wherein the respective ends of the elastic are
anchored by the fixed position fasteners (70) (72) (74)
(76).

Reference Cited
U.S. PATENT DOCUMENTS
1,873,366 7/1932 Bepko 26/275
1,926,640 5/1971 Lerner 604/267

23 Claims, 21 Drawing Figures

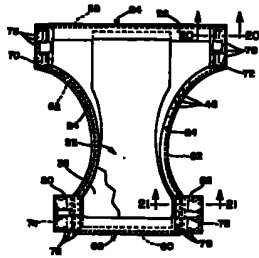


FIG. 1A

FIG. 1B

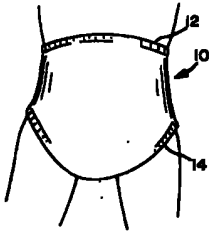
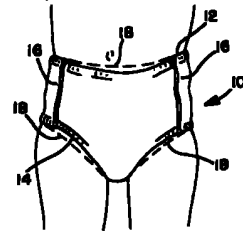


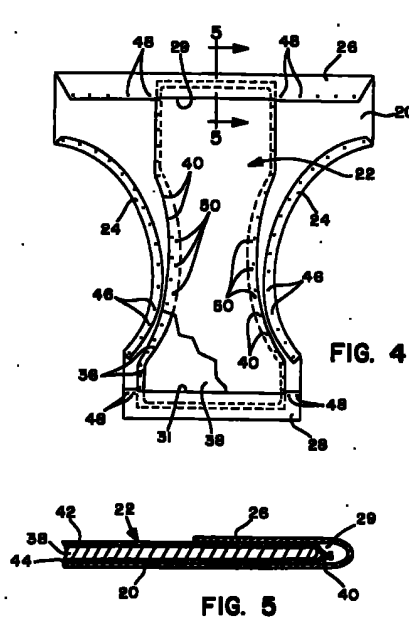
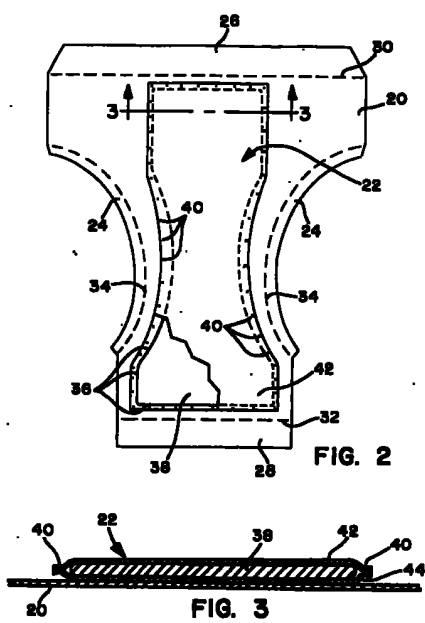
FIG. 1C

FIG. 1D

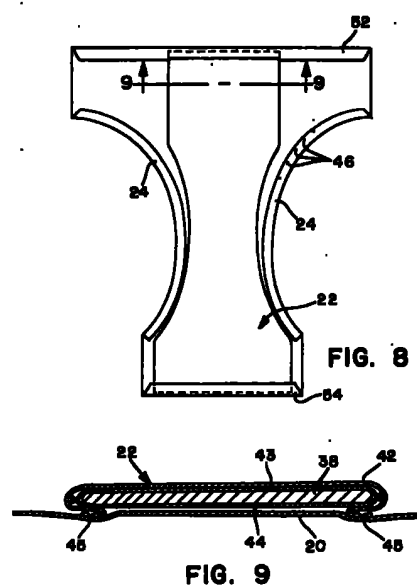
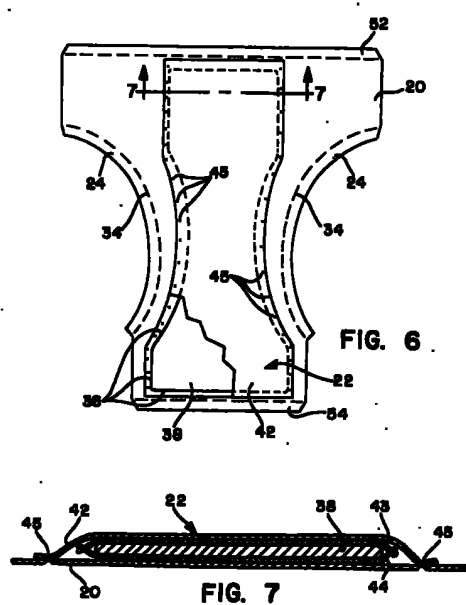


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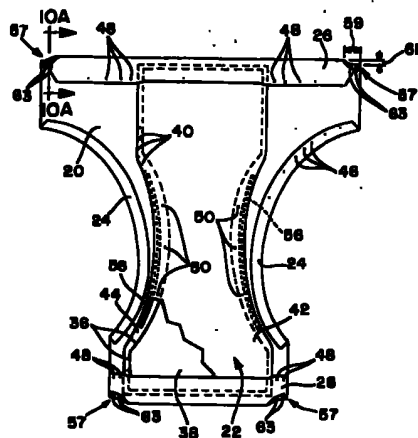


FIG. 10

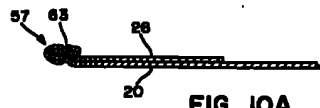


FIG. 10A

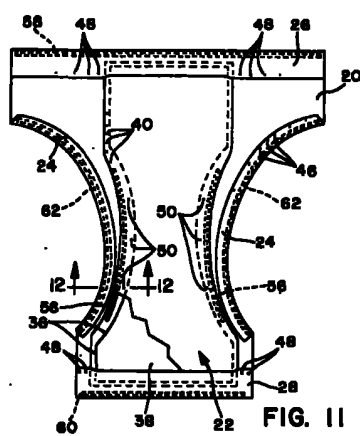


FIG. 11

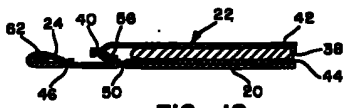
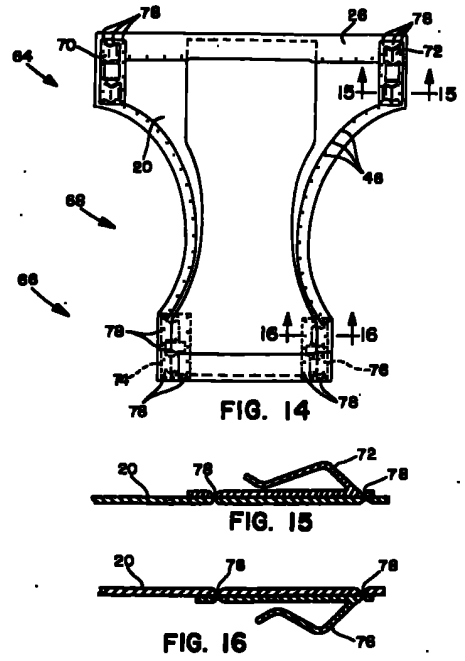
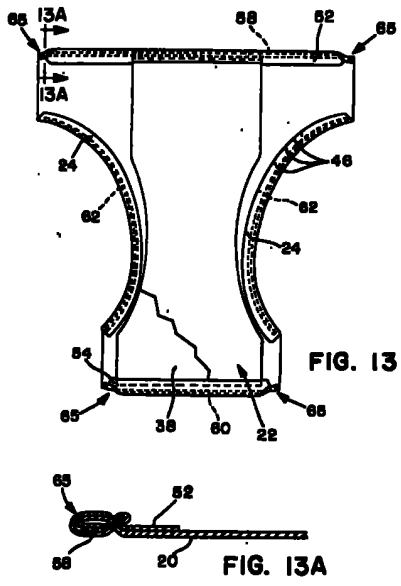
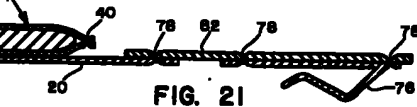
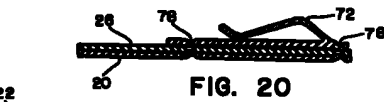
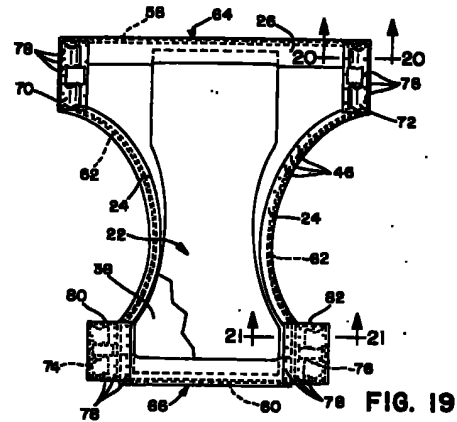
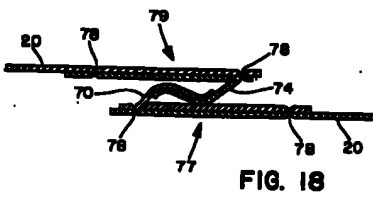
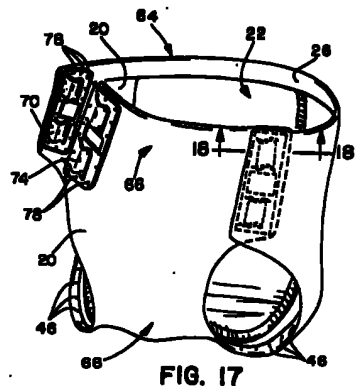


FIG. 12

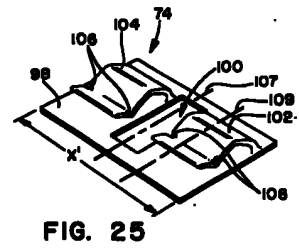
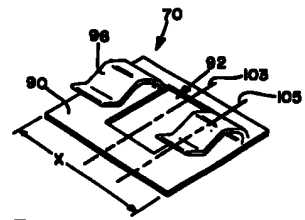
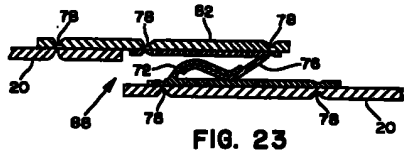
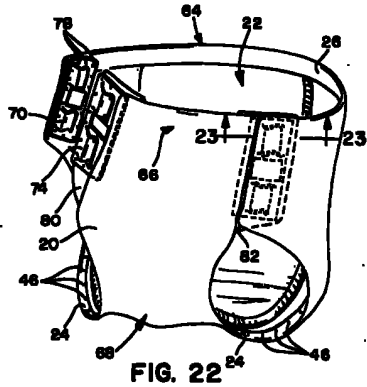
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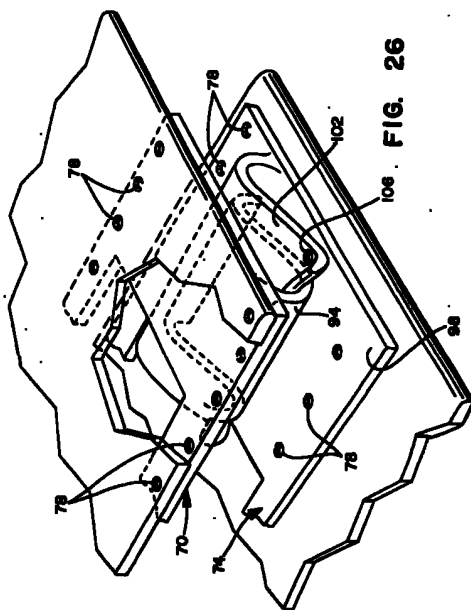


FIG. 26

FORM-FITTING SELF-ADJUSTING DISPOSABLE GARMENT WITH ANCHORED WAIST AND LEG ELASTICS

TECHNICAL FIELD

The present invention relates, generally, to the field of disposable garments utilized for the absorption and containment of urine and other body exudates. More particularly, the present invention relates to form-fitting, self-adjusting disposable garments with fluid-pooling features. Most particularly, the present invention relates to disposable diapers that provide anchored fit and fluidity through a novel construction utilizing novel materials.

BACKGROUND ART

Disposable garments are generally well known in the art and have become an important and an essentially indispensable sanitary protection item, most particularly in the field of infant and child care where disposable diapers provide for the absorption and containment of urine and other body exudates. Present commercially available disposable diapers are generally unitary, pre-shaped and preformed, and comprised of a porous facing layer, a fluid impermeable backing sheet with an absorbent material disposed therebetween. These presently available disposable diapers have not a particular need and have become ever increasingly popular. However, even though the presently available disposable diapers are efficient and effective they have several drawbacks that have been identified by mothers of infants wearing the diapers. These mothers have strongly voiced their desire to be able to obtain disposable diapers that are methodically used and attractive when on their infant or child. The methodically used articles have been identified as including a trim, size fit, and a neat fitting waist and legs that do not allow leakage of urine or feces. It has also been found that mothers do not want their children to look rumpled, bulky, or messy. In addition, these mothers have expressed a desire to obtain a disposable diaper that fits more snugly to the body and to have disposable diapers provided in more sizes.

Another drawback identified by these mothers has been the problem associated with side leakage caused by urine, feces, or moisture trapped next to the skin. They have again been very vocal in their desire to obtain disposable diapers that would solve this problem. Another major drawback is associated with the method provided to secure the diaper around the baby. The method most utilized to present commercially available disposable diapers is the plastic elastic tape. Initially, the fastening tapes introduced on disposable diapers were not reusable, which meant that when the mother wished to check the diaper for volume or to adjust the fit, the tapes could not be reused. This, in turn, meant that the diaper, if not ready to be changed, would have to be thrown away. Presently, disposable diapers use tapes that are manufactured to be reusable. However, it has been found that the tapes presently used are subject to contamination by baby powder or baby oil or other substances which prevent them from resealing, or in the worst case, prevent them from sealing upon initial use. The mothers believe that they want disposable diapers that have features that are not subject to contamination, that are always reusable and that are not easily unfastenable by babies. The attempt to provide tapes that are always reusable has caused some major

difficulties to utilize stronger adhesives on the tapes. Unfortunately, however, the stronger adhesives have a tendency to tear the outer cover which may also cause the diaper to be unusable.

Furthermore, the fastening tapes used on the present disposable diaper can also have a detrimental effect upon fit. Because the tapes are made to be untearable on any portion of the outer cover, and there is no indication to mothers where the tapes should be sealed, the tapes are very often sealed to the outer cover at the wrong position which has several detrimental effects. First, the diaper does not fit on the baby properly; for example, if too loose, the diaper falls down or drops at the waist, or if too tight, causes strain to the outer cover which can make the baby uncomfortable. Second, the improper positioning of the tapes can cause the leg openings to gap thus causing leakage. Third, in an attempt to reposition the tapes to correct the above problems mothers have found that there is an increased potential to contaminate the tapes thus causing the disposable diaper to be unusable.

The attempts to solve the drawbacks associated with present disposable diapers have extended over several years and include several different methods. One method to improve fit involves geometrical folding of rectangular diapers for the purpose of narrowing the apparent width in the crotch area. One method is taught in U.S. Pat. No. 3,615,151 to Dammann et al. in which a rectangular diaper is provided with parallel longitudinal folds that allow the diaper to be folded into a narrower shape. Another method is taught in U.S. Pat. No. 3,194,674 to Hrubetsky, in which a rectangular diaper is provided with transverse folds in the crotch area. These two methods permit the diaper to fit more snugly about the child, however, problem areas remain. First, the folded rectangular diaper results in increased bulk between the legs causing discomfort to the infant. Second, the transverse folds prevent the diaper from closely conforming to the legs leaving gaps which permit leaks to occur. Third, the transverse folds tend to pull the waist down at the sides thereby causing the diaper to gap at the front of the waist where leaks can also occur. In addition, the gapping at the front waist contributes to making the diaper appear bulky, sloppy and messy.

To solve the remaining problems associated with the transverse folds between the legs, methods, including reducing the width of the absorbent pad in the crotch area, were tried. However, because the materials used in constructing disposable diapers are relatively noncompressible, a close fit around the thighs is difficult to achieve and noticeable gaps still have a tendency to occur. In addition, the reduced width of the absorbent pad reduces the available absorbent capacity which also further increases the potential for leakage. In an attempt to reduce leakage, U.S. Pat. No. 3,002,000 to Bell provides the diaper edges with distended, flexible flaps between the distended line and the edge of the absorbent pad in the crotch.

Again, an attempt to solve one problem results in the emergence of another problem. Distended flaps provide a tight seal at the thighs because the distended elastic presses the overly distensible flaps into close contact with the legs. However, the tight seal at the thighs can have several causal effects. First, the tight seal can cause urine to collect near the diaper edges which can permeate into the area between the flap and

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the side where it can cause skin irritation. Stained, because it is necessary to rub the absorbent pad with it in order to provide the required dry width, the resulting absorbent becomes unsightly wet and looks as if it were soiled. Third, when the reduced width of the absorbent becomes unsightly wet, it tends to separate and bunch up at the bottom of the absorbent pad, hindering fluid transfer to normal portions of the absorbent pad.

To solve the problems associated with absorbent pads, the present invention is a disposable diaper which is taught in U.S. Pat. No. 4,059,482 to Weiss et al. in which the diaper is designed only along the sides in a narrowed crutch area in a manner to give a more comfortable leg fit as well as improved functional absorbent capacity. This is achieved by attaching the elastic banding elements to the sides of the absorbent pad and also banding the absorbent pad surface to the backing or facing material in that area to maintain the structure. This causes the absorbent pad to contract when the elastic banding elements contract, thus providing greater transverse rigidity in the crutch area. These transverse rigidities, however, also increase the effective absorbent capacity of the absorbent pad by decreasing the tendency of the absorbent pad to separate and increasing the wicking characteristics of the absorbent.

The present application teaches an improved disposable diaper which is automatically form-fitting and automatically self-adjusting to provide a snug, comfortable fit for the baby to wear. The diaper provided by the present invention is, thus, does not gap at the legs or waist, and has virtually instantaneous and reliable absorbent capacity. Furthermore, the disposable diaper as provided by the present invention is available and at the same time highly resistant to leakage.

DISCLOSURE OF THE INVENTION

It has now been determined in accordance with the present invention that an automatically form-fitting, generally self-adjusting disposable diaper can be produced. Advantageously, the disposable diaper of the present invention achieves a substantially improved fit and an attractive appearance when worn by a baby. Furthermore, the components of the disposable diaper of the present invention are constructed in a novel way from novel materials such that the disposable diaper is snug and comfortable and does not irritate the skin of the baby. The outer cover of the disposable diaper of the present invention is not only stretchable, but is resiliently stretchable, thus providing both the benefits of dry skin and a form-fitting, automatically self-adjusting disposable diaper that conforms to the baby's shape, the stretchable outer cover utilized in the disposable diaper of the present invention covers and protects the baby in all desired phases, provides a gentle, but secure, closure at the waist and legs and retains deformation and repels fluid during use. Further advantageously, fluid position features provide a solution to many of the problems encountered with the ramblelike tapes as used in the prior art. The fasteners, in one aspect of the present invention, have suitable releasability capabilities, are virtually insensitive to contamination, can provide closure from the waist opening to each leg opening, can maintain the distance between the waist opening and each leg opening during use which prevents the waist from sagging and the leg openings from gaping, are flexible so that they do not restrict the baby's motion and since they are fluid position pads-to-paint themselves, in a most preferred embodiment, they are virtually impossible to stain incorrectly. Another advantage of the present invention is that the waist and leg openings have finished edges, such as seams. The seams provide one aspect of the neat, trim appearance of the present invention.

The foregoing and other advantages of the present invention, are realized in an automatically form-fitting, generally self-adjusting disposable diaper comprising an outer cover, an absorbent structure disposed within the outer cover, and fluid position, pad-to-pad fasteners to secure the diaper around the body of the wearer. The outer cover is resiliently stretchable in at least one direction, in one aspect of the present invention the outer cover is resiliently stretchable in a cross body direction. The outer cover is resiliently stretchable in a range from about 20% to 200%. The self-adjusting feature of the present invention is accomplished by novel construction and novel materials which provide the diaper with a trim, snug appearance when worn by a baby. The resiliently stretchable outer cover allows the diaper to self-adjust to the various shapes and forms of various babies caused by different anatomical features such as varying statures and thigh sizes. The self-adjusting feature refers to the ability of the diaper to self-adjust to not only the differing anatomical features but to various positions and activities of the baby, for example, the various sleep positions that babies will take, the various play positions as well as the various methods of travel, i.e., walking, crawling or "scooting" along the floor. Whenever the baby is sleeping, the disposable diaper of the present invention "self-adjusts" to present a flat, trim, aesthetically neat appearance.

The waist and leg portions of the outer cover contain elastic members the ends of which are anchored by the fluid position fasteners attached to the outer cover. The anchored waist and leg elastic provide an even distribution of forces around the waist and legs and contributes to the aesthetically pleasing appearance of the diaper.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1A is a side view of the disposable diaper of the present invention shown secured around a baby;

FIG. 1B is a front view of the disposable diaper of the present invention shown secured around a baby;

FIG. 1C is a back view of the disposable diaper of the present invention shown secured around a baby;

FIG. 1D is a front view of the disposable diaper of the present invention showing the disposition of the diaper on the baby after being worn for a period of time;

FIG. 2 is a plan view of an embodiment of the disposable diaper of the present invention shown in a semi-finished condition;

FIG. 3 is a sectional view of cross section 3-3 shown in FIG. 2;

FIG. 4 is a plan view of the disposable diaper shown in FIG. 2 in a finished condition but without fasteners;

FIG. 5 is a sectional view of cross section 5-5 of FIG. 4;

FIG. 6 is a plan view of an alternative embodiment of the disposable diaper of the present invention shown in a semi-finished condition;

FIG. 7 is a sectional view of cross section 7-7 shown in FIG. 6;

FIG. 8 is the alternative embodiment shown in FIG. 6 in a finished condition;

FIG. 9 is a sectional view of cross section 9-9 as shown in FIG. 8;

FIG. 10 is a plan view of a further alternative embodiment of the disposable diaper of the present invention;

FIG. 10A is a sectional view of cross section 10A-10A as shown in FIG. 10;

FIG. 11 is a plan view of a still further alternative embodiment of the disposable diaper of the present invention;

FIG. 12 is a sectional view of cross section 12-12 as shown in FIG. 11;

FIG. 13 is still another alternative embodiment of the disposable diaper of the present invention;

FIG. 13A is a sectional view of cross section 13A-13A as shown in FIG. 13;

FIG. 14 is a plan view of an embodiment of the disposable diaper of the present invention showing a first method of attaching fluid position fasteners to the diaper;

FIG. 15 is a sectional view of cross section 15-15 as shown in FIG. 14;

FIG. 16 is a sectional view of cross section 16-16 as shown in FIG. 14;

FIG. 17 is a perspective view of an embodiment of the disposable diaper of the present invention as it would be secured around a wearer;

FIG. 18 is a sectional view of cross section 18-18 as shown in FIG. 17;

FIG. 19 is a plan view of the disposable diaper of the present invention showing a second method of attaching the fluid position fasteners to the diaper;

FIG. 20 is a sectional view of cross section 20-20 as shown in FIG. 19;

FIG. 21 is a sectional view of cross section 21-21 as shown in FIG. 19;

FIG. 22 is a perspective view of an embodiment of the disposable diaper of the present invention as it would be secured around a wearer;

FIG. 23 is a sectional view of cross section 23-23 as shown in FIG. 22;

FIG. 24 is a perspective view of one member of the fluid position fastener;

FIG. 25 is a perspective view of a second member of the fluid position fastener and

FIG. 26 is a perspective view of the two members of the fluid position fastener shown in its assembled position.

MODES FOR CARRYING OUT THE INVENTION

The present invention relates, generally, to disposable diapers for the absorption and containment of urine and other body exudates. The present invention relates more especially to disposable diapers that are automatically form-fitting, generally self-adjusting to achieve an, automatically pleasing fit on the body of a wearer. Most particularly, the present invention provides fluid position fasteners attached to an outer cover for securing the disposable diaper around a wearer. Accordingly, the present invention will now be described with reference to certain modes for carrying out the invention within the aforementioned context. Those skilled in the art will realize that such a description is meant to be exemplary only and should not be deemed restrictive regarding the scope of the present invention, for example, in terms of its construction.

Turning to the figures, in each of which like parts are identified with like reference characters, FIG. 1A through 1D show the disposable diaper 20 as it would be worn by a baby, indicated at 12 and 14 the waist and leg openings are formed. FIGS. 1A, 1B, and 1D indicate generally at 16 the position of the fasteners. FIG. 1D illustrates the unfastened condition of the diaper covers from an initial position as indicated by the dashed lines 22 after having been by an infant for a period of time.

Turning now to FIG. 2, there is shown an embodiment of the disposable diaper provided by the present invention. An outer cover 24 is shown in plan view with an absorbent structure 26 disposed thereon. Outer cover 24 is shown with leg holes 28, back waist flap 26 and front waist flap 28 indicated. Pockets 30 between waist back waist flap 26 is folded. Similarly, pockets 32 between waist front waist flap 28 is folded. Pockets 34 indicate where holes 28 are folded. Line 36 shows the periphery of absorbent composite 26. Referring to FIG. 3 in conjunction with FIG. 2, absorbent structure 26 comprises a liquid permeable backsheet layer 42 bonded to a liquid impermeable barrier 44 with absorbent composite 38 disposed therebetween. It is contemplated that any appropriate means for bonding backsheet layer 42 to barrier 44 may be utilized. A preferable method of bonding backsheet layer 42 to barrier 44 is by using an adhesive such as the bonds produced by heat or ultrasonic energy. A function of the bonding between backsheet layer 42 and barrier 44 is to maintain absorbent composite 38 disposed therebetween and to maintain absorbent structure 26 as a unitary structure. Depending upon the composition of absorbent composite 38 the bonding between backsheet layer 42 and barrier 44 may be continuous or a series of discrete points. It is noted that for the sake of clarity only a few representative bonding points 46 are shown and mentioned. Other methods, such as pressure or heat sensitive adhesives may be used and are to be considered within the scope of the present invention. As shown in FIG. 3, absorbent structure 26 is disposed upon outer cover 24. The materials making up each component will be discussed in conjunction with later figures.

Disclosed in FIG. 4 is the embodiment of the disposable diaper shown in FIG. 2 with waist flaps 26 and 28 folded over absorbent structure 26 forming pockets 30 and 32. FIG. 4 also shows holes 28 folded and bonded. Again, any method of bonding may be used, however, ultrasonic bonding is a preferable method and a series of discrete bonds are represented by numeral 46. Also indicated are antistatic bands 48 which bond the flaps 26 and 28 to the outer cover. As can be appreciated, the folding of the flaps 26 and 28 over the ends of absorbent structure 26 maintains absorbent structure 26 in position in relation to outer cover 24 without inhibiting the stretchability of outer cover 24. FIG. 5 is a sectional view of cross section 5-5 of FIG. 4 and shows the relationship of waist flap 26 which is folded over absorbent structure 26. It is to be especially noted that there are no direct bonds holding the ends of absorbent structure 26 to either the outer cover 24 or to waist flaps 26 or 28. This ensures that the stretchability of outer cover 24 is unimpeded by absorbent structure 26. In addition to front and back waist flaps 26 and 28 there are antistatic bands, indicated at 48, bonding absorbent structure 26 to outer cover 24 in the central portion of the diaper. Although these bands may inhibit the stretchability of the central portion of outer cover 24, the bands do not inhibit the functionality of outer cover 24 since there is minimal need for outer cover 24 to be stretched in a cross body direction in the crutch area.

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FIGS. 4-9 illustrate an alternative embodiment of the disposable diaper of the present invention. Referring to FIGS. 4-9 together, it is seen that absorbent structure 22 comprises a bodylike layer 42, a liquid impermeable barrier 44 with an absorbent composite 28 disposed therebetween. As shown in FIG. 7, which is a sectional view of cross section 7-7 of FIG. 4, the bodylike layer 42 is bonded to outer cover 20 rather than to barrier 44 as disclosed in the previous embodiment. In order to maintain the shape of absorbent composite 28 during manufacture the absorbent composite may be wrapped with tissue or have a frame 49 bonded to barrier 44 as shown in FIGS. 7 and 9. The bodylike layer 42 is bonded to outer cover 20 when outer cover 20 is in a stretched condition. Bodylike layer 42 may be bonded to outer cover 20 by any conventional method with the preferable method being ultrasonic bonding as discussed hereinafter and indicated generally at 48. FIGS. 8 and 9 show the disposable diaper shown in FIGS. 6 and 7 when outer cover 20 is in an unstretched condition. It is noted that the figures are not meant to be dimensionally accurate. Referring especially to FIG. 9, which is a sectional view of cross section 9-9 in FIG. 8, it can be seen that when outer cover 20 is relaxed, after bodylike layer 42 is bonded to it, bodylike layer 42 is shown under absorbent structure 22 by outer cover 20, and as can be appreciated, this method does not inhibit the absorbency of outer cover 20. The disposable diaper illustrated in FIGS. 4 through 9 has a relatively narrow heel 52 at the back waist section and a relatively narrow heel 54 at the front waist section rather than the wider heels made by waist flaps 26 and 28 illustrated in FIGS. 2 through 4.

FIG. 10 illustrates a further alternative embodiment of the disposable diaper of the present invention in which elastic members 56 are shown disposed within the stretch section of the absorbent structure 22. Elastic members 56 are advantageously bonded to other bodylike layer 42 or to barrier 44. It is preferable that elastic members 56 be bonded to bodylike layer 42 because absorbent structure 22 is meant to form a cupped shape by the tension of elastic members 56 when the diaper is placed on an infant. Antagonistic bands 60 which bond bodylike layer 42 to barrier 44 are shown only partially in FIG. 10 as are antagonistic bands 49. It is noted that antagonistic bands 50 which bond absorbent structure 22 to outer cover 20 are shown inside elastic member 56. Also illustrated in FIGS. 10 and 10A are waist tabs 57 on the outermost sections of back waist flap 26 and front waist flap 28. The waist tabs 57 cross the waist to appear straight across when the diaper is secured around a baby and provide a smooth contour near the fastener portions. The waist tabs 57 are situated near the extreme edges of front and back waist flaps 26 and 28, respectively, so be folded over as shown more clearly in FIG. 10A, which is a sectional view of cross section 10A-10A as shown in FIG. 10. The distance represented at 59 is in the range of from 1 inch to 1 1/2 inch and the fold distance, represented at 61 is approximately 1/2 inch. In addition to ensuring the waist to appear straight across the baby, the waist tabs 57 cause the waist to stay closer to the baby thereby obviating any tendency for the waist to gap. Without the gapping the appearance of the diaper on the baby is improved and the waist area fits more snugly without sliding under tension to the waist area. The waist tabs are preferably held in place by antagonistic bands indicated at 63. As discussed hereinafter, other bonding methods may be

utilized and are to be considered within the scope of the present invention.

FIGS. 11 and 12 illustrate a still further embodiment of the disposable diaper of the present invention wherein an elastic member 58 is disposed within back waist flap 26 and an elastic member 62 is disposed within front waist flap 28. Also, elastic members shown at 63 are disposed in leg bands 24. FIG. 12 is a sectional view of cross section 12-12 shown in FIG. 11 and shows the disposition of elastic members 58 and 62 in the absorbent structure 22 and leg bands 24 respectively. An indicated center, antagonistic bands 50 bond liquid impermeable barrier 44 to outer cover 20 while antagonistic bands 49 bond liquid impermeable layer 42 to liquid impermeable layer 44 of the absorbent structure with absorbent composite 28 disposed therebetween. Also shown in FIG. 12 are antagonistic bands 49 bonding back waist flap 26 to outer cover 20 with elastic members 62 disposed within band 24. It is noted that bands 26 are made up of portions of outer cover 20.

FIGS. 13 and 13A show the disposable diaper shown in FIGS. 4 through 9 with elastic member 58 disposed in band 52, elastic member 62 disposed in band 54 and elastic members 63 disposed in leg bands 24. FIG. 13A which is a sectional view of cross section 13A-13A as shown in FIG. 13 illustrates waist tabs 65 similar to the waist tabs 57 described in the discussion relating to FIGS. 10 and 10A. The tabs 65 shown in FIGS. 13 and 13A are shown folded and including the elastic member 58. This serves to anchor the elastic member 58. Further discussion concerning the anchoring of elastic members will be presented relating to FIG. 15.

FIGS. 14 through 16 illustrate an embodiment of fast point fasteners attached to outer cover 20. Outer cover 20 is generally made up of a back waist section 66, a front waist section 68 and a stretch section 69 disposed therebetween. Attached to outermost portions of back waist section 66 are a pair of fastener members 70 and 72 which will be discussed in more detail in conjunction with a later figure. Attached to outermost portions of front waist section 68 are a pair of fastener members 74 and 76 which will also be discussed in more detail in conjunction with a later figure. It is noted that fastener members 70 and 72 are attached to the inner side of outer cover 20 while fastener members 74 and 76 are attached to the outer side of outer cover 20. It is further noted that fastener members 70 and 72 could be fastened to the outer side of outer cover 20 and fastener member 74 and 76 could be attached to the inner side of outer cover 20. FIG. 14 shows the fastener members 70, 72, 74 and 76 attached to outer cover 20 with antagonistic bands represented at 78. FIG. 15 is a sectional view of cross section 15-15 shown in FIG. 14 and shows fastener member 73 attached to outer cover 20 with antagonistic bands 78 (shown partially). It should be appreciated that other methods of bonding fastener member 73 to outer cover 20 are contemplated and the illustration of antagonistic bands is not meant to be limiting. FIG. 16 is a sectional view of cross section 16-16 of FIG. 14 and shows fastener member 75 bonded to outer cover 20 by antagonistic bands 78. Similarly it is noted that other methods of bonding fastener member 75 to outer cover 20 could be utilized. FIGS. 14 through 16 illustrate a method wherein when the pair of fastener 70 and 72 are interlocked with the pair of fastener 74 and 76, the outermost portions of back waist section 66 overlap front waist section 68. This overlapping fastener

leg method will be seen more clearly in relation to FIGS. 17 and 18.

Referring now to FIGS. 17 and 18, FIG. 17 illustrates a diaper as it would be secured around a baby with one fastener open to illustrate its relative position. FIG. 18 is a sectional view of cross section 18-18 of FIG. 17 and shows fastener members 70 and 74 interlocked with fastener member 76 bonded with antagonistic bands represented at 78 to outer cover 20 and fastener member 74 attached to outer cover 20 with antagonistic bands 78. It is noted that a first portion of outer cover 20 indicated at 77 overlaps a second portion of outer cover 20, indicated at 79.

Referring now to FIGS. 19, 20, and 21 there is illustrated another embodiment of the disposable diaper of the present invention. In this embodiment, outer cover 20 comprises members 80 and 82 are attached to outermost portions of front waist section 68. Fastener members 74 and 76 are attached to outermost portions 80 and 82. As shown, the methods of attaching elastic members 80 and 82 to outermost portions of front waist section 68 of outer cover 20 and the fastener members 74 and 76 to the outermost portions 80 and 82 can be of several different methods in the art including adhesion, stitching, riveting, sewing, etc. Shown in this embodiment is a non-antagonistic bonding illustrated generally by dots 78 relating to the attachment of the fastener members 74, 76, 78 to the outermost portions 80, 82 and the attachment of the elastic members 80, 82 to the outer cover 20.

Also shown in FIGS. 19, 20 and 21 is the aspect of imparting elasticity to the waist section and leg bands. One method of imparting elasticity is by utilizing elastic members 88 and 90 in the waist section and elastic members 92 in the leg bands 24. It should be understood that the elastic members 88, 90, 92 may be utilized in any of the embodiments of the present invention, but have been shown in only selected figures for the sake of clarity. The elastic members may comprise any of the well known elastic materials such as rubber, etc. A preferred method of imparting elasticity to the waist section and/or the leg bands is by utilizing a hot melt pressure-sensitive adhesive sensitive to heat as that marketed by E. I. du Pont de Nemours & Co., St. Paul, Minn., U.S.A., under the trade-name FULLASTIC. It is to be noted that in FIG. 19 the waist elastic members are shown indicated at each end by respective fastener members. For example, elastic member 88 is anchored at each end by fastener members 70 and 72. In addition, as discussed above in relation to FIG. 15 elastic members in the waist may be anchored by tabs 65. Similarly, elastic member 92 is anchored at each end by fastener members 74 and 76. Both leg elastic members 92 are also anchored by the respective fastener members. The anchoring of the elastic members provides for a more even distribution of force thereby preventing destructive or unbalanced stretching of any one portion of the diaper. This aids in the prevention of gapping thereby aiding in eliminating the leakage of urine and feces.

FIG. 22 illustrates the embodiment shown in FIGS. 19-21 as it would appear on a child with one fastener open to show the relationship of the fastener members. FIG. 23 is a sectional view of cross section 23-23 of FIG. 22. FIG. 23 illustrates generally the fast point 49 at 89 that results from the addition of elastic members 88, 92. Note at 89 that the two portions of outer cover 20 meet without overlapping.

FIGS. 24 and 25 illustrate an embodiment of the fast point fastener members 70 and 74 respectively. It is indicated that fastener members 70,74 can be constructed by several methods. One method to efficiently produce fastener members 70,74 is to design the members so that they can be constructed in a substantially single whereby half-formed members may be cut from the substantial length of material. The substantial length can be rolled and stored for subsequent processing. A further aspect of efficient production is to design the fastener members to have the same cross section so that each fastener member can be cut from the same roll of material.

It has been determined that the fastener members 70,74 must be carefully designed and made from a properly selected material so that they do not cause the baby's skin to be chafed or irritated and at the same time do not come unstretched easily. Another factor that must be considered in the selection of the material for the fastener member 70,74 is the method of attachment to the garment or the method by which the fastener members 70,74 are to be integrated with the garment. For example, if antagonistic bonding is to be utilized, it would be necessary to select a material that is antagonistic bondable.

A selection criterion for the selection of a material and design for fastener members 70,74 is to consider the Moment of Inertia (I) of the material in conjunction with the Modulus of Elasticity (E). This selection criterion involves the product of (EI) is utilized as follows. The value (EI) is determined in a material/design combination, that is, the value (EI) is determined for a particular design utilizing a particular material. The value (EI) is calculated from the following formula taken from the textbook "Mechanical Engineering Design," 2nd Ed. by Joseph E. Shigley, Published by McGraw-Hill, 1975, page 699.

$$EI = \frac{E}{2} \times I$$

wherein E is obtained from ASTM test D-790 and wherein I is defined by ASTM test D-790. It has been determined, for example, for fastener members such as fastener members 70,74 that a material/design combination with (EI) in the range of about 0.5 pound-inches² to about 3.5 pound-inches² is preferable in that the fastener members 70,74 when tested or simulated do not chafe the skin of the wearer under normal usage and normal conditions and do not easily come unstretched under normal usage and normal conditions. A particularly preferable range of values of (EI) is from about 0.5 pound-inches² to about 1.4 pound-inches².

The Modulus of Elasticity (E) can be determined for various materials from standard tables. It has been found that if a material is selected having a Modulus of Elasticity in the range of about 4,000 psi to about 60,000 psi and more preferably in the range of about 4,000 psi to about 40,000 psi the stretching of a unitary value of (EI) is sufficient. Table I sets representative materials and their Modulus of Elasticity.

TABLE I

MATERIAL	MODULUS OF ELASTICITY	
	psi	lb./sq. in.
970 DOW 330	50,000-60,000	
250 PP PREPAREX 703		
250 DOW 32	11,000-14,000	

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TABLE I-continued

MATERIAL	MEDIAN OF ELASTICITY (psi)
200 PP PROFAX 100	-
200 PP PROFAX 100	1400-1500
Injection Molding PP PROFAX 100	4000
POLYURETHANE BETAINE 9010A	4000
POLYURETHANE BETAINE 9010	1000
POLYURETHANE BETAINE 9010	2000
POLYURETHANE BETAINE 9010	1000

*PROFAX is a trademark of Hercules Co.
 **BETAINE is a trademark of B. N. Goodrich

As can be appreciated, the proper selection of a fastener material in conjunction with the proper design of a fastener member is of paramount importance for the comfort and functionality of the garment. If the fastener material is too inflexible it may cause discomfort and possible injury to the wearer. If the fastener material is too flexible, it may be difficult to fasten. It may not remain fastened under normal usage and normal conditions and it may not maintain the shape of the garment, that is, it may allow the garment to roll or bunch up.

Referring again to FIG. 24, the fastener member 70 is comprised generally of a flat portion 90, an aperture 92 and two configured clasp 94, 96. The fastener member 70 as shown in FIG. 24 is obtained by cutting a section with a length "x" from the continuous roll of material as described above. The cross section of the entire length "x" of the section would be that as indicated by line 300. The aperture 92 is then provided which removes a portion of material from flat portion 90 and a portion of the clasp material which would be between clasp 94 and 96.

Referring now to FIG. 25 there is shown fastener member 74 (fastener member 70 in the same). Fastener member 74 is made in a similar way to that described above for fastener member 70. The fastener member 74 is not from a continuous roll of material (not shown). This roll of material can be, and it is preferable, that it is the same roll of material that fastener member 70 is cut from. In this case the member 74 is comprised generally of a flat portion 90, an aperture 100 and two clasp 102 and 104. The section is cut with a length "x" which is slightly longer than the length "x" of fastener member 70, the reason for which will become apparent. In addition, as is shown in FIG. 26, the length of aperture 100 is smaller than aperture 92 shown in FIG. 24. The ends of clasp 102 and 104 are sufficiently larger than the ends of clasp 94 and 96 to allow ends of clasp 94 and 96 to interlock under clasp 102 and 104. The sides of clasp 102 and 104 may be bonded to flat portion 90 as indicated at 106. A preferable method of bonding is by ultrasonic bonding and subsequent bonds are indicated at 108.

Referring to FIGS. 24 and 26 and to the dimension relating to the values of EI above, the values of EI through the area indicated by line 300 (FIG. 24) and line 300 (FIG. 26) are selected to be in the range of 0.5-1.5 pound-inches² and preferably in the range of 0.5-1.4 pound-inches². The values of EI through the area indicated by line 100 (FIG. 24) and line 100 (FIG. 26) are selected to be in the range of 0.002 to 0.010 pound-inches².

Referring to FIG. 26 there is shown individual clasp 102 and 96 interlocked. The interrelationship of the clasp and the required relationship of lengths "x" (FIG. 24) and "x'" (FIG. 26) is now apparent. The

fastener members have a complementary cross section for mating engagement and are relatively bielastic. The aperture bands 104 bonding the edge of clasp 102 to flat area 90 serve a twofold purpose, one, to provide stability to the fasteners and two, to prevent clasp 96 from sliding out from the side of clasp 102.

Turning now to a description of the materials used for the various components, it is desirable that the liquid permeable bodylike liner 42 utilized in the disposable diaper of the present invention meet the following criteria. One, the bodylike liner 42 should be dry, i.e., be not fluid dry when the absorbent structure 22 is loaded with urine. A measure of this criterion is that the bodylike liner 42 feel dry to the touch after a normal urine loading of the absorbent structure. Two, the adhesion (defined as the distance from the bodylike liner outward to the outer cover) field penetration rate of bodylike liner 42 should be high enough to allow urine to penetrate through to the absorbent composite at an instant's urination rate. Three, the fast, color and opacity are further criteria that are most preferably satisfied by a white material, although other colors may be acceptable, with an opacity sufficient to mask the color of urine or feces within the absorbent composite. Four, bodylike liner 42 should be sufficiently bendable to liquid impermeable barrier 44. Barrier 44 is preferably made from polypropylene, however, other liquid impermeable materials can be used.

The bodylike liner is a soft, compressible material comprised of synthetic fibers such as polyester/polypropylene integrally bonded to a top layer at spaced apart sites to provide defined areas for fluid transfer. Such a web is described in U.S. Pat. No. 4,397,644, issued to Mattews et al. and assigned to the assignor of the present application, the disclosure of which is incorporated herein by reference and relied upon. The top layer is a pattern bonded spaced-apart web of synthetic fibers such as polypropylene, polyester and the like. The combined total weight of the bodylike liner should be in the range of about 30-100 g/m². It should have a weaving finish throughout. The bottom layer of the bodylike liner is typically a carded web of polyester/polypropylene fiber containing up to 100% polyester fiber, preferably 25-50% polyester staple, providing sufficient softness finish to be wettable. Two-lam polyester staple, Type 7550, a hollow fiber, at 2.5 denier from E. I. duPont Co. with a wettable finish is preferred although other wettable polyester staple fibers would work. Polypropylene Type T-123 from Hercules Inc. has a wettable finish with the 1.5-denier, 11 inch staple preferred. The web is only bonded together through the spaced apart bonds which attach it to the liner, which are typically achieved through thermal or ultrasonic bonding. The bottom layer may also be formed by other nonwoven processes such as spun-bonding in which the filaments are spun and collected on a wire screen without bonding and then bonded to the prebonded liner as described above. It should have a wetting finish, for example, as is achieved by treating with 0.5-0.5% TRITON X-103 from Rohm and Haas Co., or equivalent surfactant.

The outer cover 20 of the disposable diaper of the present invention is preferably made from a composite elastic material which generally comprises at least one layer or web of elastic material bonded to one or more other layers of material, the elastic web being maintained in a stretch condition within its elastic range

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during the bonding step as that upon contracting or recovering after release of the clamping tension from the layer or layers to which it is bonded will gather or bunch. The resultant composite material is half elastic, any non-elastic layers in the laminate being able to move with a stretching of the elastic layer by reason of the ply or ply provided by the elastomer formed upon relaxation of the stretched elastic web to which the non-elastic web or webs are bonded.

The outer cover 20 of the present invention is preferably made from a relatively stretchable material having a stretchability of from about 20 percent to about 200 percent. The term stretchability as used herein is defined by the following relationship:

$$\text{stretchability} = \frac{\text{stretched diameter} - \text{initial diameter}}{\text{initial diameter}} \times 100\%$$

The outer cover 20 is also resilient, that is, the outer cover returns essentially to its initial dimension when the stretching force is removed.

One such relatively stretchable material is disclosed in U.S. patent application, Ser. No. 760,696 in the name of Terry J. Whinnell and Michael T. Morsen, assigned to the assignor of the present application, entitled "Polyethylene-containing Elastomers, Compositions and Methods for their Formation into Elastomeric Products", the disclosure of which is incorporated herein by reference and relied upon. This application provides elastomeric elastomers which, after extrusion, exhibit a tendency to form elastomeric products such as, for example, films, membranes, sheets, etc. As used herein and in the referenced pending application, the term "elastomeric web" means a web of material which has been formed without use of weaving processes which produce a structure of individual fibers or threads which are interwoven in an elastomeric repeating manner. However, webs have been, in the past, formed by a variety of processes such as, for example, extruding processes, spunbonding processes, the spinning processes and staple fiber spinning processes. The elastomeric elastomers compositions are blends of (1) from at least about 10 percent, by weight, of an A-B-A' block copolymer, where "A" and "A'" are each a thermoplastic polymer elastomer which includes a styrene moiety such as a poly(vinyl arene) and where "B" is an elastomeric poly(diolefin-butylene) add-block, with (2) from greater than 0 percent, by weight, to about 90 percent, by weight, of a polyolefin which, when blended with the A-B-A' block copolymer and subjected to appropriate elevated pressure and elevated temperature conditions, is extrudable, is blended there, with the A-B-A' block copolymer. The A-B-A' block copolymer serves to impart elastomeric properties to products formed from the extrudable composition and the presence of the polyolefin in the blend serves to reduce the viscosity of the composition as compared to the viscosity of the pure, that is, pure, A-B-A' block copolymer and thus enhances the extrudability of the composition.

Preferably, the "A" and "A'" thermoplastic styrene moiety containing elastomers of the block copolymer are selected from the group including polystyrene and poly(styrene-butadiene). In some embodiments the "A" and "A'" thermoplastic styrene moiety containing elastomers are identical. Preferably, the polyolefin is selected from the group including at least one polymer selected from the group including polyethylene, polypropylene, polybutene, styrene copolymers or blends of two or more of these materials.

The blend usually includes from at least about 20 percent, by weight, to about 95 percent, by weight, of the block copolymer and from at least about 5 percent, by weight, to about 80 percent, by weight, of the polyolefin. For example, the blend may include from about 30 percent, by weight, to about 90 percent, by weight, of the block copolymer and from about 10 percent, by weight, to about 50 percent, by weight, of the polyolefin. For example, the blend may include from about 50 percent, by weight, to about 90 percent, by weight, of the block copolymer and from about 10 percent, by weight, to about 30 percent, by weight, of the polyolefin. One blend includes about 60 percent, by weight, of the polyolefin.

The extrudable composition is extruded or otherwise formed, such as, for example, by extruding, for example, injection molding, at an appropriate, that is effective, combination of elevated pressure and elevated temperature conditions. These conditions will vary depending on the polyolefin utilized. For example, the extrudable composition should be extruded or otherwise formed at a temperature of at least about 125 degrees Centigrade if polyethylene is utilized as the polyolefin in the blend or at least about 175 degrees Centigrade if polypropylene is utilized in the blend, for example, at a temperature of from at least about 200 degrees Centigrade to about 345 degrees Centigrade, more specifically, at a temperature of from at least about 300 degrees Centigrade to about 325 degrees Centigrade, into elastomeric products such as, for example, elastomeric films, which may be collected as a films successive elastomeric webs.

Preferably the blends are extrudable within the above-defined temperature ranges at elevated pressures within the die tip. (For example, within the extrusion capabilities of a die tip having lary (20) extrusion capabilities per linear inch of die tip with each of the capillaries having a diameter of 0.0145 inches and a length of 0.113 inches) of no more than about 300 pounds per square inch, gage, for example, from pressures of from about 20 pounds per square inch, gage, to about 150 pounds per square inch, gage. More specifically, the blends are extrudable within the above-defined temperature ranges at pressures of from about 20 pounds per square inch, gage, to about 250 pounds per square inch, gage, for example, from about 125 pounds per square inch, gage, to about 225 pounds per square inch, gage. Higher elevated pressures can be utilized with other die designs having a lower number of capillaries per inch of die, but, generally speaking, lower production rates result.

Importantly, it has been found that the extrudable composition are extrudable at satisfactory throughput rates because the presence of the polyolefin in the extrudable composition reduces the viscosity of the extrudable composition, as compared to the viscosity of the pure, that is, pure, block copolymer, to satisfactory levels. This reduced viscosity proportionally reduces the die tip pressure if all other parameters remain the same. For example, the viscosity of the extrudable compositions will generally be less than about 300 poise

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when extruded at the above-defined elevated temperature and elevated pressure ranges. Preferably, the viscosity of the extrudable composition is less than about 300 poise when extruded at the above-defined elevated temperature and elevated pressure ranges. For example, the viscosity of the extrudable composition may be from at least about 100 poise to about 200 poise when extruded at the above-defined elevated temperature and elevated pressure conditions.

Because the polyolefin reduces the viscosity of the blend, as compared to the viscosity of the block copolymer, the extrudable composition is extrudable within the above-defined elevated temperature and elevated pressure ranges, through a die tip having, for example, thirty capillaries per inch of die tip with the capillaries having a diameter of about 0.0143 inches and a length of about 0.113 inches at a rate of from at least about 0.02 grams per capillary per minute to about 1.7 or more grams per capillary per minute. For example, the extrudable composition may be extruded through the above-identified die tip having capillaries with a diameter of about 0.0143 inches and a length of about 0.113 inches at the rate of from at least about 0.1 grams per capillary per minute to about 1.25 grams per capillary per minute. Preferably, the extrudable composition is extrudable through the above-identified die tip having capillaries with a diameter of about 0.0143 inches and a length of about 0.113 inches at the rate of from at least about 0.3 grams per capillary per minute to about 1.1 grams per capillary per minute.

The extrudable composition may be formed into fibrous nanowoven elastomeric webs preferably having microflows with an average diameter of not greater than about 100 microns, and preferably having an average hole weight of not more than about 300 grams per square meter, for example, an average hole weight of from about 5 grams per square meter to about 100 grams or more per square meter. More specifically, an average hole weight of from about 10 grams per square meter to about 75 grams per square meter. For example, a fibrous nanowoven elastomeric web may be formed by extruding the extrudable composition at an appropriate, that is, alternative, combination of elevated temperature and elevated pressure conditions. Preferably, the extrudable composition is extruded at a temperature of from at least about 125 degrees Centigrade if the polyolefin is polyethylene or at least about 175 degrees Centigrade if the polyolefin is polypropylene, for example, from the 200 degrees Centigrade to about 345 degrees Centigrade, more specifically from about 300 degrees Centigrade to about 335 degrees Centigrade. Preferably, the extrudable composition is extruded within the above-defined temperature ranges and pressures, within the die tip, (for example, within the extrusion capillaries of a die tip having thirty (30) extrusion capillaries per inch of die tip with each of the capillaries having a diameter of about 0.0143 inches and a length of 0.113 inches) of no more than about 300 pounds per square inch, gauge, for example, from about 20 pounds per square inch, gauge, to about 230 pounds per square inch, gauge. More specifically, the extrudable composition is extruded at a pressure within the capillaries of the above-identified die tip of from about 30 pounds per square inch, gauge, to about 230 pounds per square inch, gauge, for example, from about 125 pounds per square inch, gauge, to about 225 pounds per square inch, gauge.

In the formation of elastomeric nanowoven webs, the extrudable composition is extruded, at the above-

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defined elevated temperature and elevated pressure conditions at a rate of from at least about 0.02 grams per capillary per minute to about 1.7 or more grams per capillary per minute, for example, from at least about 0.1 grams per capillary per minute to about 1.25 grams per capillary per minute, more specifically, from at least about 0.3 grams per capillary per minute to about 1.1 grams per capillary per minute, through a die having a plurality of small diameter extrusion capillaries, as noted above, through a die tip having a diameter of from at least about 0.5 inches to about 1.0 inches, for example, from about 0.5 inches to about 1.0 inches. The extrusion capillaries are formed into a gas stream which attenuates the molten threads to provide a gas-borne stream of microflows which are then formed into the fibrous nanowoven elastomeric web upon their deposition on a collecting arrangement. The attenuating gas stream is applied to the molten threads at a temperature of from at least about 100 degrees Centigrade to about 400 degrees Centigrade, for example, from about 200 degrees Centigrade to about 350 degrees Centigrade and at a pressure of from at least about 0.5 pounds per square inch, gauge, to about 20 pounds per square inch, gauge, for example, from at least about 1 pound per square inch, gauge, to about 10 pounds per square inch, gauge. The desired attenuating gas stream may be an inert, non-oxidizing gas stream such as, for example, a stream of nitrogen gas. In some embodiments the velocity and temperature of the throat-exiting gas stream is adjusted so that the fibrous nanowoven elastomeric web is formed into a web having a diameter of from about ten (10) inches to about ten (10) inches, for example, from at least about ten (10) inches to about forty (40) inches. The fibrous nanowoven elastomeric web so formed will include elastomeric fibers composed of from at least about 10 percent, by weight, of the block copolymer and greater than 0 percent, by weight, and up to about 50 percent, by weight, of the polyolefin. The fibers are usually composed of from at least about 20 percent, by weight, to about 95 percent, by weight, of the block copolymer and from at least about 5 percent, by weight, to about 80 percent, by weight, of the polyolefin. For example, the fibers may be composed of from at least about 30 percent, by weight, to about 90 percent, by weight, of the block copolymer and from at least about 10 percent, by weight, to about 70 percent, by weight, of the polyolefin. Preferably, the fibers are composed of from about 30 percent, by weight, to about 90 percent, by weight, of the block copolymer and from at least about 10 percent, by weight, to about 50 percent, by weight, of the polyolefin. For example, the fibers may be composed of from at least about 30 percent, by weight, to about 70 percent, by weight, of the block copolymer and from at least about 30 percent, by weight, to about 50 percent, by weight, of the polyolefin.

Another such readily available material is disclosed in U.S. patent application, Ser. No. 760,457 to the name of John D. Taylor and Richard J. Vondra Witten and assigned to the assignee of the present application, entitled "Composite Elastomeric Material and Process for Making the Same", the disclosure of which is incorporated herein by reference and relied upon. That application provides a method of producing a composite elastomeric material comprising at least one elastomeric web bonded to at least one elastic web, the method comprising: (a) laminating an elastic web (which may comprise a fibrous web such as a nanowoven web of elastomeric fibers, for example, nanowoven elastomeric fibers) to elongate it; (b) bonding the elongated elastic web to at least one elastomeric web under conditions which reform at least portions of the elastic web to form a bonded

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composite web; and (c) relaxing the composite web immediately after the bonding step whereby the elastomeric web is gathered to form the composite elastomeric web. The fibrous elastic web can also be maintained in a stretched condition during the bonding, at an elongation of at least about 25 percent, preferably about 20 percent to over 200 percent, for example, about 25 percent to 250 percent elongation during the bonding. The method also includes bonding the elongated elastic web to the elastomeric web by overlapping the elastic and elastomeric webs and applying heat and pressure to the overlaid webs, for example, by heating the webs or the elastic web to a temperature of from at least about 65 degrees Centigrade to about 120 degrees Centigrade, preferably from at least about 70 degrees Centigrade to about 90 degrees Centigrade.

This application also provides an elastic composite material comprising an elastic web bonded to at least one elastomeric web which is elastomeric and continuous with the elastic web upon stretching and relaxing of the composite material, the elastic composite material being made by a method as described above. Also provided is an elastic web that is bonded to the elastomeric web at a plurality of spaced-apart locations in a repeating pattern and the elastomeric web is gathered between the bonded locations. The elastic web may comprise a nanowoven web of elastomeric fibers, preferably elastomeric microfibers, such as, for example, an elastomeric nanowoven web of elastomeric elastomeric fibers or an elastomeric film.

The elastic composite material may include one or more of the following in any combination: the elastomeric fibers, preferably elastomeric elastomeric fibers, may be formed from material selected from the group including (1) A-B-A' block copolymers wherein "A" and "A'" may be the same or different elastomers and each is a thermoplastic polymer elastomer or elastomer which contains a thermoplastic moiety such as polyethylene or polypropylene homopolymers, and "B" is an elastomeric polymer elastomer or elastomer, for example, a elastomeric elastomer selected from the group including polyethylene-butylene, polyisoprene and polybutadiene, with polyethylene-butylene being preferred and (2) blends of one or more polyolefins with the A-B-A' block copolymers of (1) where "B" is a polyethylene-butylene elastomer, each of the "A" and "A'" elastomers may be selected from the group consisting of polyethylene and polypropylene homopolymers, for example, polyethylene homopolymer, and where the elastomeric fibers are formed from a blend of one or more polyolefins with an A-B-A' block copolymer where "B" is a polyethylene-butylene elastomer, the polyolefin is selected from one or more of polyethylene, polypropylene, polybutadiene, polyisoprene, polyethylene homopolymers and butene copolymers, propylene homopolymers and butene copolymers which form the elastomeric nanowoven web, for example, the elastomeric microfibers, are composed of at least 10 percent, for example at least 30 percent, more specifically at least 50 percent, for example, from about 10 percent to 50 percent, by weight, of the polyolefin; the elastic web, for example, a fibrous elastic web, is bonded to the elastomeric web at a plurality of spaced-apart locations in a repeating pattern and the elastomeric web is gathered between the bonded locations; the elastic web preferably has a low, hole weight of from about 5 to

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about 300, preferably from about 5 to about 200, grams per square meter, for example, from about 5 to about 100 grams per square meter, although its hole weight can be much higher; the elastomeric web is a nanowoven, non-elastic material, preferably one composed of fibers formed from materials selected from the group including polyethylene fibers, for example, polyethylene terephthalate fibers, polypropylene fibers, polyethylene fibers, for example, nylon fibers, elastomeric fibers, for example, cotton fibers, and elastomeric fibers. Alternatively, the elastomeric web may be any suitable woven fabric. In a particular aspect, the composition of the A-B-A' polymer used is such that the sum of the molecular weight of "A" with the molecular weight of "A'" is from about 14 to 21 percent (from about 14 to 20 percent when "B" is polyethylene-butylene) of the molecular weight of the A-B-A' block copolymer.

A further such readily available material is disclosed in U.S. patent application, Ser. No. 760,448, to the name of Richard J. Wondra, and assigned to the assignee of the present invention, entitled "Composite Nanowoven Elastic Web", the disclosure of which is incorporated herein by reference. That application is directed to a process for producing a nanowoven elastomeric web which is composed of a nanowoven elastomeric web that is joined to a fibrous nanowoven elastomeric web. In particular, the process disclosed therein provides a composite elastomeric web which, in a relaxed, unstretched state, is composed of a gathered nanowoven elastomeric web that is joined to a nanowoven elastomeric web with the nanowoven elastomeric web having been relaxed from a stretched, banded length to a relaxed, unstretched length so as to gather the fibrous nanowoven elastomeric web. An important feature of the process disclosed therein is that the fibrous nanowoven elastomeric web is formed directly onto a surface of the nanowoven elastomeric web with the nanowoven elastomeric web is maintained in a stretched, banded and elongated condition. The nanowoven elastomeric web may be formed by, for example, a multilayering process or any other process for forming a nanowoven elastomeric web. For example, the nanowoven elastomeric web could be an elastomeric film or an elastomeric film as opposed to a multilayered fibrous nanowoven elastomeric web. The formed nanowoven elastomeric web has a relaxed, unstretched, unstretched length. Therefore, the nanowoven elastomeric web is elongated by being stretched to a stretched, banded length. In a subsequent step of the process a fibrous nanowoven elastomeric web may be formed, for example, by either a multilayering or multilayering process or any other process for forming a fibrous nanowoven elastomeric web, directly upon a surface of the nanowoven elastomeric web with the nanowoven elastomeric web is maintained at its elongated, stretched and banded length. During formation of the fibrous nanowoven elastomeric web the nanowoven elastomeric web is maintained at a stretched length which is at least about 125 percent, that is, at least about one and one quarter of the relaxed, unstretched length of the nanowoven elastomeric web. For example, the stretched, banded length of the nanowoven elastomeric web may be maintained in the range of from at least about 125 percent of the relaxed, unstretched length of the nanowoven elastomeric web to about 700 or more percent of the relaxed, unstretched length of the nanowoven elastomeric web. The fibrous nanowoven elastomeric web is joined to the nanowoven elastomeric web with the nanowoven elastomeric web is maintained at its elongated, stretched, banded length. This results in the formation of a composite nanowoven

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elastic web which includes the narrow elastic web which is joined to the fibrous nonwoven gatherable web. Because the fibrous nonwoven gatherable web is formed directly onto the surface of the narrow elastic web while the narrow elastic web is being maintained at its stretched, biased length, the narrow elastic web is, at this stage in the process, elongated, stretched and biased and the fibrous nonwoven gatherable web is in an unstrained but gatherable condition. In one aspect, the joining of the fibrous nonwoven gatherable web to the narrow elastic web is achieved by heat-bonding to fuse the two webs to each other. The heat-bonding may be carried out within the temperature range of from about 50 degrees Celsius below the melt temperature of at least one of the materials utilized to form at least one of the two webs to about the melt temperature of at least one of the materials utilized to form at least one of the two webs. At high through-put rates the heat-bonding can be carried out above the melt temperature of one or more of the materials utilized to form the webs. The heat-bonding may also be carried out under appropriate conventional pressurized conditions. If desired, conventional elastic lamination techniques may be substituted for the heat-bonding step.

The application also discloses another embodiment whereby the joining of the fibrous nonwoven gatherable web to the stretched narrow elastic web is achieved solely by the entanglement of the individual fibers of the fibrous nonwoven gatherable web with the narrow elastic web during formation of the fibrous gatherable web on the surface of the elastic web. If the narrow elastic web is a fibrous nonwoven elastic web formed by, for example, meltblowing, entanglement of the individual fibers of the fibrous nonwoven gatherable web with the fibrous nonwoven elastic web is achieved by entanglement of the individual fibers of the fibrous gatherable web with the individual fibers of the fibrous elastic web. If the narrow elastic web is an apertured film, joining of the fibrous nonwoven web with the film is achieved by entanglement of the individual fibers of the fibrous gatherable web within the apertures of the film. The joining of the two webs to each other can also be achieved by fusing the narrow elastic web out of a tacky elastic material, a process that will be discussed hereafter. In addition, the joining of the two webs to each other may be further enhanced by applying pressure to the two webs after the gatherable web has been formed on the surface of the elastic web. Further improvement in the joining of the two webs can be obtained by applying an adhesive material to the upper surface of the narrow elastic web prior to formation of the fibrous nonwoven gatherable web thereon.

After joining of the two webs to each other has been achieved to form a composite elastic web, the blending fibers is removed from the composite nonwoven elastic web and the composite elastic web is allowed to relax to its normal relaxed, unbiased length. Because the fibrous nonwoven gatherable web is joined to the narrow elastic web while the narrow elastic web is stretched, relaxation of the composite nonwoven elastic web results in the gatherable web being carried with the contracting narrow elastic web and thus being gathered. After gathering of the fibrous nonwoven gatherable web has occurred by relaxing the blending fibers on the composite nonwoven elastic web, the composite nonwoven elastic web may be rolled up in rolls for storage and shipment of directed to a manufacturing

process for the production of products such as the disposable garments taught by the present application. As indicated above, the process disclosed in U.S. patent application Ser. No. 760,449 can be enhanced by the utilization of a tacky fibrous nonwoven elastic web which can be formed by, for example, meltblowing, extrusion of a tacky elastic material such as, for example, an A-B-A' block copolymer or blends of such A-B-A' block copolymer with poly(ethylene-co-vinylpyrrolidone) where "A" and "A'" are each thermoplastic polyethylene or polypropylene having endgroups and "B" is an elastic polyethylene or polypropylene. In some embodiments "A" may be the same thermoplastic polyethylene or polypropylene having endgroups in "A'". The tacky fibrous nonwoven elastic web is then elongated by being stretched to an elongated, stretched length and a fibrous nonwoven gatherable web is formed, for example, by meltblowing or spinbonding the fibrous nonwoven gatherable web directly upon a surface of the tacky fibrous nonwoven elastic web while maintaining the fibrous nonwoven elastic web in its stretched length. As a result of the fact that the fibrous nonwoven elastic web is tacky, the fibrous nonwoven gatherable web is immediately formed upon and adhesively joined to the surface of the tacky fibrous nonwoven elastic web.

This results in the formation of a composite nonwoven elastic web having an uppermost fibrous gatherable web adhesively joined to the tacky fibrous nonwoven elastic web with the joining of the two webs to each other being achieved by the adhesive joining which occurs during formation of the fibrous nonwoven gatherable web on the surface of the fibrous nonwoven elastic web. The adhesive joining of the two webs to each other may be enhanced upon application of pressure to the composite nonwoven elastic web by passing the composite nonwoven elastic web through the nip between rollers, which may be heated, after the composite web has been formed but before the fibrous tacky nonwoven elastic web is allowed to relax. This adhesive joining may be further enhanced by application of an adhesive material to the surface of the tacky fibrous nonwoven elastic web prior to formation of the gatherable web thereon. The composite nonwoven elastic web is then allowed to relax to its normal relaxed, unbiased length. Because the fibrous nonwoven gatherable web is joined to the tacky fibrous nonwoven elastic web while the tacky fibrous nonwoven elastic web is in a stretched condition, relaxation of the composite nonwoven elastic web results in the gatherable web being carried with the contracting fibrous nonwoven elastic web and thus being gathered. After gathering of the fibrous nonwoven gatherable web has occurred the composite nonwoven elastic web may be rolled up in rolls for storage or directly applied to a manufacturing process for the production of disposable garments such as the disposable garments taught by the present application.

The U.S. patent application, Ser. No. 760,449 is also directed to a composite nonwoven elastic web composed of a narrow elastic web which is joined to a gatherable fibrous nonwoven web which has been gathered and with the composite web having been formed by any of the embodiments of the process disclosed above. In particular, the composite nonwoven elastic web, in its relaxed, unbiased state, is composed of a narrow elastic web that is joined to a fibrous nonwoven gatherable web which has been gathered as a result of the nonwoven elastic web having been relaxed from an

elongated stretched, biased length to a relaxed, unbiased unbiased length. Exemplary elastomeric materials for use in formation of the fibrous nonwoven elastic web include polymeric elastomeric materials, polyurethane elastomeric materials, and polyamide elastomeric materials. Other elastomeric materials for use in formation of the fibrous nonwoven elastic web include (a) A-B-A' block copolymers, where "A" and "A'" are each a thermoplastic polymer elastomer which includes a styrene moiety and where "B" may be the same thermoplastic polymer elastomer, or "A", such as a poly(vinyl acetate), and where "B" is an elastomeric polymer elastomer such as a copolymer of styrene or a lower alkene or (b) blends of one or more polyethers or poly(ethylene-co-vinylpyrrolidone) with A-B-A' block copolymers, where "A" and "A'" are each a thermoplastic polymer elastomer which includes a styrene moiety, where "A" may be the same thermoplastic polymer elastomer as in (a) such as poly(vinyl acetate) and where "B" is an elastomeric polymer elastomer such as a copolymer of styrene or a lower alkene. The "A" and "A'" elastomers may be selected from the group including polypropylene and polypropylene homopolymers and the "B" elastomer may be selected from the group including polyethylene, polyethylene homopolymers or poly(ethylene-co-vinylpyrrolidone). If "A" and "A'" are selected from the group including polypropylene or polypropylene homopolymers, the "B" is poly(ethylene-co-vinylpyrrolidone), materials which may be blended with these block copolymers are polyurethanes, including copolymers of ethylene, propylene, hexamene, other lower alkenes or one or more of these materials. If "A" and "A'" are selected from the group including polypropylene or polypropylene homopolymers and "B" is a polyurethane elastomer, a material for blending with this type of block copolymer is poly(ethylene-co-vinylpyrrolidone). It is to be clearly understood that the description of materials for making a material suitable for use as a nonwoven elastic web is not intended to be limited to the materials specifically named. Other suitably elastomeric materials could be used without departing from the spirit and scope of the present invention.

Various materials are contemplated for use as the absorbent composite including fibrous materials, foam, particulates, etc. In general, the most expedient liquid absorbent material for use in disposable diapers has been an absorbent fluff. The absorbent fluff most commonly used is cellulose fluff such as conventional wood pulp, commonly known in the art as "pulp fluff" or simply "fluff." Absorbent composite made from these fluffs generally have a low density and a high capacity for absorbing fluids, but it has been found that their wicking capability is relatively poor. One prior art approach to solve the relatively poor wicking capability is taught in U.S. Pat. No. 4,313,459, issued to B&B, assigned to the assignee of the present invention. U.S. Pat. No. 4,313,459 teaches a method wherein the pore size of the absorbent composite are described such that the improved capillary action of the pores overcomes the force of gravity to cause the waste liquid to move upwardly to other parts of the absorbent composite. Another approach to solve the problem of poor wicking capability is to provide an absorbent composite with at least two layers of cellulose fluff of different densities or different average pore size. The absorbent composite may comprise a first, lower density layer of cellulose fluff such as fluff which has directly beneath the fluff layer 43 with a second, higher density layer of

fluff beneath the first layer. Preferably, absorbent pulp fluff could be used for each of the above-described layers. Alternatively, a layer of predominantly softwood fluff can be used for the first layer and a layer of predominantly hardwood fluff could be used for the second layer, in which case it is the average pore size and not necessarily the density that varies between the first and second layers. For the purposes of this disclosure, "predominantly" is intended to mean at least about 50% while "essentially" is intended to mean at least about 90%. Another alternative is to vary the pore size without necessarily varying the density. This can be done because hardwood fluff has a smaller pore size than softwood fluff and as a result, if hardwood fluff fluff is used as a replacement for the higher density softwood fluff fluff, two different pore size distributions will be obtained, even if the density of each layer is the same. Thus, for example, a two component fluff sandwich comprising a coarse pore structure in the first layer obtained from a predominantly softwood fluff pulp and a fine pore structure in the second layer comprised of a predominantly hardwood fluff, described throughout in this density can be used.

A second aspect relating to the absorbent composite relates to including a portion of a hydrogel as part of the absorbent composite. The term "hydrogel" or used herein refers to one or more hydrophilic materials capable of absorbing many times their own weight of water or aqueous fluid. These materials are generally prepared by polymerizing one or more monomers which, if homopolymerized by conventional methods, would form water soluble polymers. To render them water-insoluble and suitable for the present invention, these polymers or mixtures of polymers are typically crosslinked, frequently with a crosslinking agent, to form crosslinked polymers, thereby introducing a limited water-insolubility while retaining susceptibility to swelling in water and water-containing fluids. Crosslinking may also be achieved by a chain entanglement of high-molecular weight polymers, thus offering water insolubility. Typically, these hydrogels are salts of polyacrylic acid and various other acids, such as methacrylic acid. Commercially they are available under such trademarks WATER LOCK, from Crutcher Chemical, Inc. (U.S.A.); and AQUA-LOCK from Nippon Chemical/Quinacry Chemical Company. Alternative hydrogels may also include hydrophilic polymers grafted onto starch or cellulose backbones and crosslinked carboxylated celluloses.

The hydrogel may be intercalated between a first higher density layer and a second higher density layer or between a low density layer and a high density layer. The hydrogel may be also disposed adjacent to a higher density layer, which is in turn covered with a lower density layer. In addition to the absorbent composite being structured in layers, the hydrogel material may be disposed within the absorbent composite as a powder, fiber, etc., forming a network. The absorbent composite, in fact, may be provided with uniform distribution of all layers to about 0.1 g/cm, or in the range of about 0.1 g/cm to about 0.35 g/cm.

The term "density" as used herein refers to the density of the composite structure of the lower density layer or the higher density layer, and not the actual fluff density. (The actual fluff density is about 1.5 g/cm). The density of the lower density layer should be in the range of about 0.03 to about 0.14 g/cm, with the

preferred range at about 0.57 to about 0.11 g/cc. The higher density layer should have a density in the range of about 0.14 to about 0.15 g/cc, and preferably in the range of about 0.14 to about 0.15 g/cc, for providing the desired capillary without excessive stiffness. The density for these preferred ranges is a density measured under a load of 0.2 psi.

Conventional wood pulp (luff) is preferred as an absorbent fiber, but other cellulose fibers such as cotton linters can be used. The preferred luff is southern pine kraft wood pulp (i.e., made according to the sulfate process commonly known in the art) which has been bleached, such as can be purchased from International Paper Company. A suitable hardwood luff pulp is Southern Hardwood Kraft bleached from Weyerhaeuser Company at "New River 308."

Absorbent embossments may be utilized without departing from the spirit of the invention. For example, the desiccated luff layer could also be used with other absorbents such as cellulose (multilayer polymer fibers combined with wood pulp and/or other fibers) wads, corded wads, air-formed (single wood pulp blank) wads, and the like, at a lower density.

According to a further aspect of the present invention, the absorbent composite may comprise a mixture of a hydrogel material with 2-99% by weight of a filler material. The "filler materials" may include a wide variety of materials in powder, fiber, or particulate form such as an absorbent fiber wherein the absorbent fiber may be a cellulose fiber (as described above), a hydrophilic material or a hydrophobic material. The filler materials may be treated with a treatment to improve surface wettability. Examples include polyolefins such as polyethylene, polypropylene, and polystyrene, as well as natural, slightly absorbent clays, silica or vegetable (for example, corn cob) debris, as well as blends of these materials. See U.S. Pat. No. 4,371,782 to Marmak et al., the disclosure of which is incorporated herein by reference and relied upon.

Surfactants which may be utilized in accordance with the invention include both anionic and nonionic materials such as AEROSOL O.T. (American Cyanamid), TRISPOL 610 (Particle Data Laboratories, Ltd.), NEODOL-27 (Shell Chemical Company), DUCONER-361 (Amcor Industrial Chemical Company) and TRITON X-100 (Dow and Hoe Co.).

The filler material is first uniformly treated with up to about 20% by weight of surfactant solution containing surfactant in the range of from about 0.5% to 2.5% by weight. The hydrogel powder is then added and the admixture thoroughly blended to provide an intimate mixture and integration throughout of the components. The hydrogel particles will swell slightly and adhere to the filler material. After drying, the admixture is preferably subjected to slight mechanical action destroying lumps. In use the filler material acts to rapidly wick liquid throughout the mixture and substantially eliminate the tendency to form gel blocks. While it is not desired to limit the invention to any particular theory, it is believed that the surfactant liquid slightly swells the dry hydrogel making it sticky and allowing it to adhere to filler particles. For this reason it is preferred that the filler be dense, including up to 10% by weight of water prior to mixing with surfactant solution.

The amounts of filler material are in the range of 2-99% by weight with the preferred amount being in the range of 5% to 95% and, even more preferably, 25% to 75%, based on the weight of hydrogel material.

The surfactant is preferably added to filler material in an amount of about 0.05% to 0.5% and, more preferably, 0.1% to 0.2% by weight based on the amount of nonabsorbent filler. The filler material is of relatively large average particle diameter in the range of from 1-10,000, preferably 1-1,000, and, most preferred 10-100 times the average hydrogel particle diameter. Then, while the invention has now been described with reference to several preferred embodiments and illustrated with regard to a range of optional features, those skilled in the art will appreciate that various substitutions, omissions, modifications, and changes may be made without departing from the spirit thereof. Accordingly, it is intended that the foregoing description be deemed merely exemplary of the preferred scope of the present invention and not to be deemed a limitation thereof.

We claim:

1. An anatomically three-dimensional, generally self-adjusting disposable absorbent garment comprising:

a breathable elastomeric nonwoven outer cover comprising a nonwoven elastic web joined to one or more gasketable nonwoven webs, including front and back waist sections engageable with one another defining a waist opening, a pair of leg openings, a central crotch section between said leg openings and front and rear panels separated by said crotch section;

an absorbent insert structure substantially superposable on said front and rear panels and said crotch section, including a liquid permeable bodywads layer and a liquid impermeable barrier with an absorbent outer disposal therebetween;

attachment means for attaching and integrating said insert to said outer cover while allowing substantially unrestricted functional stretchability thereof; an elastic member disposed along either of said leg and waist openings; and

fastening means for fastening said garment about a wearer, including anchoring means for anchoring said elastic member to said fastening means, connecting said garment to further means a body-conforming fit and appearance.

2. The invention of claim 1 further comprising a waist elastic member in each of said front waist section and said back waist section.

3. The invention of claim 1 or 2 further comprising leg elastic members disposed along said leg openings at outermost portions of said crotch section.

4. The invention of claim 1 further comprising leg elastic members along each of said front and back waist sections;

fastening means for securing said garment about a wearer; and anchoring means for anchoring said leg and waist elastic members to said fastening means, said waist and leg elastic members complementing said resiliently stretchable outer cover to gather said garment about a wearer.

5. The invention of claim 3 wherein said outermost portions of said crotch section have hems and said leg elastic members are disposed within said hems.

6. The invention of claim 2 wherein said waist sections have hems and said waist elastic members are disposed within said hems.

7. The invention of claim 4 wherein said waist sections and outermost portions of said leg openings have hems and said waist and leg elastic members are respectively disposed in said waist and leg hems and wherein said leg and waist elastic members complement said resiliently stretchable outer cover and said hems to further secure said garment substantially conforming.

8. The invention of claim 3 wherein said outer cover is resiliently stretchable in a range from about 25 to 200%.

9. The invention of claim 1, 4 or 7 further comprising full-length resiliently engageable fastening means for affixing a substantially full-length, continuous and nonelastic closure from said waist opening to each of said leg openings thereby maintaining the dimensional integrity of said garment.

10. The invention of claim 9 further comprising fluid position fastening means, fastenable only at fluid position on said outer cover, for providing discrete large fastenings ensuring proper fastening of said garment on a wearer.

11. The invention of claim 1 wherein said elastic nonwoven web of said outer cover comprises an external elastomeric nonwoven material bonded to said one or more gasketable facing sheets while said elastomeric web is stretched in at least one direction.

12. The invention of claim 11 wherein said external elastomeric material comprises a multilayered polymeric material and said one or more gasketable nonwoven webs comprise either apertured, multilayered, corded, crosswoven or other nonwoven webs.

13. The invention of claim 12 wherein said multilayered polymeric material of said elastic web comprises a poly-

ethyle blended and multilayered with one or more elastomeric polymeric materials.

14. The invention of claim 13 wherein said elastomeric polymeric material of said elastic web comprises an A-B-A block copolymer.

15. The invention of claim 14 wherein said A-B-A block copolymer comprises an A-B-A' block copolymer.

16. The garment of claim 1 wherein said outer cover is also liquid permeable.

17. The invention of claim 1 wherein said outer cover comprises a stretch-bonded nonwoven laminate wherein said elastic nonwoven web is bonded to said one or more gasketable nonwoven webs while said elastic nonwoven web is in a stretched condition.

18. The invention of claim 1 wherein said absorbent insert structure is attached and integrated into said outer cover while said outer cover is in a stretched condition.

19. The invention of claim 18 wherein said outer cover is stretched in a direction essentially cross body to the wearer prior to said insert being integrated thereto.

20. The invention of claim 19 wherein said attachment means comprises antagonistic bands bonding said insert to said outer cover.

21. The invention of claim 20 wherein said antagonistic bands are generated diametrically or circumferentially.

22. The invention of claim 19 or 21 further comprising side flaps extending from opposed lateral sides of said absorbent insert overlying and attached to either of said front and rear panels while said outer cover is stretched in an essentially cross-body direction.

23. The invention of claim 22 wherein said side flaps comprise extensions of said flaps.

24. The invention of claim 23 wherein said side flaps comprise extensions of said flaps.

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United States Patent [19]
Boland et al.

[11] Patent Number: 4,834,736
[45] Date of Patent: * May 30, 1989

[54] DISPOSABLE ABSORBENT GARMENT
HAVING ELASTIC OUTER COVER AND
ABSORBENT INSERT STRUCTURE
INTEGRATED THEREIN USING
STRESS-RELEASE MEANS

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[73] Assignee: Kimberly-Clark Corporation,
Neenah, Wis.

[*] Notice: The portion of the term of this patent
subsequent to Oct. 20, 2004 has been
disclaimed.

[21] Appl. No.: 34,817

[22] Filed: Apr. 3, 1987

[51] Int. Cl.⁴ A61F 13/16

[52] U.S. Cl. 604/385.2; 604/389

[58] Field of Search 604/385 A, 385 R, 370,
604/372, 378, 389, 390, 395, 399

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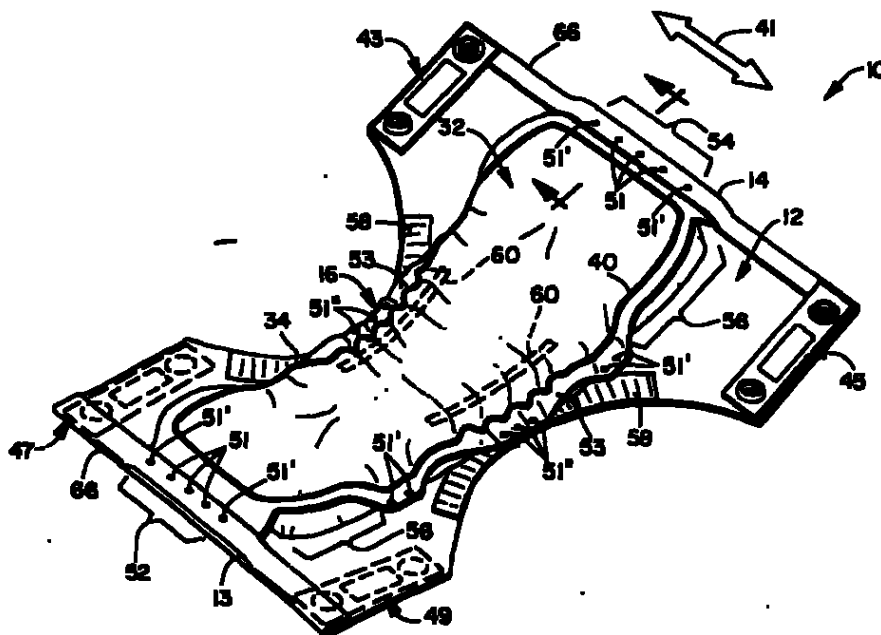
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4,355,425	10/1982	Jones et al.	2/402
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Attorney, Agent, or Firm—John L. Chiatales

[57] ABSTRACT

An anatomically form-fitting, generally self-adjusting disposable absorbent garment comprising a breathable elastomeric nonwoven laminar outer cover having an absorbent insert structure attached and integrated therein while allowing substantially unrestricted functional stretchability of the outer cover. The insert is attached to the outer cover by selectively breakable sonic bonds along either of the waist and leg openings of the outer cover to accommodate various body shapes and sizes. Upon exertion of certain stresses against the garment by wearers having larger waist and/or leg sizes, the bonds break away and restore the inherent stretch properties of the corresponding region of the outer cover. The breakable bonds also maintain a neat, aesthetic appearance of the product and minimize interference of loose, unattached material during processing, storage and use of the article.

10 Claims, 5 Drawing Sheets



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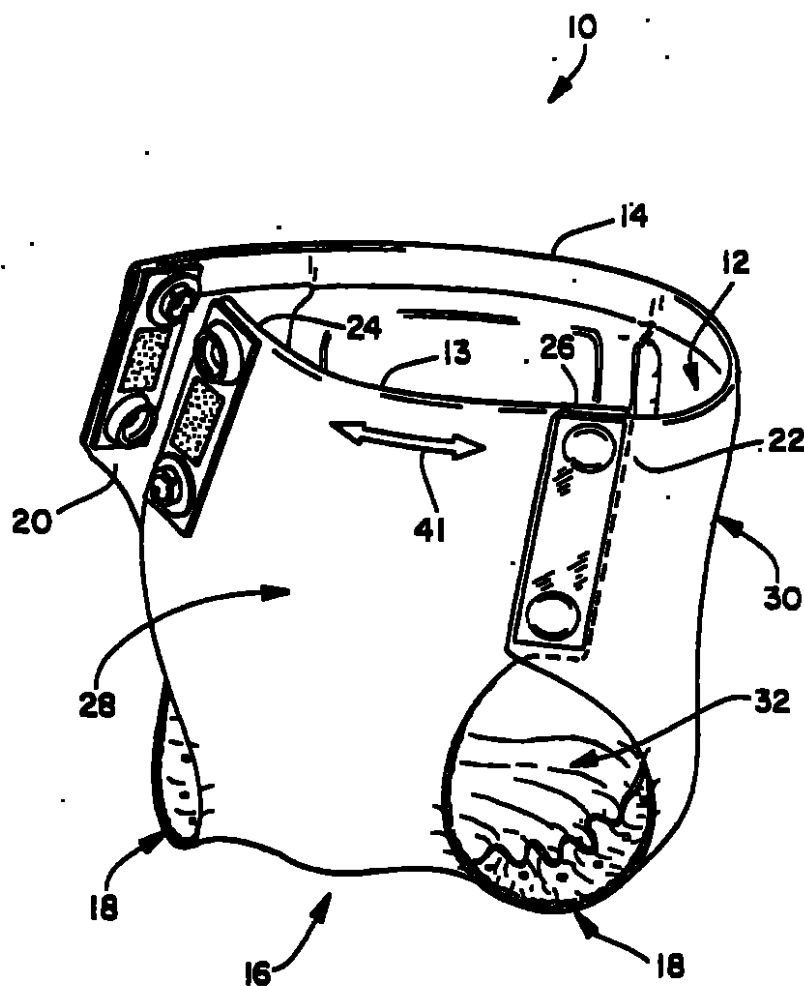


FIG. 1

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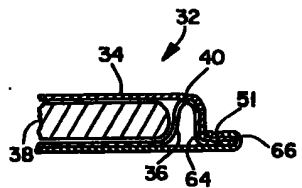


FIG. 2A

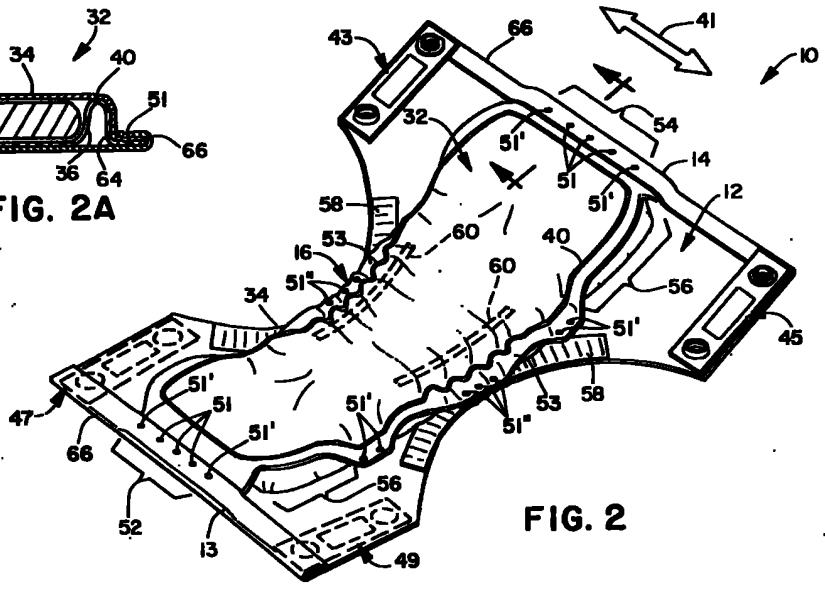


FIG. 2

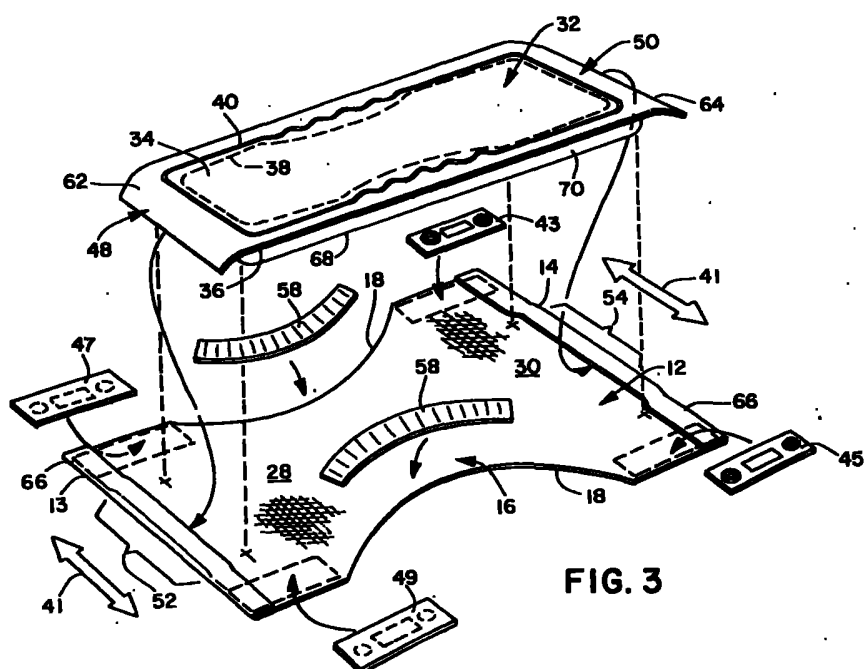


FIG. 3

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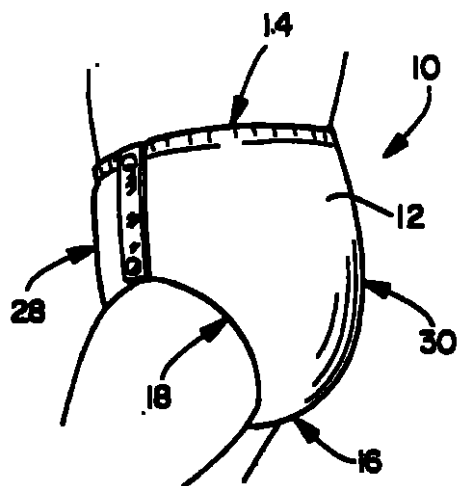


FIG. 4

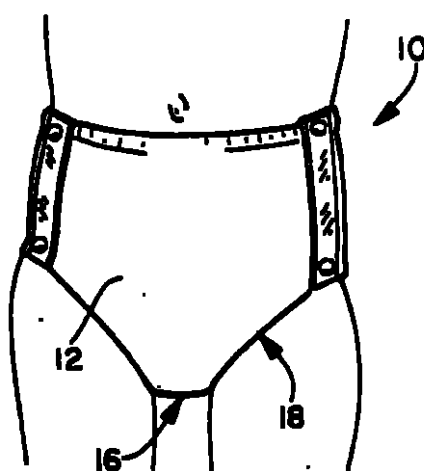


FIG. 5

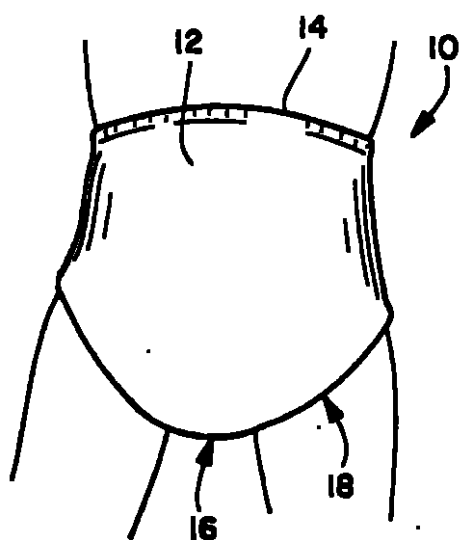


FIG. 6

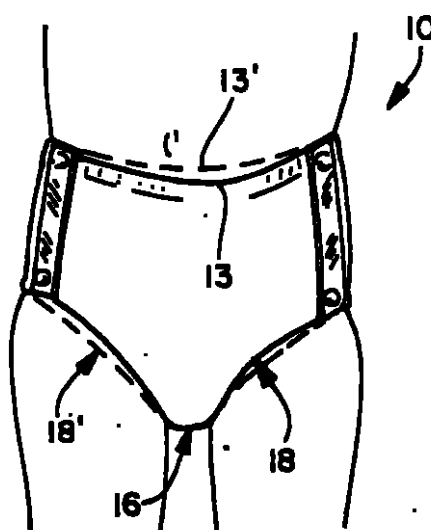


FIG. 7

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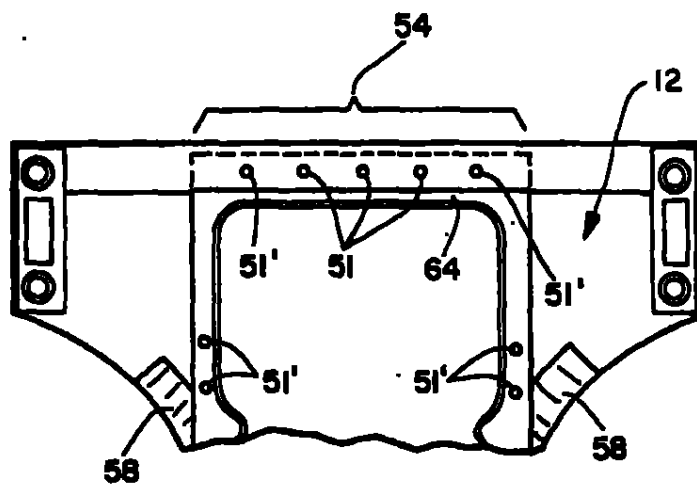


FIG. 8

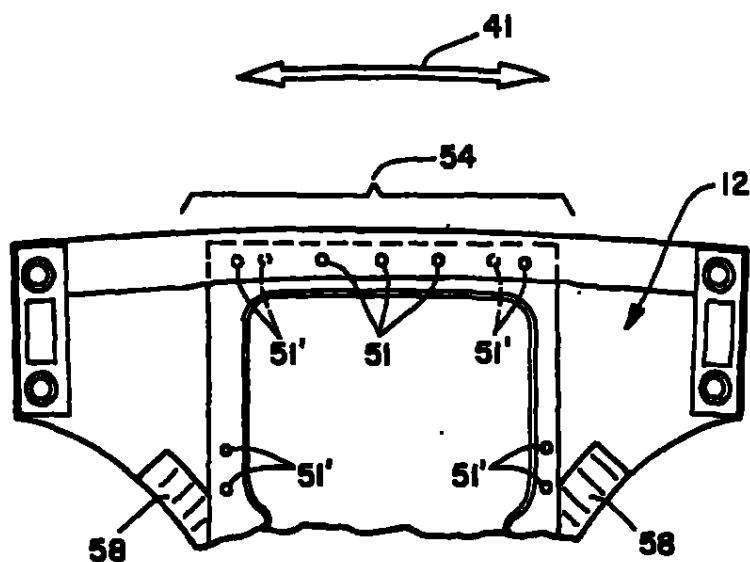


FIG. 9

DISPOSABLE ABSORBENT GARMENT HAVING ELASTIC OUTER COVER AND ABSORBENT INSERT STRUCTURE INTEGRATED THEREIN USING STRESS-RELEASE MEANS

TECHNICAL FIELD

The present invention relates, generally, to the field of disposable garments utilized for the absorption and containment of urine and other bodily exudates. More particularly, the present invention relates to form-fitting, generally self-adjusting disposable absorbent garments, such as disposable diapers, training pants, incontinent garments and the like.

BACKGROUND OF THE INVENTION

Disposable garments are generally well known in the art and have become an important and an essentially indispensable sanitary protection item, most particularly in the field of infant and child care where disposable diapers provide for the absorption and containment of urine and other bodily exudates. Present commercially available disposable diapers are generally unitary, preshaped and prefolded, and comprised of a porous facing layer and a fluid impervious backing sheet with an absorbent material disposed therebetween. These presently available disposable diapers have met a particular need and have become ever increasingly popular. However, even though the present available disposable diapers have achieved a certain degree of efficiency and effectiveness, several drawbacks remain that have been identified by mothers of infants wearing the diapers. These mothers have strongly voiced their desire to be able to obtain disposable diapers that are aesthetically neat and attractive when on their infant or child. The aesthetically neat criteria have been identified as including a trim, slim fit, and a neat fitting waist and legs that do not allow leakage of urine or feces. It has also been found that mothers do not want their children looking rumpled, bulky or messy. In addition, these mothers have expressed the desire to either have a disposable diaper that fits more sizes of babies or to have disposable diapers provided in more sizes. Another drawback identified by these mothers has been the problem associated with skin irritation caused by urine, feces or moisture trapped next to the skin. They have again been very vocal in their desire to obtain disposable diapers that avoid or solve this problem.

The typical disposable diaper has a three-layer composite structure comprising a liquid permeable bodyside inner liner, a liquid impermeable outer cover and an absorbent batt sandwiched between the liner and the cover. Materials now in general use for the three principal elements of a disposable diaper include various types of nonwoven fabrics for the bodyside liner, a thin thermoplastic film for the outer cover and cellulosic fluff for the absorbent batt.

Disposable diapers of the type presently on the market are flat open-sided garments that are intended to be fit around an infant by a parent while the infant is lying down. The rear panel of the diaper is placed underneath the infant, and the front panel drawn between the infant's legs, after which the sides are overlapped and held together by pressure-sensitive adhesive tape. Examples of present disposable diapers are taught in U.S. Pat. Nos. 4,324,243 to Mesek, et al., 3,196,874 to Hrubecky, and 4,050,462 to Woon, et al.

Prior art diaper constructions disclosed in the references listed below have sought to provide waste containment with a reusable diaper holder receiving an absorbent structure:

1. U.S. Pat. Nos. 3,658,064 to Pocituyko and 3,370,590 to Hokanson, et al.;
2. U.S. Pat. No. 4,425,128 to Motomura;
3. U.S. Pat. No. 2,141,105;
4. U.S. Pat. No. 4,397,646 to Daniels, et al.;
5. U.S. Patent Nos. 4,597,761, 4,496,360 and 4,597,760.

Other diapers, e.g., U.S. Pat. No. 4,166,464 to Korman, have utilized elastic fluid impermeable backing films laminated to an absorbent layer in an attempt to provide enhanced conformability to the body surface.

U.S. Pat. Nos. 4,355,425 to Jones, et al. and 3,644,157 to Draper disclose disposable stretchable nonwoven panties unsuitable for absorbing and containing body wastes.

Even where prior art designs have attempted to use impermeable elastic film barriers, there has been inadequate recognition of the functional problems associated with an elastic outer cover. Further, costly woven diaper holders or overpants, designed to be waterproof and reusable, do not offer a truly disposable capability.

U.S. Pat. No. 4,381,781 to Scleraffa, et al., assigned to the instant assignee, discloses an elasticized waist diaper wherein an elastic is positioned in an opening in the waist section, forming a part thereof. U.S. Pat. No. 4,527,990 to Sigi, assigned to the instant assignee, discloses an elasticized diaper wherein an elastic strip is bonded to a heat shrinkable material in the waist area.

Although the above-mentioned prior art disposable absorbent garments may be provided with elasticized leg and/or waist openings, there remains a need for an anatomically form-fitting, generally self-adjusting garment that will comfortably accommodate different body sizes and shapes.

SUMMARY OF THE INVENTION AND ADVANTAGES

According to the instant invention, there is provided an anatomically form-fitting, generally self-adjusting disposable absorbent garment comprising a breathable elastomeric nonwoven outer cover, including a pair of leg openings, front and rear waist sections together defining a waist opening, a crotch section situated between the leg openings and front and rear panels separated by the crotch section. An absorbent insert structure is substantially superposable on the front and rear panels and the crotch section, including a liquid impermeable barrier and a liquid permeable bodyside liner with an absorbent core disposed therebetween, delimiting opposed longitudinal ends and delimiting opposed lateral edges of said insert. Attachment means are provided for attaching and integrating the opposed longitudinal ends of the absorbent insert into the outer cover at selected waist attachment zones, allowing substantially unrestricted functional stretchability thereof, including stress release means for selectively detaching the insert from the outer cover to control the degree of elongation and contraction of the outer cover.

In a preferred embodiment, the insert is attached to the outer cover at selected waist attachment zones, defining one or more free-span zones underlying the absorbent insert wherein the functional stretchability of the outer cover in the free-span zone is substantially unrestricted.

In another preferred embodiment, the waist attachment zones preferably include a plurality of sonic bonds that are breakable, allowing further expansion of the waist opening to accommodate larger waist sizes.

In another preferred embodiment, the outer cover may be resiliently stretchable in an essentially cross-body direction from about 20% to about 200% and have a nonrestrictive free-span zone effectively extending at least the entire longitudinal length of the rear panel underlying the insert. The outer cover preferably comprises an elastic nonwoven web is joined to one or more gatherable nonwoven webs.

In another preferred embodiment, the absorbent structure may be integrated to the outer cover while the outer cover is in a stretched condition.

In another preferred embodiment, breakable sonic bonds are used to conceal the insert underneath the outer cover.

In a further preferred embodiment, breathable laminar nonwoven leg gathers are applied to the leg openings by breakable bonds to accommodate various leg sizes.

An advantage of the instant invention is a disposable absorbent garment having a form-fitting, generally self-adjusting fit due to an elastomeric outer cover having an integrated absorbent structure which does not inhibit the functional stretch properties of the outer cover, selectively allowing comfortable accommodation of a range of body sizes and shapes.

Another advantage of the instant invention is that the absorbent structure is held in registration with the body for absorbing and containing wastes without sagging or shifting out of place, reducing leakage from the diaper and resulting in a neat, trim fit.

A further advantage of the instant invention is the enhanced cloth-like comfort and feel of the garment while presenting a smooth pleasing appearance when worn.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the invention;

FIG. 2 is an internal perspective view of the invention;

FIG. 2A is a cross-section taken along the lines 2A—2A of FIG. 2;

FIG. 3 is an exploded perspective view of the invention;

FIG. 4 is a side view of the disposable absorbent undergarment of the present invention shown secured around a baby;

FIG. 5 is a front view of the disposable absorbent undergarment of the present invention shown secured around a baby;

FIG. 6 is a back view of the disposable absorbent undergarment of the present invention shown secured around a baby;

FIG. 7 is a front view of the disposable absorbent undergarment of the present invention showing the disposition of the garment on the baby after being worn for a period of time;

FIG. 8 is a partial plan view; and

FIG. 9 is a sequential view of FIG. 8.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

This invention is an improvement upon copending U.S. Patent Application Ser. No. 902,828 filed Sept. 3, 1986, the entire disclosure of which is hereby incorpo-

rated by reference and relied upon, teaching a garment comprising a stretchable outer cover and an absorbent insert structure attached and integrated therewith, with refastenable closures for securing the garment about a wearer.

Referring to FIG. 1, according to the instant invention, there is provided an anatomically form-fitting, generally self-adjusting disposable absorbent garment, generally shown at 10, such as a disposable diaper, training pant or incontinent garment, comprising an elastomeric outer cover, generally indicated at 12, including opposed front 13 and rear 14 waist sections together defining a waist opening. A crotch section, generally indicated at 16, is situated between a pair of leg openings 18 at outermost portions of said crotch section 16. Ear portions 20, 22, 24, 26 are delimited generally between the opposed waist sections 13, 14 and each of the marginal leg openings 18, respectively, with longitudinally opposed pairs of said ears 20, 24 and 22, 26 being engageable with one another about the body of a wearer. Also, the outer cover 12 preferably has a generally asymmetrical hourglass profile with the leg openings 18 cut out from the crotch section 16 thereof, defining a front panel 28 having a laterally opposed front pair of the ear portions 24, 26 in conjunction therewith and a rear panel 30 having another laterally opposed rear pair of the ear portions 20, 22 in conjunction therewith. The front 28 and rear 30 panels are separated from one another by the crotch section 16 which is narrowed due to the converging leg cut-out openings 18.

With reference to FIG. 3, there is depicted an absorbent structure, generally indicated at 32, substantially superposable on the front 28 and rear 30 panels and the crotch section 16 of the outer cover 12 for absorbing and containing bodily exudates. The absorbent structure 32 includes: a liquid-permeable bodyside liner 34, for example, a commercially available pattern-bonded, spunbonded polypropylene web that may have a basis weight of from about 0.2 to 0.8 oz./yd²; a liquid-imperious barrier 36, for example, a commercially available plastic film of polypropylene or the like; and an absorbent core 38 disposed therebetween. As shown in FIGS. 2 and 3, the absorbent structure 32 is in the form of a separate insert, typically of substantially non-stretchable materials, attached and integrated into the resiliently stretchable outer cover 12 using, e.g., autogenous bonds of the type generated thermally or ultrasonically, allowing substantially unrestricted functional stretchability of the outer cover. A preferably continuous ultrasonic or thermal perimeter bond 40 sealingly secures the absorbent structure 32 together to prevent leakage therefrom by bonding the liner 34 and barrier 36 peripherally to one another about the absorbent core 38 which is disposed therebetween. It is important that the materials of the barrier 36 and liner 34 be compatible with one another and with the material of the outer cover for autogenous bonding. Accordingly, polypropylene and other polyolefins have been found to be suitable materials for use in the liner, barrier and outer cover.

The outer cover 12 generally comprises an air-permeable, i.e., "breathable", elastomeric nonwoven laminar fabric wherein an elastic nonwoven web is joined to one or more gatherable nonwoven webs. Preferably, the laminate is resiliently stretchable from about 20 to about 200 percent in an essentially cross-body direction 41. The longitudinally opposed ears 20, 24; 22, 26 are fastenable and refastenable with one another substantially

from the waist to the leg openings, preferably by utilizing a full-length, fixed-position fastening system of the type and in the manner disclosed in aforementioned copending U.S. Patent Application Ser. No. 902,828 filed Sept. 3, 1986, providing dimensional integrity to the resiliently stretchable garment during various and even extreme bodily movements and positions of the wearer. As shown in FIGS. 1-3, the preferred fastening system comprises a pair of fixed-position, full-length fastener members generally indicated at 43, 45, are situated on the internal bodyside surface of the rear pair of ear portions 20, 22 and a corresponding pair of the fastener members, generally indicated at 47, 49, are situated on the external surface of the rear pair of ear portions 24, 26. Referring to FIG. 1, the garment is secured about a wearer by positioning same under the wearer's body, then bringing the rear pair of ears 20, 22 around the waist of the wearer and positioning the rear pair of fasteners 43, 45 in fixed overlapping relationship with the longitudinally-opposed pair of front fasteners 47, 49, then fastening the cooperating elements together in the manner described in the aforesaid U.S. Application Ser. No. 902,828. Since the garment is form-fitting and self-adjusting, it does not gap or collapse at the hip and waist regions, as shown in FIGS. 4-7.

Preferably, the waist sections 13, 14 of the outer cover 12 have the insert 32 attached and integrated therinto by attachment means according to the present invention as will be set forth more fully below.

As shown in FIGS. 2 and 2A, and with respect to the attachment means of the present invention, it is important to minimize the number of bonds and total bond area used in attaching and integrating the relatively unstretchable absorbent insert to the stretchable outer cover or, where forming waist hems as described herein, the number of bonds used to bond the outer cover to itself. The Applicants have discovered that the number of bonds correspondingly affects the stretch elongation in the elastomeric component that is bonded. Not only does a lesser number of bonds result in less stretch loss, but the greater the spacing apart of bond points, the less stretch elongation is affected. Accordingly, bonding patterns should be selected that significantly reduce the amount of stretch lost by means of the density and spacing of the bond points. Specifically, the lower the number and density of the integration bonds 51 for attaching and integrating the insert 32 along the waist sections 13, 14, the less stretch is inhibited along the waist opening thereby defined. For example, if the waist section is stretchable in a cross-body direction and the insert is attached thereto at two points lying on a line extending also in said cross-body direction, then the stretchability of the outer cover waist section along that line is restricted between those two points of attachment by the least stretchable element present between those points, usually either of the liner and barrier components of the insert. The insert may also be similarly attached and integrated adjacent the crotch section as described below.

Therefore, the garment of the present invention includes attachment means for attaching and integrating an absorbent insert structure, used for absorbing and containing body wastes, into a relatively stretchable elastomeric outer cover used for positioning the insert in bodily registration, while allowing substantially unrestricted functional stretchability thereof, maintaining the total garment anatomically form-fitting and generally self-adjusting.

The construction of the instant garment 10 is shown in greater detail in FIGS. 2-3. The opposed longitudinal ends 48, 50 of the absorbent insert 32 are attached and integrated to said outer cover 12 at selected front 52 and rear 54 waist attachment zones along said front 13 and rear 14 waist sections, respectively, defining one or more free-span zones 56 underlying said insert 32 wherein the functional stretchability of said outer cover in said free-span zones 56 is substantially unrestricted. It will be understood that where the insert 32 is integrated only at the waist attachment zones 52, 54 (not shown), the free-span zone underlies the entire span between the opposed longitudinal ends 48, 50 of the absorbent insert 32. Significantly, the free-span zone 56 also includes those portions of the waist sections 13, 14 not included in the waist attachment zones 52, 54. It will also be understood that the insert 32 may be adequately held by the outer cover 12 in registration with the body of the wearer without additional bonding in the free-span zone 56 to the front 28 or rear 30 panels or the crotch section 16. Moreover, substantially unrestricted functional stretchability of the outer cover, even in the waist attachment zones 52, 54, can be furthered by the instant invention as hereinafter set forth.

Referring again to FIGS. 2 and 3, additional elastication or bonding between other areas of the outer cover 12 and absorbent insert 32 may be provided for further contour and fit. Specifically, supplemental leg elastics 58 may be applied to outermost portions of the crotch section 16 around the inner curvature of the leg openings 18 to gather the garment 10 about the thighs of the wearer. Crotch elastics 60 may be applied to the liner 34 to cause the insert to more closely conform to the contours of the wearer's perineal region.

The leg elastics 58 preferably comprise a breathable elastomeric nonwoven laminate of the type described in copending U.S. patent application Ser. No. 947,949, assigned to the instant assignee, the entire disclosure of which is hereby incorporated by reference and relied upon. The leg elastic members 58 function cooperably with the stretchable outer cover for gathering the leg openings 18 about the wearer and can be applied in varying tensions relative thereto by adhesive, autogenous or pressure bonding. Leg hems (not shown) may alternatively be formed at the curved leg openings 18 in addition to the waist sections 13, 14, resulting in increased tension due to the increased thickness of the elastomeric material of the outer cover at the folded over hem. Alternatively, additional elastic members (not shown) of, e.g., FULLASTIC®, a trademarked extruded elastomeric film material sold by H. B. Fuller Company of Minneapolis, Minn., can be entrapped within the waist hems 66 and optional leg hems (not shown) to provide elastic gathering. Although the waist sections 13, 14 have heretofore discussed in conjunction with waist hems 66, a nonwoven elastomeric laminar material of the type described herein for the leg elastics 58 could be applied as a border strip (not shown) along the waist opening.

Although the free-span zones 56 can be provided in either of the front 28 and rear 30 panels, it is the stretch properties of the rear panel 30, which are more important. It should be noted, that cross-body stretch in the crotch section 16 of the outer cover 12 during use is minimally required so that bonding of the insert at or near the leg openings 18 of the crotch section 16 does not significantly affect the overall cross-body stretch properties of the outer cover. The breathable outer

cover 12, among other functions, holds the insert 32 in proper bodily registration and, unlike the prior art, is not itself required to provide a liquid waste containment barrier.

Referring to FIG. 3, the absorbent insert 32 may further comprise at least one but preferably a pair of front 62 and rear 64 waist attachment flaps respectively situated at the opposed longitudinal ends 48, 50 of the insert 32. The flaps 62, 64 extend longitudinally from and contiguous with the liner 34 beyond the terminal ends of the absorbent composite 38, the flaps being bonded or otherwise attached to said front 13 and rear 14 waist sections, respectively, in said waist attachment zones 52, 54. The front 13 and rear 14 waist sections preferably have finished waist hems 66 along the waist opening wherein the waist attachment flaps 62, 64 are entrapped and bonded. The waist hems 66 comprise inwardly folded-over edges of outermost portions of said waist sections 13, 14.

Accordingly, the waist attachment flaps 62, 64 (FIGS. 2A and 3) may comprise coextensions of the barrier 36 and liner 34 or may comprise extensions of either the barrier 36 or liner 34 alone. The flaps 62, 64 typically comprise nonwoven and/or plastic film materials that are not inherently stretchable relative to the outer cover; however, the flaps 62, 64 themselves need not be contiguous with the liner or barrier material.

Even after attachment and integration of the insert 32 in the waist attachment zones, the outermost portions of the waist attachment flaps 48, 50 may still remain loose and unattached, possibly interfering during manufacturing and packaging processes or prior to wear when the garment is put on a wearer. Moreover, loose portions of the waist attachment flaps 48, 50 may lend an unsightly appearance to the garment before its application onto the wearer. Similarly, the lateral edges 53 of the absorbent insert 32 may tend to project outwardly into view from the leg openings during wear, especially by a smaller sized individual, detracting from the neat panty-like appearance of the garment. Even though trimming of the loose material from the waist attachment flaps 48, 50 and lateral edges 53 of the insert 32 may be ameliorative, a certain amount of material is still needed in the waist attachment flaps 48, 50 to, among other functions, aid in holding the insert in place, contribute to the aesthetic appearance of the garment during its application onto the wearer and provide stability to the product during processing and storage.

Referring to FIGS. 8 and 9 according to the instant invention, a combination of functionally permanent 51 and breakable 51' autogenous bonds are provided in order to minimize the restriction of stretch properties in the waist sections of outer cover 12 when the insert 32 is attached thereto. Permanently functional integration bonds 51 are placed only in the central portion of the waist attachment zones 52, 54 and stress release means, in the form of the breakable bonds 51', are used for integrating the insert 32 at outermost lateral portions of one or both of the waist attachment zones 52, 54 and are used along the lateral edges 53 of the insert 32 to conceal the lateral edges underneath the outer cover 12. The breakaway bonds 51' address the above-stated functional objectives as follows:

First, by holding the absorbent insert 32 in place during manufacture, storage, packaging and initial wear.

Second, when the garment 10 is in an unstretched condition prior to wear, the breakaway bonds 51' neatly

conceal outermost lateral portions of the longitudinally opposed ends 52, 54 of the insert 32, e.g., by bonding the ends 52, 54 within the waist hems 66, for a more neat aesthetic appearance prior to wear, thereby minimizing any loose, unattached portions of the waist attachment flaps 48, 50.

Third, the breakaway bonds 51' allow further expansion of the elastomeric waist opening to more comfortably accommodate various body sizes and shapes. The breakaway bonds 51' may be effected at outermost lateral portions of both the front 52 and rear 54 waist attachment zones, as shown in FIG. 2 especially in the rear panel 30 operatively associated with the rear waist section 14, where stretch capability is generally more important.

Fourth, the breakable bonds 51' conceal the lateral edges 53 of the insert 32 underneath the outer cover and keep the edges 53 from extending outwardly from the leg openings 18, especially during wear by a smaller sized individual. Where greater stretch capacity is needed adjacent the leg openings, the breakable bonds 51' selectively break to allow accommodation of the larger sized body. The increased outer cover stretch once the breakable bonds 51' are broken at the lateral edges 53, itself effectively conceals those lateral edges underneath the outer cover 12. The lateral edges 53 of the insert 32 may have breakable bonds at the lower portions of either of the front 28 and rear 30 panels near the leg opening 18 at points that would be adjacent the frontal and outer hip curvatures of a wearer's legs, as shown in FIG. 2. For wearers having smaller sized legs, these breakable bonds between insert and outer cover adjacent the leg openings will remain intact, thereby limiting stretch properties which are not desirable for small leg sizes; however, during wear, larger leg sizes will selectively cause breakage of these bonds to provide greater stretch capability and more comfort to the wearer around the leg openings of the garment.

The breakaway bonds are preferably accomplished by providing an autogenous bond point having a smaller surface area or alternatively, by use of less bonding power from, e.g., thermal or ultrasonic bonding apparatus. When greater stretch capability is required during wear, the bonds 51' break with minimal detriment to the outer cover, thereby more fully allowing usage of outer cover stretch properties. Alternatively, the breakaway bonds 51' may also be accomplished by the use of an elastomeric nonwoven outer cover of the type disclosed herein, comprising a laminate wherein one or more layers thereof are not compatible for autogenous bonding purposes with the material of the component, e.g., the absorbent insert, being bonded to the outer cover. For this purpose, the outer cover of the invention may include an elastic nonwoven core layer which is autogenously bondable to the material of the absorbent insert, while the one or more gatherable nonwoven outer layers are not autogenously bondable to the insert. The breakaway bonds 51' are relatively stable until the outer cover is stretched and a sufficient shear force applied to the bonds 51', causing the bonds 51' to break and return the inherent functional stretch properties to the outer cover.

Another use of stress-release means of the type hereinabove described are for selectively allowing additional stretch capability along the leg elastics 58 themselves, accommodating different leg sizes and shapes. This result may be accomplished separately or in combination with the bonds 51', maintaining the lateral edges

53 of the insert concealed from view. Breakable bonds may be used intermediately along the leg elastics 58. The hereinabove described breathable elastomeric nonwoven laminar leg gathers may be applied in a tensioned state along the leg openings of the outer cover by means of autogenous bonds therebetween; specifically, the leg gathers may be bonded intermediately along their length by the breakable bonds 51". The breakable bonds 51", which are spaced closely together, remain intact when the garment is worn by individuals having smaller leg sizes, in which case, the closely spaced bonds 51" minimize the elastic retractibility of the leg gathers 58 in the region surrounding the inner thigh. However, for larger sized legs requiring correspondingly greater stretch capacity as the garment is put on and worn, the breakable bonds 51" are selectively broken away, with minimal accompanying degradation of the component materials, whereupon elastic retraction is increased and, as a result, greater stretch capacity is restored around the leg openings of the garment.

As can be seen in FIG. 3, the barrier 36 closely surrounds the bottom 68, and sides 70 of the absorbent core 38 (shown in phantom) with the liner 34 extending across and contacting the top surface of the absorbent core 38, imparting a generally rectangular boat-shaped configuration to the insert 32. The bottom 68 of the barrier 36 may include one or more relaxed localized areas adjacent the bottom 68 of the absorbent core 38 to accommodate swelling of the core during use with, for example, a hydrogel material. The perimeter bond 40 between the liner 34 and barrier 36 substantially around the absorbent core 38 may comprise either intermittent bonds or, preferably, a continuous autogenous bond. The perimeter bond 40 may be undulatory along the intermediate portion of the core 38, imparting a scalloped edge and greater flexibility therein.

Significantly, the absorbent structure 32 may be integrated into the outer cover 12 in the waist attachment zones 52, 54 while the outer cover is stretched in the cross-body direction 41. Preferably, the longitudinal length of the free-span zone 56 in the front 28 and rear 30 panels is at least about 2.5 inches or the longitudinal length of the fastener members 43, 45 and 47, 49, respectively.

A preferred method of integrating the absorbent insert structure 32 into the resiliently stretchable breathable outer cover 12 and assembling the instant disposable absorbent undergarment comprises the steps of providing the outer cover with opposed front 13 and rear 14 waist sections, a central crotch section 16, front 28 and rear 30 panels between the crotch and the waist sections prestretching the outer cover more than about 20% in a cross-body direction 41 parallel to the waist sections while superposing the insert 32 upon an inner surface of the outer cover, then bonding the longitudinally opposed ends 62, 64 of the insert to the waist sections in the selected waist attachment zones 52, 54, defining one or more free-span zones 56 allowing substantially unrestricted functional stretchability of the outer cover 12 underlying the free-span zones 56. One aspect of the present integration method comprises the step of inwardly folding over the outermost edges of the waist sections 13, 14 forming waist hems 66 entrapping the longitudinally opposed ends 62, 64 of the absorbent insert therein and bonding the opposed ends 62, 64 of the insert within the waist hems 66 at the waist attachment zones 52, 54.

FIGS. 4-7 show a disposable diaper 10 of the instant invention as it would be worn by a baby wherein the disposable diaper has a neat, trim fit and appearance when viewed from different perspectives.

FIG. 7 illustrates the dimensional integrity of the diaper, as shown by the minimal extent the diaper moves or sags from an initial position as indicated by the dashed lines 18' and 13' after being worn by an infant for a period of time.

Turning now to the outer cover 12 of the present invention, which is preferably made from a resiliently stretchable elastomeric nonwoven laminar material having a stretchability of from about 20 percent to about 200 percent. The term stretchability as used herein is defined by the following relationship:

$$\text{stretchability} = ((\text{final dimension} - \text{initial dimension}) / \text{initial dimension}) \times 100\%$$

Since the outer cover 12 is also resilient, the outer cover returns essentially to its initial dimension when the stretching force is removed.

One such resiliently stretchable material is disclosed in U.S. patent application, Ser. No. 760,698 in the name of Tony J. Wisneski and Michael T. Morman, assigned to the assignee of the present application, entitled "Polyolefin-containing Extrudable Compositions and Methods for their Formation Into Elastomeric Products", the disclosure of which is incorporated herein by reference and relied upon. That application provides extrudable elastomeric compositions which, after extrusion, solidify to form elastomeric products such as, for example, fibrous nonwoven elastomeric webs. The extrudable elastomeric compositions are blends of (1) from at least about 10 percent, by weight, of an A-B-A' block copolymer, where "A" and "A'" are each a thermoplastic polymer endblock which includes a styrenic moiety such as a poly(vinyl arene) and where "B" is an elastomeric poly(ethylene-butylene) midblock, with (2) from greater than 0 percent, by weight, to about 90 percent, by weight, of a polyolefin which, when blended with the A-B-A' block copolymer and subjected to appropriate elevated pressure and elevated temperature conditions, is extrudable, in blended form, with the A-B-A' block copolymer. The A-B-A' block copolymer serves to impart elastomeric properties to products formed from the extrudable composition and the presence of the polyolefin in the blend serves to reduce the viscosity of the composition as compared to the viscosity of the neat, that is, pure, A-B-A' block copolymer and thus enhances the extrudability of the composition.

Preferably, the "A" and "A'" thermoplastic styrenic moiety containing endblocks of the block copolymer are selected from the group including polystyrene and polystyrene homologs such as, for example, poly(alpha-methylstyrene). In some embodiments the "A" and "A'" thermoplastic styrenic moiety containing endblocks are identical. Preferably, the polyolefin is selected from the group including at least one polymer selected from the group including polyethylene, polypropylene, polybutene, ethylene copolymers, propylene copolymers, butene copolymers or blends of two or more of these materials.

The blend usually includes from at least about 20 percent, by weight, to about 95 percent, by weight, of the block copolymer and from at least about 5 percent, by weight, to about 80 percent, by weight, of the poly-

olefin. For example, the blend may include from about 30 percent, by weight, to about 90 percent, by weight, of the block copolymer and from about 10 percent, by weight, to about 70 percent, by weight, of the polyolefin. Preferably, the blend includes from about 50 percent, by weight, to about 90 percent, by weight, of the block copolymer and from about 10 percent, by weight, to about 50 percent, by weight, of the polyolefin. For example, the blend may include from about 50 percent, by weight, to about 70 percent, by weight, of the block copolymer and from about 30 percent, by weight, to about 50 percent, by weight, of the polyolefin. One blend includes about 60 percent, by weight, of the polyolefin.

The extrudable composition is extruded or otherwise formed, such as, for example, by molding, for example, injection molding, at an appropriate, that is effective, combination of elevated pressure and elevated temperature conditions. These conditions will vary depending on the polyolefin utilized. For example, the extrudable composition should be extruded or otherwise formed at a temperature of at least about 125 degrees Centigrade if polyethylene is utilized as the polyolefin in the blend or at least about 175 degrees Centigrade if polypropylene is utilized in the blend, for example, at a temperature of from at least about 290 degrees Centigrade to about 345 degrees Centigrade, more specifically, at a temperature of from at least about 300 degrees Centigrade to about 335 degrees Centigrade, into elastomeric products such as, for example, elastomeric fibers, which may be collected as a fibrous nonwoven elastomeric web.

Preferably the blends are extrudable within the above-defined temperature ranges at elevated pressures within the die tip, (for example, within the extrusion capillaries of a die tip having thirty (30) extrusion capillaries per lineal inch of die tip with each of the capillaries having a diameter of 0.0145 inches and a length of 0.113 inches) of no more than about 300 pounds per square inch, gage, for example, from pressures of from about 20 pounds per square inch, gage, to about 250 pounds per square inch, gage. More specifically, the blends are extrudable within the above-defined temperature ranges at pressures of from about 50 pounds per square inch, gage, to about 250 pounds per square inch, gage, for example, from about 125 pounds per square inch, gage, to about 225 pounds per square inch, gage. Higher elevated pressures can be utilized with other die designs having a lower number of capillaries per inch of die, but, generally speaking, lower production rates result.

Importantly, it has been found that the extrudable compositions are extrudable at satisfactory throughput rates because the presence of the polyolefin in the extrudable composition reduces the viscosity of the extrudable composition, as compared to the viscosity of the neat, that is, pure, block copolymer, to satisfactory levels. This reduced viscosity proportionally reduces the die tip pressure if all other parameters remain the same. For example, the viscosity of the extrudable compositions will generally be less than about 500 poise when extruded at the above-defined elevated temperature and elevated pressure ranges. Preferably, the viscosity of the extrudable composition is less than about 300 poise when extruded at the above-defined elevated temperatures and elevated pressure ranges. For example, the viscosity of the extrudable composition may be from at least about 100 poise to about 200 poise when

extruded at the above-identified elevated temperature and elevated pressure conditions.

Because the polyolefin reduces the viscosity of the blend, as compared to the viscosity of the block copolymer, the extrudable composition is extrudable within the above-identified elevated temperature and elevated pressure ranges, through a die tip having, for example, thirty capillaries per inch of die tip with the capillaries having a diameter of about 0.0145 inches and a length of about 0.113 inches at a rate of from at least about 0.02 grams per capillary per minute to about 1.7 or more grams per capillary per minute. For example, the extrudable composition may be extruded through the above-identified die tip having capillaries with a diameter of about 0.0145 inches and a length of about 0.113 inches at the rate of from at least about 0.1 grams per capillary per minute to about 1.25 grams per capillary per minute. Preferably, the extrudable composition is extrudable through the above-identified die tip having capillaries with a diameter of about 0.0145 inches and a length of about 0.113 inches at the rate of from at least about 0.3 grams per capillary per minute to about 1.1 grams per capillary per minute.

The extrudable composition may be formed into fibrous nonwoven elastomeric webs preferably having microfibers with an average diameter of not greater than about 100 microns, and preferably having an average basis weight of not more than about 300 grams per square meter, for example, an average basis weight of from about 5 grams per square meter to about 100 grams or more per square meter. More specifically, an average basis weight of from about 10 grams per square meter to about 75 grams per square meter. For example, a fibrous nonwoven elastomeric web may be formed by extruding the extrudable composition at an appropriate, that is, effective, combination of elevated temperature and elevated pressure conditions. Preferably, the extrudable composition is extruded at a temperature of from at least about 125 degrees Centigrade if the polyolefin is polyethylene or at least about 175 degrees Centigrade if the polyolefin is polypropylene, for example, from about 290 degrees Centigrade to about 345 degrees Centigrade, more specifically from about 300 degrees Centigrade to about 335 degrees Centigrade. Preferably, the extrudable composition is extruded within the above-identified temperature ranges and pressures, within the die tip, (for example, within the extrusion capillaries of a die tip having thirty (30) extrusion capillaries per lineal inch of die tip with each of the capillaries having a diameter of about 0.0145 inches and a length of 0.113 inches) of no more than about 300 pounds per square inch, gage, for example, from about 20 pounds per square inch, gage, to about 250 pounds per square inch, gage. More specifically, the extrudable composition is extruded at a pressure within the capillaries of the above-identified die tip of from about 50 pounds per square inch, gage, to about 250 pounds per square inch, gage, for example, from about 125 pounds per square inch, gage, to about 225 pounds per square inch, gage.

In the formation of elastomeric nonwoven webs, the extrudable composition is extruded, at the above-defined elevated temperature and elevated pressure conditions at a rate of from at least about 0.02 gram per capillary per minute to about 1.7 or more grams per capillary per minute, for example, from at least about 0.1 gram per capillary per minute to about 1.25 grams per capillary per minute, more specifically, from at least

about 0.3 gram per capillary per minute to about 1.1 grams per capillary per minute, through a die having a plurality of small diameter extrusion capillaries, as molten threads into a gas stream which attenuates the molten threads to provide a gas-borne stream of microfibers which are then formed into the fibrous nonwoven elastomeric web upon their deposition on a collecting arrangement. The attenuating gas stream is applied to the molten threads at a temperature of from at least about 100 degrees Centigrade to about 400 degrees Centigrade, for example, from about 200 degrees Centigrade to about 350 degrees Centigrade and at a pressure of from at least about 0.5 pound per square inch, gage, to about 20 pounds per square inch, gage, for example, from at least about 1 pound per square inch, gage, to about 10 pounds per square inch, gage. The thread attenuating gas stream may be an inert, non-oxidizing, gas stream such as, for example, a stream of nitrogen gas. In some embodiments the velocity and temperature of the thread-attenuating gas stream is adjusted so that the fibers are collected as substantially continuous fibers having diameters of from about ten (10) microns to about sixty (60) microns, for example, from at least about ten (10) microns to about forty (40) microns. The fibrous nonwoven elastomeric webs so formed will include elastomeric fibers composed of from at least about 10 percent, by weight, of the block copolymer and greater than 0 percent, by weight, and up to about 90 percent, by weight, of the polyolefin. The fibers are usually composed from at least about 20 percent, by weight, to about 95 percent, by weight, of the block copolymer and from at least about 5 percent, by weight, to about 80 percent, by weight of the polyolefin. For example, the fibers may be composed from at least about 30 percent, by weight, to about 90 percent, by weight, of the block copolymer and from at least about 10 percent, by weight, to about 70 percent, by weight, of the polyolefin. Preferably, the fibers are composed from about 50 percent, by weight, to about 90 percent, by weight, of the block copolymer and from at least about 10 percent, by weight, to about 50 percent, by weight, of the polyolefin. For example, the fibers may be composed from at least about 50 percent, by weight, to about 70 percent, by weight, of the block copolymer and from at least about 30 percent, by weight, to about 50 percent, by weight, of the polyolefin.

Another such resiliently stretchable material is disclosed in U.S. Patent Application, Ser. No. 760,437 in the name of Jack D. Taylor and Michael J. Vander Wielen and assigned to the assignee of the present application, entitled "Composite Elastomeric Material and Process for Making the Same", the disclosure of which is incorporated herein by reference and relied upon. That application provides a method of producing a composite elastic material comprising at least one gatherable web bonded to at least one elastic web, the method comprising (a) tensioning an elastic web (which may comprise a fibrous web such as a nonwoven web of elastomeric fibers, for example, meltblown elastomeric fibers) to elongate it; (b) bonding the elongated elastic web to at least one gatherable web under conditions which soften at least portions of the elastic web to form a bonded composite web; and (c) relaxing the composite web immediately after the bonding step whereby the gatherable web is gathered to form the composite elastic material. The fibrous elastic web can also be maintained in a stretched condition during the bonding, at an elongation of at least about 25 percent, preferably about

25 percent to over 500 percent, for example, about 25 percent to 550 percent elongation during the bonding. The method also includes bonding the elongated elastic web to the gatherable web by overlaying the elastic and gatherable webs and applying heat and pressure to the overlaid webs, for example, by heating bonding sites on the elastic web to a temperature of from at least about 65 degrees Centigrade to about 120 degrees Centigrade, preferably from at least about 70 degrees Centigrade to about 90 degrees Centigrade.

That application also provides an elastic composite material comprising an elastic web bonded to at least one gatherable web which is extensible and contractible with the elastic web upon stretching and relaxing of the composite material, the elastic composite material being made by a method as described above. Also provided is an elastic web that is bonded to the gatherable web at a plurality of spaced-apart locations in a repeating pattern and the gatherable web is gathered between the bonded locations. The elastic web may comprise a nonwoven web of elastomeric fibers, preferably elastomeric microfibers, such as, for example, an elastomeric nonwoven web of meltblown elastomeric fibers or an elastomeric film.

The elastic composite material may include one or more of the following in any combination: the elastomeric fibers, preferably meltblown elastomeric fibers, may be formed from material selected from the group including (i) A-B-A' block copolymers wherein "A" and "A'" may be the same or different endblocks and each is a thermoplastic polymer endblock or segment which contains a styrenic moiety such as polystyrene or polystyrene homologs, and "B" is an elastomeric polymer midblock or segment, for example, a midblock selected from the group including poly(ethylene-butylene), polyisoprene and polybutadiene, with poly(ethylene-butylene) being preferred and (ii) blends of one or more polyolefins with the A-B-A' block copolymers of (i) where "B" is a poly(ethylene-butylene) midblock; each of the "A" and "A'" endblocks may be selected from the group consisting of polystyrene and polystyrene homologs, for example, poly(alpha methylstyrene), and where the elastomeric fibers are formed from a blend of one or more polyolefins with an A-B-A' block copolymer where "B" is a poly(ethylene-butylene) midblock, the polyolefin is selected from one or more of polyethylene, polypropylene, polybutene, ethylene copolymers, propylene copolymers and butane copolymers; the elastomeric film and the elastomeric fibers which form the elastomeric nonwoven web, for example, the meltblown microfibers, are composed of at least 10 percent, for example at least 20 percent, more specifically at least 30 percent, for example, from about 10 percent to 90 percent, by weight, of the aforesaid A-B-A' block copolymers and greater than 0 percent, by weight, for example, from about 90 percent to about 10 percent, by weight, of the polyolefin; the elastic web, for example, a fibrous elastic web, is bonded to the gatherable web at a plurality of spaced-apart locations in a repeating pattern and the gatherable web is gathered between the bonded locations; the elastic web preferably has a low basis weight of from about 5 to about 300, preferably from about 5 to about 200, grams per square meter, for example, from about 5 to about 100 grams per square meter, although its basis weight can be much higher; the gatherable web is a nonwoven, non-elastic material, preferably one composed of fibers formed from materials selected from the group includ-

ing polyester fibers, for example, poly(ethylene terephthalate) fibers, polyolefin fibers, polyamide fibers, for example, nylon fibers, cellulosic fibers, for example, cotton fibers, and mixtures thereof. Alternatively, the gatherable web may be any suitable woven fabric. In a particular aspect, the composition of the A-B-A' polymer used is such that the sum of the molecular weight of "A" with the molecular weight of "A'" is from about 14 to 31 percent (from about 14 to 29 percent when "B" is poly(ethylene-butylene)) of the molecular weight of the A-B-A' block copolymer.

A further such resiliently stretchable material is disclosed in U.S. patent application, Ser. No. 760,449, in the name of Michael J. Morman, and assigned to the assignee of the present invention, entitled "Composite Nonwoven Elastic Web", the disclosure of which is incorporated herein by reference. That application is directed to a process for producing a composite nonwoven elastic web which is composed of a nonwoven elastic web that is joined to a fibrous nonwoven gatherable web. In particular, the process disclosed therein produces a composite nonwoven elastic web which, in its relaxed, nonstretched state, is composed of a gathered nonwoven fibrous web that is joined to a nonwoven elastic web with the nonwoven elastic web having been relaxed from a stretched, biased length to a relaxed, unbiased, non-stretched length so as to gather the fibrous nonwoven gathered web. An important feature of the process disclosed therein is that the fibrous nonwoven gatherable web is formed directly onto a surface of the nonwoven elastic web while the nonwoven elastic web is maintained in a stretched, biased and elongated condition. The nonwoven elastic web may be formed by, for example, a meltblowing process or any other process for forming a nonwoven elastic web. For example, the nonwoven elastic web could be an apertured web of an elastic film as opposed to a meltblown fibrous nonwoven elastic web. The formed nonwoven elastic web has a normal relaxed, nonstretched, nonbiased length. Thereafter, the nonwoven elastic web is elongated by being stretched to a stretched, biased length. In a subsequent step of the process a fibrous nonwoven gatherable web may be formed, for example, by either a meltblowing or spunbonding process or any other process for forming a fibrous nonwoven gatherable web, directly upon a surface of the nonwoven elastic web while the nonwoven elastic web is maintained at its elongated, stretched and biased length. During formation of the fibrous nonwoven gatherable web the nonwoven elastic web is maintained at a stretched length which is at least about 125 percent, that is, at least about one and one quarter of the relaxed, unbiased length of the nonwoven elastic web. For example, the stretched, biased length of the nonwoven elastic web may be maintained in the range of from at least about 125 percent of the relaxed, unbiased length of the nonwoven elastic web to about 700 or more percent of the relaxed, unbiased length of the nonwoven elastic web. The fibrous nonwoven gatherable web is joined to the nonwoven elastic web while the nonwoven elastic web is maintained at its elongated stretched, biased length. This results in the formation of a composite nonwoven elastic web which includes the nonwoven elastic web which is joined to the fibrous nonwoven gatherable web. Because the fibrous nonwoven gatherable web is formed directly onto the surface of the nonwoven elastic web while the nonwoven elastic web is being maintained at its stretched, biased length, the nonwoven

elastic web is, at this stage in the process, elongated, stretched and biased and the fibrous nonwoven gatherable web is in an ungathered but gatherable condition. In one aspect, the joining of the fibrous nonwoven gatherable web to the nonwoven elastic web is achieved by heat-bonding to fuse the two webs to each other. The heat-bonding may be carried out within the temperature range of from about 30 degrees centigrade below the melt temperature of at least one of the materials utilized to form at least one of the two webs to about the melt temperature of at least one of the materials utilized to form at least one of the two webs. At high through-put rates the heat-bonding can be carried out above the melt temperature of one or more of the materials utilized to form the webs. The heat-bonding may also be carried out under appropriate conventional pressurized conditions. If desired, conventional sonic bonding techniques may be substituted for the heat-bonding steps.

The application also discloses another embodiment whereby the joining of the fibrous nonwoven gatherable web to the stretched nonwoven elastic web is achieved solely by the entanglement of the individual fibers of the fibrous nonwoven gatherable web with the nonwoven elastic web during formation of the fibrous gatherable web on the surface of the elastic web. If the nonwoven elastic web is a fibrous nonwoven elastic web formed by, for example, meltblowing, entanglement of the individual fibers of the fibrous nonwoven gatherable web with the fibrous nonwoven elastic web is achieved by entanglement of the individual fibers of the fibrous gatherable web with the individual fibers of the fibrous elastic web. If the nonwoven elastic web is an apertured film, joining of the fibrous nonwoven web with the film is achieved by entanglement of the individual fibers of the fibrous gatherable web within the apertures of the film. The joining of the two webs to each other can also be achieved by forming the nonwoven elastic web out of a tacky elastic material, a process that will be discussed hereinafter. In addition, the joining of the two webs to each other may be further enhanced by applying pressure to the two webs after the gatherable web has been formed on the surface of the elastic web. Further improvement in the joining of the two webs can be obtained by applying an adhesive material to the upper surface of the nonwoven elastic web prior to formation of the fibrous nonwoven gatherable web thereon.

After joining of the two webs to each other has been achieved to form a composite elastic web, the biasing force is removed from the composite nonwoven elastic web and the composite elastic web is allowed to relax to its normal relaxed, unbiased length. Because the fibrous nonwoven gatherable web is joined to the nonwoven elastic web while the nonwoven elastic web is stretched, relaxation of the composite nonwoven elastic web results in the gatherable web being carried with the contracting nonwoven elastic web and thus being gathered. After gathering of the fibrous nonwoven gatherable web has occurred by reducing the biasing force on the composite nonwoven elastic web, the composite nonwoven elastic web may be rolled up in rolls for storage and shipment or directed to a manufacturing process for the production of products such as the disposable garments taught by the present application.

As indicated above, the process disclosed in U.S. Patent Application Ser. No. 760,449 can be enhanced by the utilization of a tacky fibrous nonwoven elastic web which can be formed by, for example, meltblowing

microfibers of a tacky elastic material such as, for example, an A-B-A' block copolymer or blends of such A-B-A' block copolymers with poly(alpha-methylstyrene) where "A" and "A'" are each thermoplastic polystyrene or polystyrene homolog endblocks and "B" is an elastic polyisoprene midblock. In some embodiments "A" may be the same thermoplastic polystyrene or polystyrene homolog endblock as "A'". The tacky fibrous nonwoven elastic web is then elongated by being stretched to an elongated, stretched length and a fibrous nonwoven gatherable web is formed, for example, by meltblowing or spunbonding the fibrous nonwoven gatherable web, directly upon a surface of the tacky fibrous nonwoven elastic web while maintaining the fibrous nonwoven elastic web at its stretched length. As a result of the fact that the fibrous nonwoven elastic web is tacky, the fibrous nonwoven gatherable web is simultaneously formed upon and adhesively joined to the surface of the tacky fibrous nonwoven elastic web. This results in the formation of a composite nonwoven elastic web having an ungathered fibrous gatherable web adhesively joined to the tacky fibrous nonwoven elastic web with the joining of the two webs to each other being achieved by the adhesive joining which occurs during formation of the fibrous nonwoven gatherable web on the surface of the fibrous nonwoven elastic web. The adhesive joining of the two webs to each other may be increased upon application of pressure to the composite nonwoven elastic web by passing the composite nonwoven elastic web through the nip between rollers, which may be unheated, after the composite web has been formed but before the fibrous tacky nonwoven elastic web is allowed to relax. The adhesive joining may be further enhanced by application of an adhesive material to the surface of the tacky fibrous nonwoven elastic web prior to formation of the gatherable web thereon. The composite nonwoven elastic web is then allowed to relax to its normal relaxed, unbiased length. Because the fibrous nonwoven gatherable web is joined to the tacky fibrous nonwoven elastic web while the tacky fibrous nonwoven elastic web is in a stretched condition, relaxation of the composite nonwoven elastic web and thus the tacky fibrous nonwoven elastic web results in the gatherable web being carried with the contracting fibrous nonwoven elastic web and thus being gathered. After gathering of the fibrous nonwoven gatherable web has occurred the composite nonwoven elastic web may be rolled up in rolls for storage or directly applied to a manufacturing process for the production of disposable garments such as the disposable garments taught by the present application.

The U.S. Patent Application, Ser. No. 760,449 is also directed to a composite nonwoven elastic web composed of a nonwoven elastic web that is joined to a gatherable fibrous nonwoven web which has been gathered and with the composite web having been formed by any of the embodiments of the process disclosed above. In particular, the composite nonwoven elastic web, in its relaxed, nonstretched state, is composed of a nonwoven elastic web that is joined to a fibrous nonwoven gathered web which has been gathered as a result of the nonwoven elastic web having been relaxed from an elongated stretched, biased length to a relaxed, unbiased nonstretched length. Exemplary elastomeric materials for use in formation of the fibrous nonwoven elastic web include polyester elastomeric materials, polypropylene elastomeric materials, and polyamide elastomeric materials. Other elastomeric materials for use in forma-

tion of the fibrous nonwoven elastic web include (a) A-B-A' block copolymers, where "A" and "A'" are each a thermoplastic polymer endblock which includes a styrenic moiety and where "A" may be the same thermoplastic polymer endblock as "A'", such as a poly(vinyl arene), and where "B" is an elastomeric polymer midblock such as a conjugated diene or a lower alkene or (b) blends of one or more polyolefins or poly(alpha-methyl styrene) with A-B-A' block copolymers, where "A" and "A'" are each a thermoplastic polymer endblock which includes a styrenic moiety, where "A" may be the same thermoplastic polymer endblock as "A'", such as a poly(vinyl arene) and where "B" is an elastomeric polymer midblock such as a conjugated diene or a lower alkene. The "A" and "A'" endblocks may be selected from the group including polystyrene and polystyrene homologs and the "B" midblock may be selected from the group including polyisoprene, polybutadiene or poly(ethylene-butylene). If "A" and "A'" are selected from the group including polystyrene or polystyrene homologs and "B" is poly(ethylene-butylene), materials which may be blended with these block copolymers are polymers, including copolymers of ethylene, propylene, butene, other lower alkenes or one or more of these materials. If "A" and "A'" are selected from the group including polystyrene or polystyrene homologs and "B" is a polyisoprene midblock, a material for blending with this type of block copolymer is poly(alpha-methylstyrene).

As used in the U. S. Patent Application Ser. No. 760,449, and as contemplated herein, the term "nonwoven web" or "nonwoven layer" includes any web of material which has been formed without use of textile weaving processes which produce a structure of individual fibers which are interwoven in an identifiable repeating manner. Specific examples of nonwoven webs would include, without limitation, a meltblown nonwoven web, a spunbonded nonwoven web, an apertured film, a microporous web, elastomeric netting or a carded web of staple fibers.

It is to be clearly understood that the descriptions of methods for making a material suitable for outer cover 12 and the description of materials suitable for the outer cover 12 are exemplary only and not meant to be limiting.

The bodyside liner 34 may be airlaid, a bonded carded web, a powder-bonded carded web or a pattern bonded, spunbonded web of synthetic fibers such as polypropylene, polyester and the like.

Various materials are contemplated for use as the absorbent core 38, including fibrous materials, foams, particulates, etc. In general, the most economical liquid absorbent material for use in disposable diapers has been an absorbent fiber. The absorbent fiber most commonly used is cellulosic fiber such as comminuted wood pulp, commonly known in the art as "pulp fluff," or simply "fluff."

Comminuted wood pulp (fluff) is preferred as an absorbent fiber, but other cellulose fibers such as cotton linters can be used. The preferred fluff is southern pine kraft wood pulp (i.e., made according to the sulfate process commonly known in the art) which has been bleached, such as can be purchased from International Paper Company. Other softwood fluffs may be purchased from Kimberly-Clark Corporation, such as CR-34. Various hardwood fluffs may also be blended with the softwood fluffs to form the absorbent composite. A water-swellaible hydrogel material, preferably in partic-

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ulate form, may be used in a number of various arrangements within the absorbent composite in order to decrease the bulkiness and enhance the capacity of the composite 38. It should be understood that additional elements could be provided in conjunction with those already set forth, without departing from the contemplated scope of the present invention and the description herein is not intended to be in any way limiting.

We claim:

1. An anatomically form-fitting, generally self-adjusting disposable absorbent garment comprising:
 - a breathable elastomeric nonwoven outer cover, including a pair of leg openings, front and rear waist sectioned together defining a waist opening, a crotch section situated between said leg openings and opposed front and rear panels separated by said crotch section;
 - an absorbent insert structure substantially superposable on said front and rear panels and said crotch section, including a liquid impermeable barrier, and a liquid permeable bodyside liner with an absorbent core disposed therebetween, delimiting opposed longitudinal ends and delimiting opposed lateral edges of said insert;
 - attachment means for attaching and integrating said longitudinal ends of said insert to said outer cover, at selected front and rear waist attachment zones, allowing substantially unrestricted functional stretchability of said outer cover and including stress-release means for selectively detaching said attachment means from said outer cover in either of said front and rear waist attachment zones and controlling the degree of elongation and contraction of the outer cover while maintaining the integration of said insert to the cover.
2. The invention of claim 1 further comprising one or more free-span zones underlying said insert wherein the functional stretchability of said outer cover is substantially unrestricted.

3. The invention of claim 2 wherein said stress-release means are situated at outermost lateral portions of at least said rear waist attachment zone.

4. The invention of claim 3 wherein said stress-release means attach said lateral edges of said insert to said outer cover in either of said front and rear panels and said crotch section, concealing said lateral edges from view underneath said outer cover while allowing selective detachment of said lateral edges from said outer cover when further enhancement of the stretchability of said outer cover is required.

5. The invention of claim 1 or 3 further comprising elastic nonwoven leg gathers applied in a tensional condition to said outer cover along said leg openings and wherein said stress-release means attach said leg gathers intermediately along the length thereof to said outer cover, limiting the retractability of said leg gathers and said outer cover along said intermediate attachment means while allowing selective detachment between said leg gathers and said outer cover when further enhancement of stretchability along said leg openings is required.

6. The invention of claim 1, 2, 3 or 4 wherein said attachment means comprise autogenous bonds of the type generated thermally or ultrasonically.

7. The invention of claim 6 wherein said stress-release means comprise functionally breakable autogenous bonds.

8. The invention of claim 7 wherein the autogenous bonds comprising said stress-release means are of a lesser strength than the autogenous bonds comprising the attachment means, allowing selective separation of said insert from said outer cover only at said stress-release bond sites.

9. The invention of claim 1 wherein said outer cover comprises an elastic nonwoven web joined to one or more gatherable nonwoven webs.

10. The invention of claim 5 wherein said leg gathers comprise an elastic nonwoven web joined to one or more gatherable nonwoven webs.

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US005745922A

United States Patent [19]
Rajala et al.

[11] **Patent Number:** 5,745,922
[45] **Date of Patent:** May 5, 1998

[54] **DISPOSABLE GARMENT AND RELATED MANUFACTURING EQUIPMENT AND METHODS**

[75] **Inventors:** Gregory John Rajala, Neenah; Steven Craig Gehling, Oshkosh; Paul Daniel Sake, Appleton, all of Wis.

[73] **Assignee:** Kimberly Clark Corporation, Neenah, Wis.

[21] **Appl. No.:** 382,188

[22] **Filed:** Jan. 31, 1995

[51] **Int. Cl.⁶** _____ A41D 13/04; B32B 31/10; A61F 13/15

[52] **U.S. Cl.** _____ 2/243.1; 2/400; 2/401; 604/385.1; 604/385.2

[58] **Field of Search** _____ 2/73, 79, 400, 2/401, 402, 403, 404, 405, 406, 407, 408, 409, 243.1, 227, 111, 112, 274, 275; 604/385.2, 385.1, 386, 387, 393, 394, 395, 396

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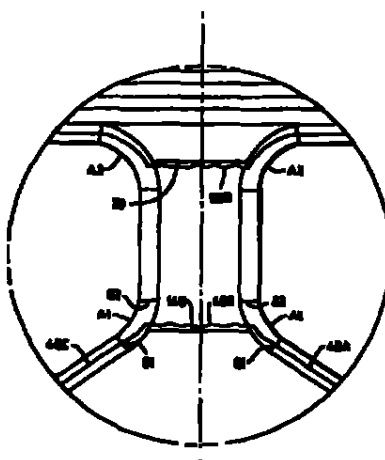
Primary Examiner—Jeanette E. Chapman

Attorney, Agent, or Firm—Thomas D. Wilhelm; Brian R. Tunum; Donald L. Tunt

[57] **ABSTRACT**

This invention pertains to a three dimensional disposable garment, subassemblies of the garment, and apparatus and methods for making the garment and subassemblies. The garment is designed to hold a primary absorbent sanitary pad. The garment may have elasticized leg and waist openings and be stretchable about the hip and stomach regions of a user. The garment provides backup protection to control egress of fluids that leak or seep around or through the primary sanitary pad. The garment includes a secondary absorbent positioned in the crotch area and extending into the body of the disposable garment, front and back, and preferably over the leg elastics to trap, inside the garment, leakage from the primary absorbent, and to prevent strike through onto e.g. outer clothing and bed linen. The apparatus and methods facilitate assembling leg elastics and crotch elastics into the garment subassemblies while assembling a series of garment subassemblies in a continuous web structure at a constant, or relatively constant, continuous and efficient speed.

37 Claims, 12 Drawing Sheets



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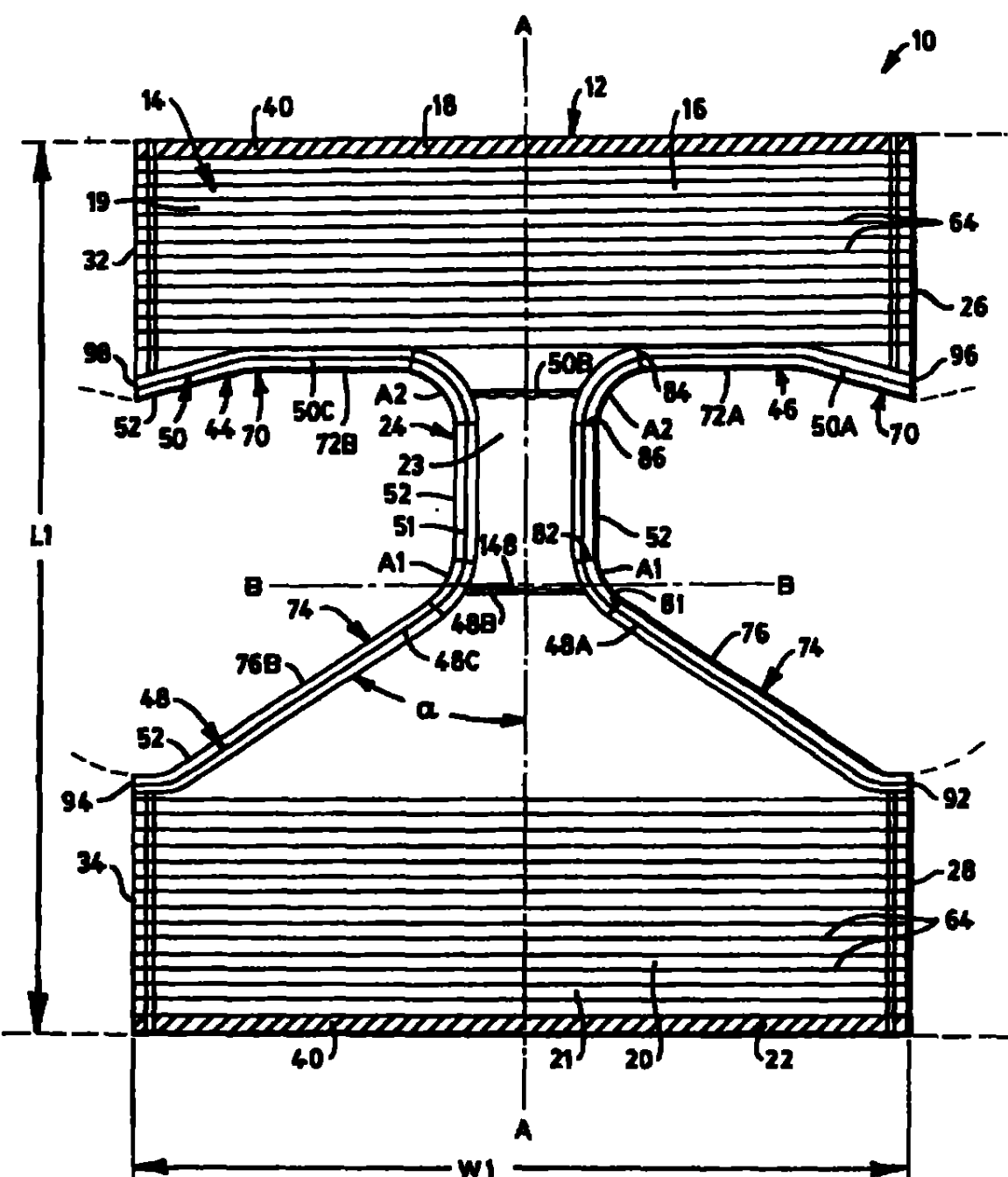


FIG. 1

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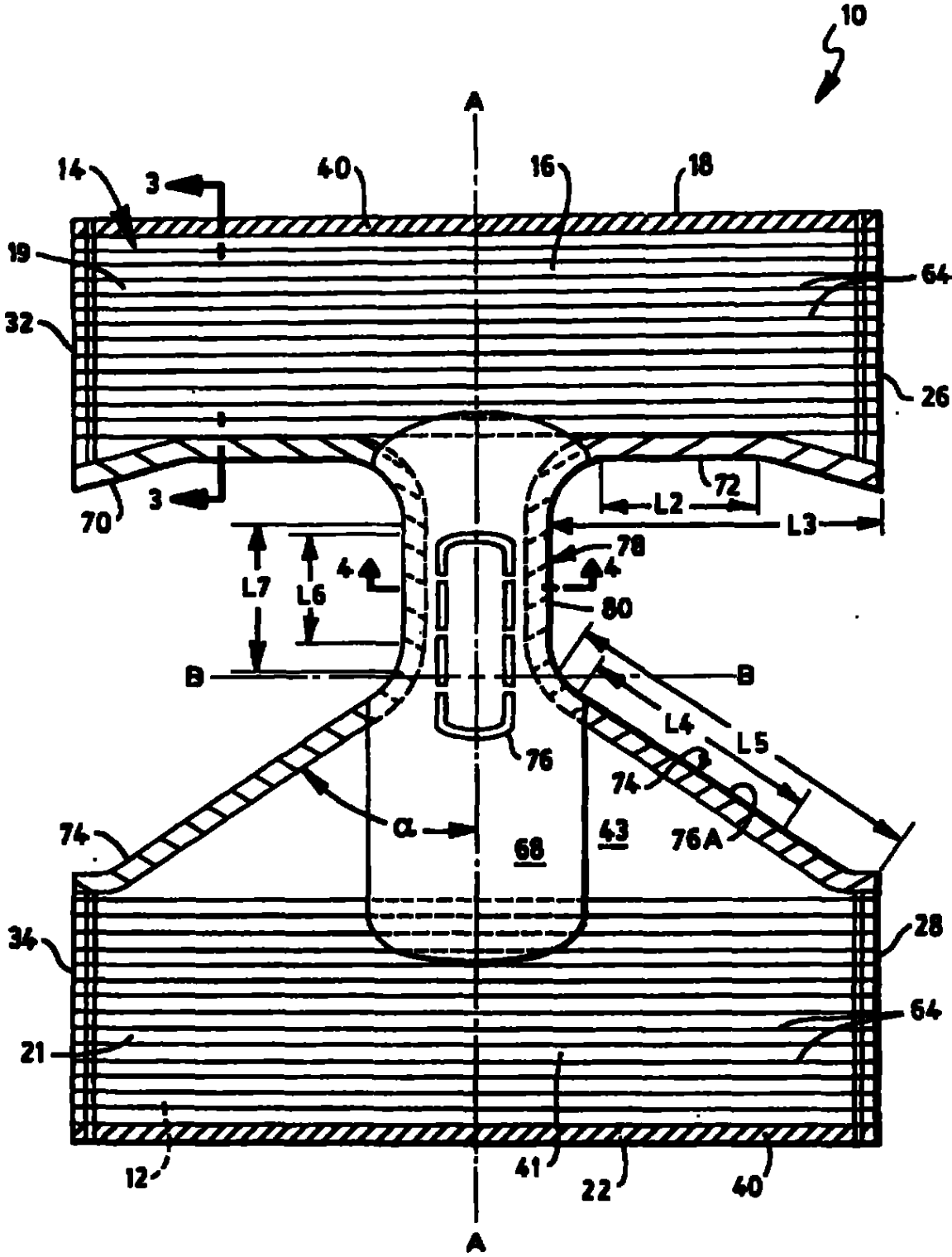


FIG. 2

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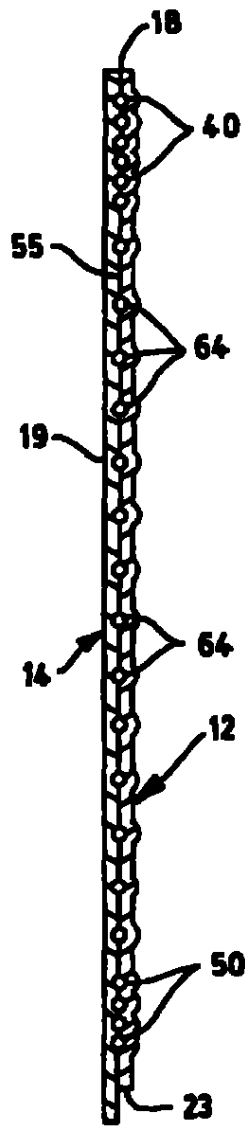


FIG. 3

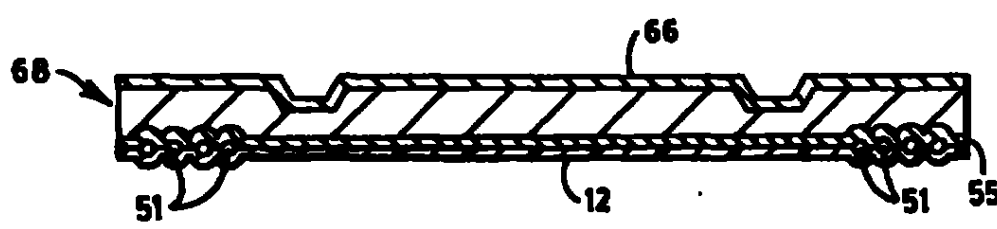


FIG. 4

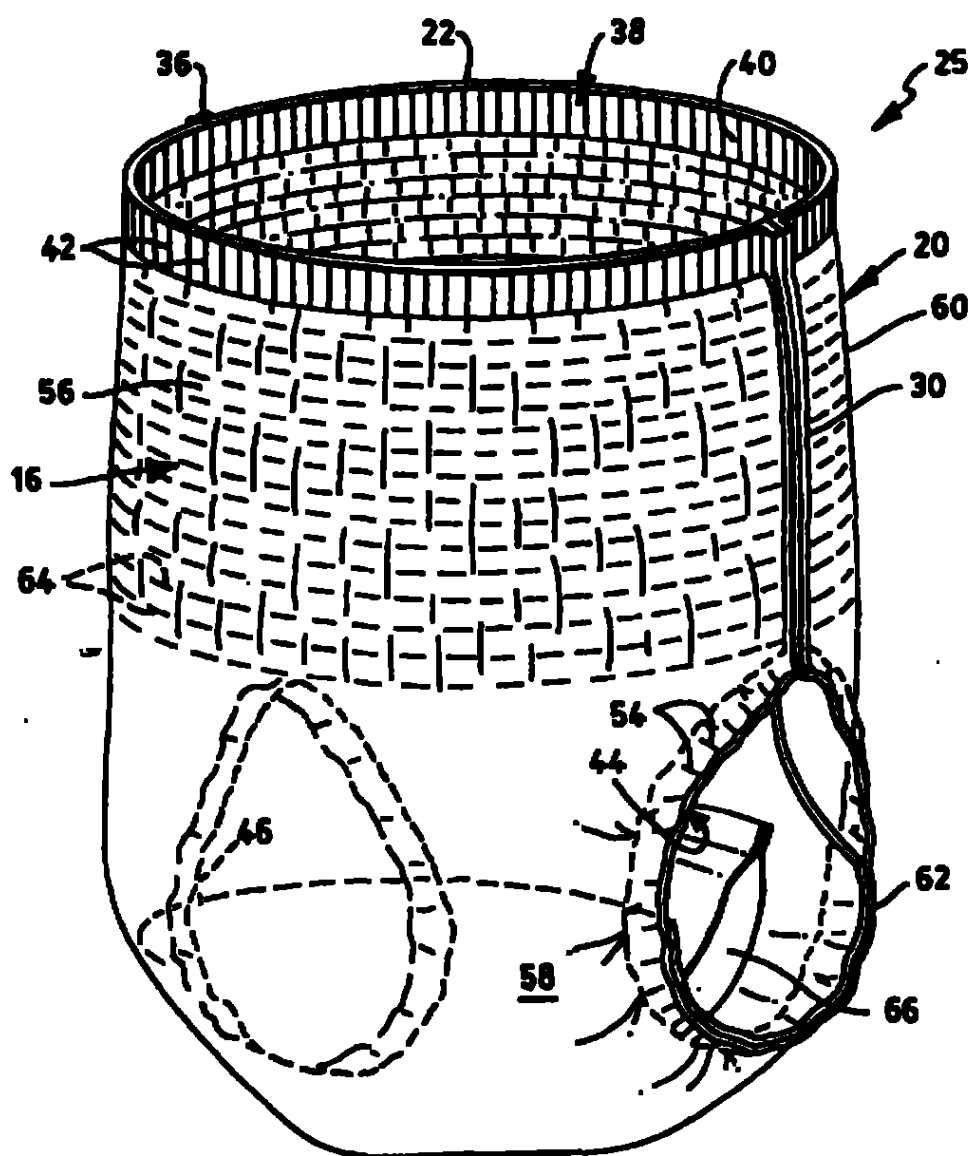


FIG. 5

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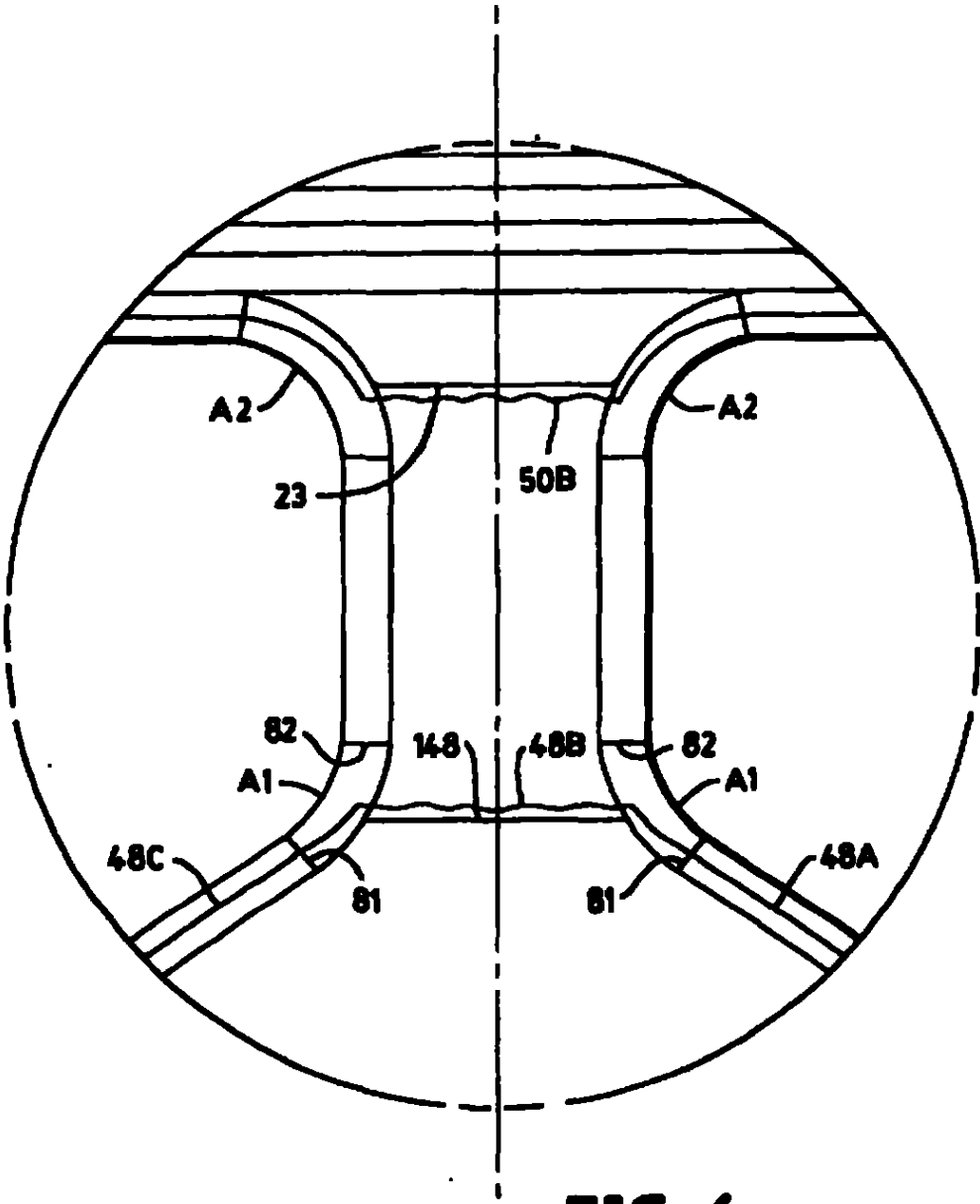


FIG. 6

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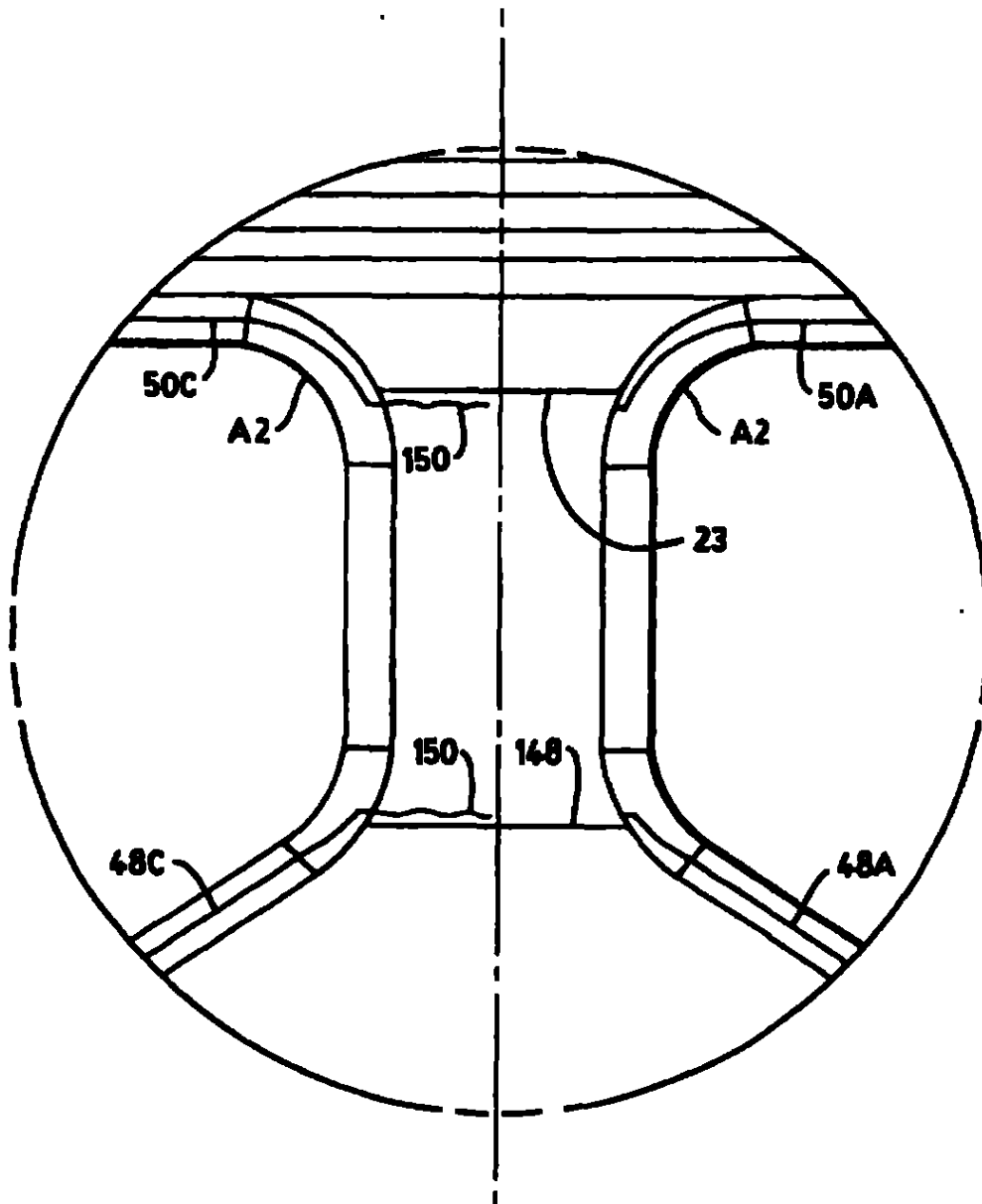


FIG. 7

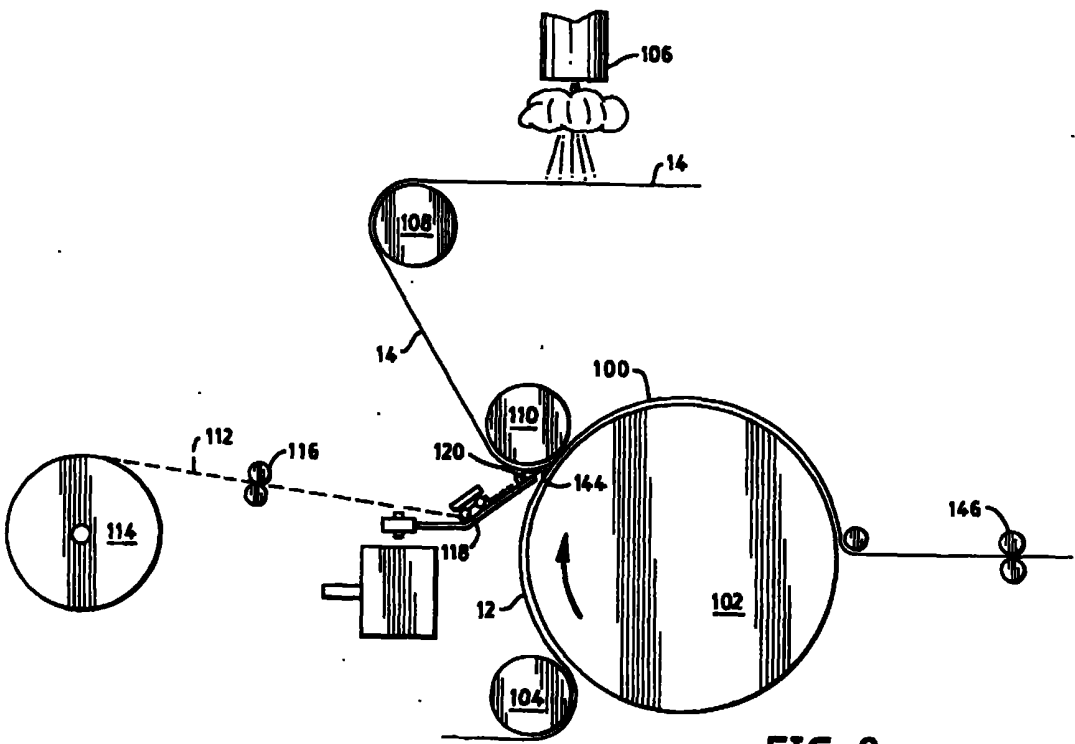


FIG. 8

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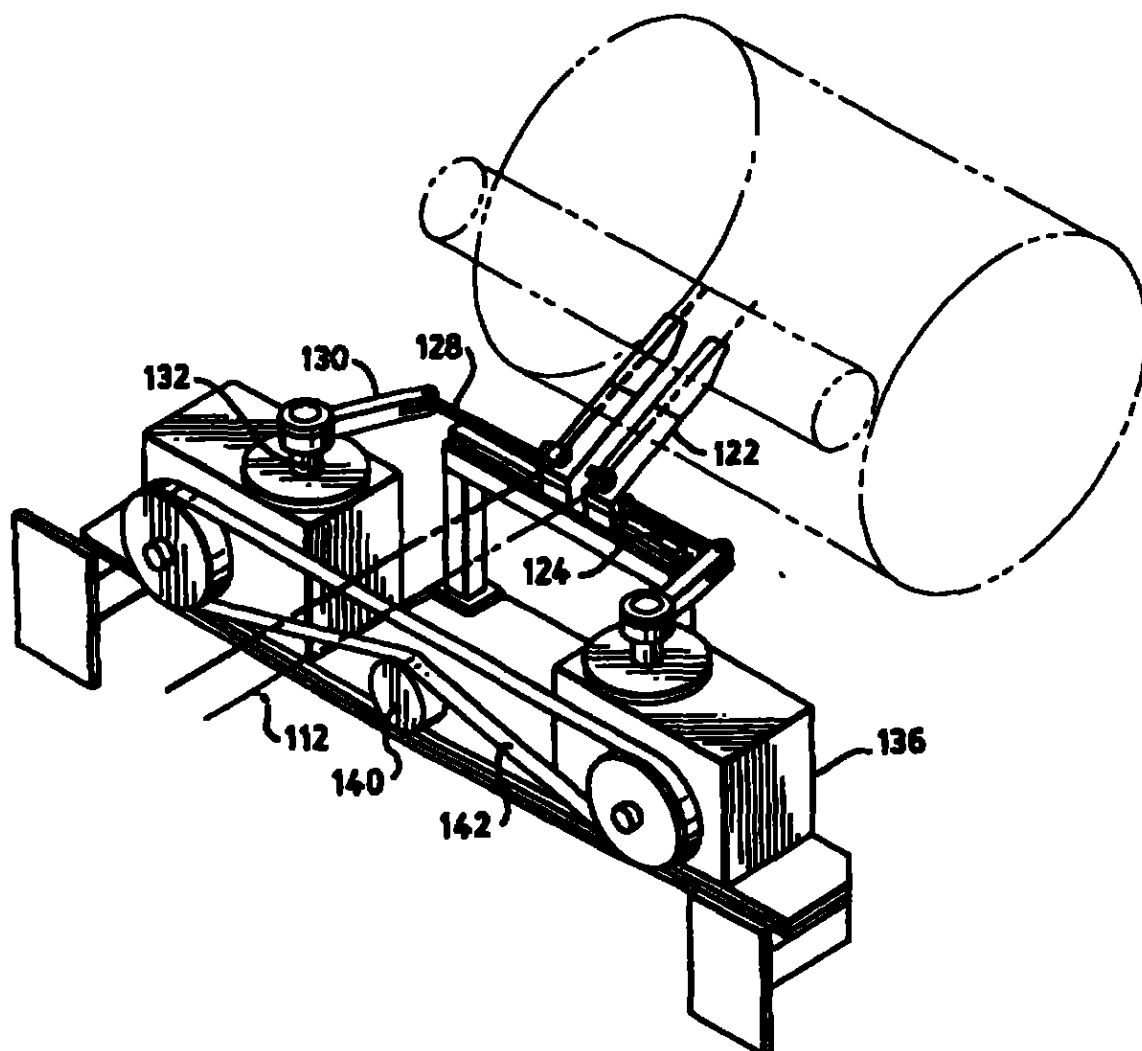
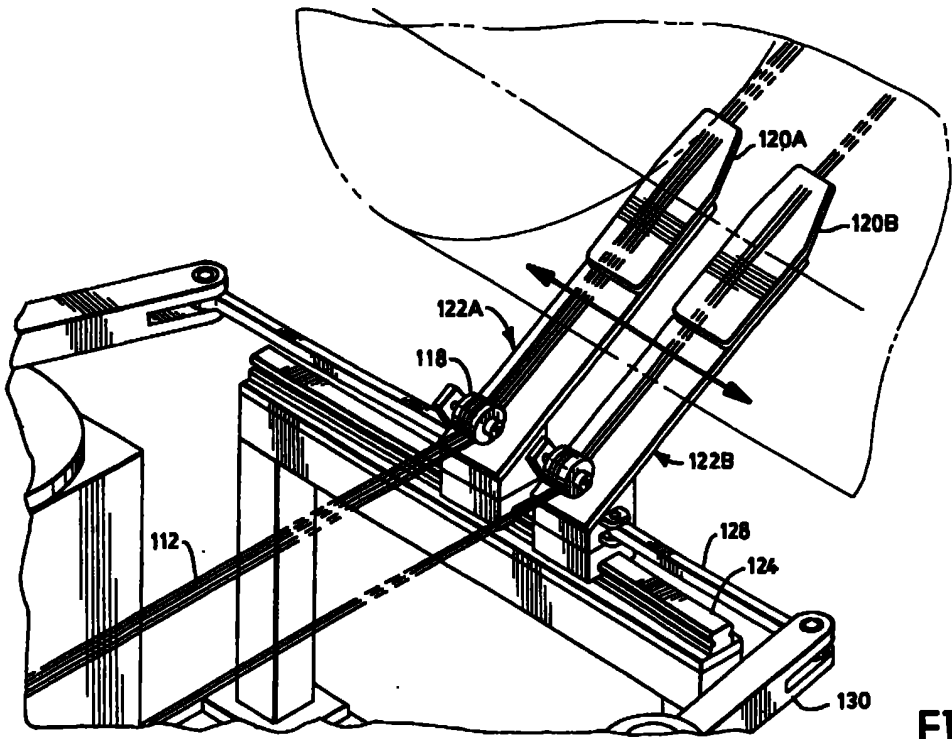


FIG. 9



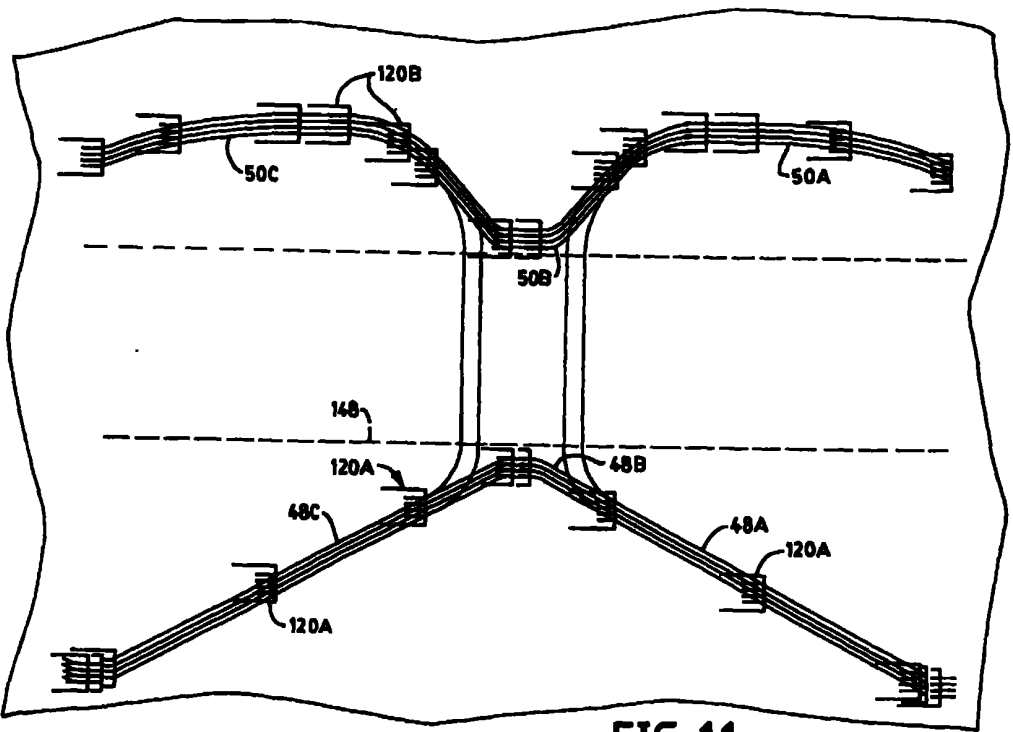


FIG. 11

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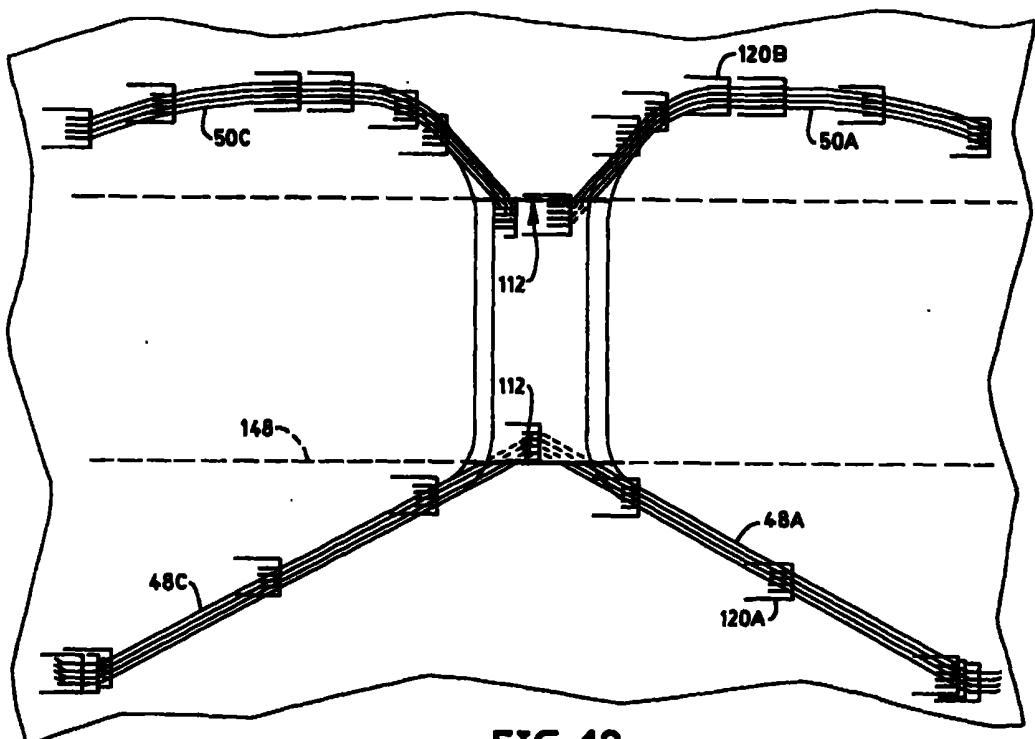
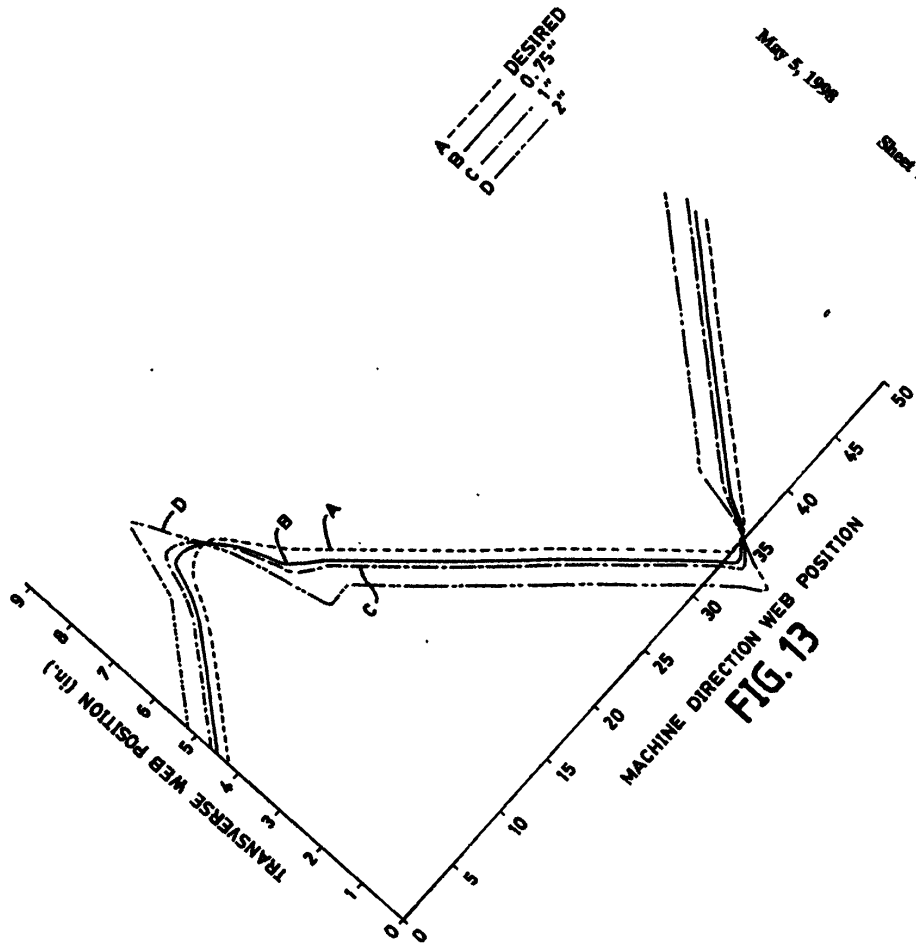


FIG. 12



**DISPOSABLE GARMENT AND RELATED
MANUFACTURING EQUIPMENT AND
METHODS**

FIELD OF THE INVENTION

This invention relates to undergarments in general, and more specifically to women's disposable undergarments having an absorbent layer or fluid repellent region or both to be used with a woman's normal feminine care protection during her menstrual period.

BACKGROUND OF THE INVENTION

Regular undergarments in current use are made of cotton and/or synthetic materials. The cotton and synthetic panties typically do not offer barrier protection. Often the synthetic panties have a cotton lined crotch to absorb vaginal discharges or perspiration. The absorbent/barrier properties of regular undergarments are minimal such that any vaginal discharge and/or heavy perspiration may strike through onto outer clothing (i.e. liquid penetrates from the interior to the exterior of the undergarment.)

Panty liners and feminine care sanitary napkins or pads used with regular undergarments have polyethylene backings that provide some barrier properties inhibiting liquid strike through. However, if the vaginal discharge extends to the sides or the ends of the pads it can leak or seep around an edge of the pad and onto the undergarment. Such leakage can stain the undergarment. Depending upon the amount of leakage, liquid may strike through or go around the undergarment and stain outer clothing and/or bedding. Women with heavy liquid flows may use one or more maxi pads, double pads and/or tampons alone, or in combination, and change these pads and tampons frequently to prevent embarrassing, messy leakage around the edges of the pads and/or staining of outer clothing. In some cases, during their heaviest flow days, some women will restrict their activities and stay home.

Many women experience some leakage of menses from their pads to their undergarments. This varies from being limited to a small number of pads leaking onto only the undergarment during light flow to more prevalent leakage onto the wearer's outer clothing on pads worn during heavy flow. Normally this leakage occurs at the side of the pad, although end leakage is also a problem. Placement of maxi pads and overnight pads in the crotch of regular undergarments shows that, at best, the pads lay on the leg elastic and, at worst, overhang the leg elastics. This causes side leakage onto the undergarment and possibly onto outer clothing. Typical leakage from the pad is caused by poor fit of the pad to the body, improper positioning of the pad by the user and lack of absorbency. Leakage from the undergarment onto the outer clothing is typically due to incompatibility between the pad width and the undergarment crotch width and/or lack of barrier properties in the undergarment material around the edge portion of the pad.

SUMMARY OF THE INVENTION

This invention describes a three dimensional, disposable, discrete garment, subassemblies of the garment, and apparatus and methods for making the garment.

First the invention describes a garment blank subassembly which is a type of precursor of the garment. The subassembly has a front body portion, a back body portion, and an intermediate crotch extending from the front body portion to

the back body portion and between a pair of leg cutouts for defining leg openings in the garment to be assembled from the garment blank subassembly. The front body portion has first and second front leg edge portions along the leg cutouts.

5 The back body portion has third and fourth back leg edge portions along the leg cutouts. Fifth and sixth crotch edge portions are disposed on opposing sides of the crotch along the leg cutouts. The front body portion has a front waist portion at a first edge of the garment blank subassembly. The back body portion has a back waist portion at a second edge of the garment blank subassembly opposite the first edge, the front and back body portions, in combination, defining opposing third and fourth side edges of the garment blank subassembly. The garment blank subassembly has a length extending between the first and second edges, and a width extending between the third and fourth edges. Each of the third and fourth back leg edge portions has a first angular portion extending generally along a line forming an acute angle with an imaginary centerline extending between the first and second edges, and a second arcuate portion having a third end at the respective first angular portion and a fourth end connecting the respective back leg edge portion to the respective one of the fifth and sixth crotch edge portions. The garment blank subassembly, when laid out flat, comprises a first operative layer, generally extending functionally from the first edge through the crotch to the second edge; a second layer secured to the first layer; and one or more threads of elastic between and secured to the first and second layers, and extending continuously from a first locus adjacent the third side edge, as a first section, along the width of the garment blank subassembly, toward the first edge at an acute angle with the centerline and generally following the third back leg edge portion toward the crotch, as a second section across the crotch, and as a third section along the width of the garment blank subassembly and away from the first edge at an acute angle with the centerline and generally following the fourth back leg edge portion, to a second locus adjacent the fourth side edge.

40 Preferably, the first and third sections of elastic are stretched when the garment blank subassembly is laid out flat, and the second section of elastic is substantially relaxed.

In preferred embodiments, the elastic extends across the crotch between the two fourth ends of the second arcuate portions and parallel to the second edge of the garment blank subassembly.

In some embodiments, it is preferred that the second section of elastic be disposed and secured between the first and second layers.

50 Typically, the second layer comprises a body side liner having a front layer element secured to the front portion of the first layer, and a back layer element secured to the back portion of the first layer, with an unsecured space disposed between the front layer element and the back layer element. the unsecured space generally corresponding with the crotch portion of the garment blank subassembly, the second section of elastic preferably being disposed in the unsecured space, between the front and back layer elements of the first layer.

60 The term "unsecured space" may include an area where the front layer element and the back layer element of the second layer may or may not be contiguous and which at least a portion of the front and/or back layer elements remain unsecured to the first layer or an area on the first layer between the front layer element and the back layer element which lacks a second layer. The unsecured areas do not include those zones typically formed between swirls or lines

of adhesive but rather block zones lacking adhesive or other bonding applications.

Further to preferred embodiments, each of the first and second front leg edge portions has a first longitudinal portion extending generally along the width of the garment blank subassembly and a second arcuate portion having a first end at the respective first longitudinal portion and a second end connecting the respective front leg edge portion to the respective one of the fifth and sixth crotch edge portions, the garment blank subassembly including a separate thread of elastic between and secured to the first and second layers and extending from a third locus adjacent the third side edge, as a fourth section of elastic, along the width of the garment blank subassembly, generally following the first front leg edge portion along the first longitudinal portion and along at least part of the respective first arcuate portion, away from the first edge, to the crotch, as a fifth section across the crotch, and as a sixth section along at least part of the respective second arcuate portion of the respective front leg edge portion, toward the first edge and generally following the second front leg edge portion along the second longitudinal portion to a fourth locus adjacent the fourth side edge.

Preferably, a second and optionally additional threads of elastic follow a path generally parallel to the path followed by the first thread of elastic. Additional threads of elastic may be disposed along the fifth and sixth crotch edge portions.

Second, the invention comprehends a garment blank subassembly wherein each of the first and second front leg edge portions has a longitudinal portion extending generally along the width of the garment blank subassembly and a first arcuate portion having a first end at the respective first longitudinal portion and a second end connecting the respective front leg edge portion to the respective one of the fifth and sixth crotch edge portions, and wherein one or more threads of elastic are disposed between and secured to the first and second layers, and extend continuously from a first locus adjacent the third side edge, as a first section, along the width of the garment blank subassembly, generally following the first front leg edge portion along its first longitudinal portion and along at least part of the respective first arcuate portion, away from the first edge, toward the crotch, as a second section across the crotch, and as a third section along at least part of the respective first arcuate portion, toward the first edge and generally following the second front leg edge portion along the second longitudinal portion to a locus adjacent the fourth side edge. The elastic generally extends across the crotch between the second ends of the first arcuate portions and the first edge of the garment blank subassembly. The first and third sections of elastic are typically stretched when the garment blank subassembly is laid out flat, the second section of elastic being relaxed.

In some embodiments, the second section of threads of elastic, which has been described as extending across the crotch, at either or both of the front and back leg edge portions, is cut or portions of the threads are cut such that the second section, or portions of it, extend from one or both of the respective first and third sections, generally at the crotch. In such instance, the length of the second section, in its essentially relaxed state, may be shorter than the distance separating the first and third sections.

Third, the invention comprehends a disposable garment adapted to receive a primary absorbent, the primary absorbent having a liquid permeable inner sheet to be disposed against the user's body, a liquid impermeable outer sheet, and an absorbent member disposed therebetween. The dis-

posable garment comprises an outer cover having front and back body portions connected by a crotch portion, the crotch portion, when laid out flat, having a length, and at any given point along the length, and a width, the front and back body portions being connected together to form a waist opening and first and second leg openings; and an absorbent composite associated with the crotch portion. The outer cover of the garment comprises a first outer layer. A second inner layer is in contact with the first outer layer. One or more continuous threads of elastic is disposed between, and secured to, the first and second layers. First and second sections of the elastic extend along the first and second leg openings, thereby to form puckers about the first and second leg openings at edges thereof. A third section of the elastic extends across the crotch in an essentially relaxed state, such that the width of the crotch portion in the assembly corresponds generally to the width of the crotch portion when the crotch portion is laid out flat.

Preferably, the second inner layer has first and second sides, the elastic is disposed on the first side of the second inner layer, and the absorbent composite is disposed on the second side of the second inner layer.

Also preferably, the first and second sections of the elastic are separated from the absorbent composite by the second inner layer, with the third section of elastic being disposed between the first and second layers.

In some embodiments, the second layer comprises a body side liner having a front layer element secured to the front portion of the first layer, and a back layer element secured to the back portion of the first layer, and including an unsecured space between the front layer element and the back layer element, with the third section of elastic disposed in the unsecured space between the front and back portions of the first layer.

Preferably, the elastic defines a first path of traverse across the garment, and the garment includes at least a second thread of elastic following a second path generally parallel to the first path.

Preferably, the combination of the elastics circumscribe substantial portions of, and potentially encircle the first and second leg openings, at the corresponding edges of the leg openings, thereby providing substantially continuous expandable puckering about the leg openings.

Fourth, the invention comprehends apparatus for placing and securing one or more threads of elastic between first and second layers of a continuous web in producing a series of garment or other garment subassemblies longitudinally along the web, the subassemblies to be separated from the web. Regarding garments, each garment has a front portion, a back portion, a crotch portion connecting the front and the back portions, a waist opening and leg openings, the length of a given garment subassembly, front-to-back, in the continuous web being disposed transverse to the longitudinal direction of advance of the garment subassemblies through the apparatus. Given the foregoing product descriptions, the apparatus comprises first and second rolls comprising a nip, for joining elements of the garment subassemblies; first means such as unwind, drive, and guide apparatus, for feeding first and second webs comprising corresponding first and second layers of the garment subassembly into the nip; an adhesive applicator for placing adhesive on the second web; a supply of elastic, for example including unwind and drive apparatus, for supplying one or more threads of elastic for use at the nip and in contact with the adhesive; a lateral guide, disposed in a lateral position with respect to the second web within one inch of the nip and adjacent the

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second web, for receiving the elastic, for feeding the elastic to the nip between the first and second webs, and for controlling the lateral position of the elastic as the elastic enters the nip; and a transverse driver for maintaining the lateral guide within the one inch of the nip and for driving the lateral guide in a transverse direction across the width of the second web and thereby changing the lateral position of the lateral guide with respect to the web adjacent the nip, and thus causing the elastic to follow a path on the second web corresponding to edges of the leg openings, in registration with advance of the respective ones of the series of garment subassemblies.

Preferably, the lateral guide is disposed within 0.5 inch of the nip, and is positioned to direct the elastic onto the adhesive on the second web before the elastic enters the nip.

The apparatus preferably includes a cutter for cutting the leg openings, and thereby creating the edges of the leg openings which correspond in registration with the lateral positions of the elastic, such that the elastic follows a path on the subassembly parallel to the leg openings across the transverse dimension of the garment subassembly to a locus at least adjacent the crotch.

Fifth, the invention comprehends a method of placing and securing an elastic thread between first and second layers of a continuous web in producing a series of garment-type assemblies or subassemblies, each garment-type assembly or subassembly having at least one opening. The method comprises the steps of feeding first and second webs comprising corresponding first and second layers of the garment-type assembly into a nip; applying adhesive on the second web ahead of the nip; supplying one or more threads of elastic for use at the nip and in contact with the adhesive; feeding the elastic to a lateral guide, disposed in a lateral position with respect to the second web within one inch of the nip and adjacent the second web, and thus receiving the elastic, and feeding the elastic to the nip between the first and second webs, and controlling the lateral position of the elastic as the thread enters the nip; and maintaining the lateral guide within two inch of the nip, and driving the lateral guide in a transverse direction across the width of the second web and thereby changing the lateral position of the lateral guide with respect to the web adjacent the nip, and thus causing the elastic to follow a path corresponding to an edge of the opening, in registration with advance of the respective ones of the series of garment-type assemblies or subassemblies.

The method preferably includes disposing the lateral guide within 0.5 inch of the nip, preferably directing the elastic onto the adhesive on the second web before the elastic enters the nip, and cutting the opening, and thereby creating the edge of the opening which corresponds in registration with the lateral positions of the elastic, such that once the opening is cut, the previously-incorporated elastic follows a path generally parallel to the opening across the transverse dimension of the garment-type assembly or subassembly.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be more fully understood and further advantages will become apparent when reference is made to the following detailed description of the invention and the drawings, in which:

FIG. 1 is a plan view of a garment subassembly relating to an garment of the invention.

FIG. 2 is a plan view of the garment subassembly of FIG. 1, including the secondary absorbent in the crotch.

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FIG. 3 is a cross section of the garment subassembly taken at 3-3 of FIG. 2.

FIG. 4 is a cross section of the garment subassembly taken at 4-4 of FIG. 2.

FIG. 5 is a perspective view of a disposable garment of the invention.

FIGS. 6 and 7 are enlarged cut-away views of a fragment of the subassembly of FIG. 1, showing detail of the cross-crotch elastics.

FIG. 8 is a side elevation view of an equipment layout for fabricating and otherwise processing the subassemblies of the invention.

FIGS. 9 and 10 are pictorial views of the nip area of the elevation shown in FIG. 8.

FIG. 11 is a plan view showing the relative transverse positioning of the front and back leg elastics along the advancing web while the outer cover layer and body side layer are being joined.

FIG. 12 is a plan view as in FIG. 10, showing an alternate pattern for the elastic threads.

FIG. 13 is a diagram illustrating the elastic guide movement required to obtain a given pattern in the final product for various guide to nip distances.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

The following detailed description is made in the context of an article including a disposable garment, and corresponding garment subassemblies, for holding a sanitary pad in place as a primary absorbent during use of the garment. It is readily apparent, however, that the garments made using the present invention can be employed with other disposable sanitary articles, such as feminine tampons, incontinent garments, diapers, training pants, and the like.

The garment subassembly 10 of FIG. 1 illustrates the preferred embodiment of the two-layer garment subassembly prior to incorporation of the secondary absorbent. The garment subassembly of FIG. 2 illustrates the preferred embodiment of the finished garment including all elements, but before the final steps of assembling the composite to form the garment structure. FIG. 5 shows the finally-assembled disposable garment structure. Referring to FIGS. 1-3, the garment subassembly 10 has an outer cover layer 12 generally defining the overall length "L1" and width "W1" of the subassembly, and at least one body side layer(s) 14 secured to the outer cover layer to cover adhesively applied components. The garment subassembly 10 generally includes a front body portion 16 terminating at a front waist portion 18 as a first edge of the subassembly, a back body portion 20 terminating at a back waist portion 22 as a second edge of the subassembly, and a crotch portion 24.

Advantageously, the body side layer 14 includes a front layer element 19 generally overlying and secured to the outer cover layer 12 on the front body portion 16, and a back layer element 21 generally overlying and secured to the outer cover layer 12 on the back body portion 20. A unsecured space 23 separates the front layer element 19 from the back layer element 21.

Referring to FIGS. 2 and 5, for assembling the subassembly of FIG. 2 to form a garment 25 as in FIG. 5, a first side edge 26 of front body portion 16 is assembled with a first side edge 28 of the back body portion 20 to form a first side seal 30. Similarly, a second side edge 32 of the front body portion 16 is assembled with a second side edge 34 of the back body portion 20 to form a second side seal 36. The

waist portions 18, 22 when assembled form a waist opening 38 for putting on and taking off the garment 25. The waist opening 38 is surrounded at least in part by a waist elastic 40. The waist elastic 40 is stretched and attached to the waist portions 18, 22 in the stretched state. The waist elastic 40 is released after attachment to produce waist folds or pleats 42 to allow expansion of the waist opening 38 so that the garment 25 can fit various sizes of people. Because users of this invention generally prefer a brief style garment, the front waist portion 18 preferably comes as high as the navel and is level around the wearer's waist. Having the garment at this height provides a snug fit. Alternative garment styles include bikini (e.g. regular leg cut or french leg cut) and hipster (e.g. regular leg cut or french leg cut).

Referring to FIGS. 1 and 3, the front body portion 16, the back body portion 20, and the crotch portion 24, in combination, form left and right leg openings 44 and 46, respectively, which are generally circular or oval in shape in the finally assembled garment 25. The leg openings 44 and 46 are formed by cutting away portions of the outer cover layer 12, and corresponding portions of any of body side layer 14. Each leg opening 44, 46 is surrounded at least in part by a back leg elastic 48, a front leg elastic 50, and a crotch elastic 51 between the back leg elastic and the front leg elastic. Each of the respective elastics 48, 50, 51 is adjacent the respective one of the edges 52 of the corresponding leg openings. The front and back leg elastics 48, 50 are secured between the outer cover layer 12 and the body side layer 14 by adhesive 53. The crotch elastics 51 are secured to outer cover layer 12 by adhesive 53. The elastics 48, 50, 51 are in the stretched state when secured to the outer cover layer 12. Accordingly, when the elastics, the outer cover layer and the body side layer are released after the elastics are secured to the outer cover layer, the elastics produce leg folds or pleats 54 at the edges of the leg openings 44, 46 to allow expansion of the leg openings 44, 46 to fit various sizes of legs. Between the front body portion and the back body portion in generally the crotch portion of the garment, an unsecured area is created. The unsecured area can be substantially unsecured or relatively unsecured in comparison to the attachment of the front and back portions to the first layer.

The front body portion 16 may be divided into a front upper portion 56 and a front lower portion 58. Similarly, the back body portion 20 may be divided into a back upper portion 60 and a back lower portion 62. The upper portions 56 and 60 are preferably designed to include body elastics 64 which readily stretch to allow the wearer to put on the garment 25 and then readily contract to resume the normal release state of the body elastics. This ensures a close or snug fit to different body sizes and forms. A number of body elastics 64 are positioned on both the front and the back portions 56, 60, respectively, at positions between the waist opening 38 and the leg openings 44, 46, so that the garment 25 has a good fit, particularly around the body.

The lower body portions 58, 62 generally do not require the spaced elastics as in the upper body portions 56, 60, although the elastics may be used.

The width of the crotch portion 24 between the left and right crotch elastics 51 should be wide enough to accommodate laying the primary absorbent 66 between the edges 52 without having the primary absorbent 66 obstruct the crotch elastics 51. This allows the crotch elastics 51 to contract and draw up the sides of the crotch about the primary absorbent, to thus accommodate the thickness of the primary absorbent 66, and to give surface area within the crotch portion 24 of the garment, adjacent edges 52, to contain leakage from the primary absorbent 66.

The width of the crotch portion 24 between the elastics 51 should not be so wide as to seem bulky or uncomfortable. A suitable width is at least about 2.75 inches (70 mm) between the crotch elastics. Width of crotch portion 24 is advantageous from about 3 inches (76 mm) to about 3.5 inches (89 mm). Preferably, the width is about 3 inches (76 mm).

Preferably, the crotch elastics 51 are from about 0.375 inch (10 mm) to about 0.625 inch (16 mm) wide. More preferably, the width is about 0.5 inch (13 mm). Preferably, ruffle material on the edge of the leg openings 44, 46 outside the leg elastics 48, 50 and crotch elastics 51 is less than about 0.25 (6 mm). More preferably, the ruffle material is less than about 0.125 inch (3 mm). It is most desirable to eliminate any ruffle material from the edges of the leg openings 44, 46, as illustrated in FIG. 3.

The overall width of the crotch portion 24 includes the width between the left and right crotch elastics 51, the width of the crotch elastics, and any ruffle material outside the crotch elastics to the edges 52 of the leg openings. Preferably, the overall width of the crotch portion 24 should be at least about 4 inches (102 mm).

FIG. 2 shows the garment subassembly 10 of FIG. 1 with a secondary absorbent 68 secured in the crotch portion 24, over the outer cover layer 12 and parts of the front and back layer elements 19, 21 of the body side layer 14. The width of the secondary absorbent 68 is sized in relation to the width of the crotch portion 24. Preferably, the width of the secondary absorbent 68 is at least the width of the crotch portion 24 between the crotch elastics 51. More preferably, the width of the secondary absorbent is equivalent to the overall width of the crotch portion 24.

The secondary absorbent 68 should have sufficient capacity to absorb any flow or seepage of body fluid around or through the primary absorbent 66. The secondary absorbent 68 should preferably have a capacity and thickness substantially less than that of the primary absorbent 66, thus providing a nonbulky and flexible fit. The secondary absorbent 68 should have a total capacity of about one-half the capacity of the primary absorbent 66. Preferably, the secondary absorbent 68 should have a total capacity of at least about 3 grams and not more than 6 grams. More preferably, the total capacity of the secondary absorbent 68 should be from about 4 grams to about 6 grams. However, the basis weight of, or the type of, the secondary absorbent 68 should be selected to provide resistance to flexibility of less than about 400 grams, as measured by INDA Standard Test method IST 90.3-92 Standard Test Method for Handle-O-Meter Stiffness of Nonwoven Fabrics.

The secondary absorbent has a low stiffness. The low stiffness allows the absorbent and its barrier to remain attached to the conformable outer cover layer 12 and the body side layer 14 which conform to a wide range of body sizes and shapes. Preferably, the secondary absorbent has a stiffness of less than 400 grams along any axis tested, more preferably less than 300 grams along any axis and less than 100 grams along the axis parallel to the waist opening. The secondary absorbent alone will have a stiffness of less than 250 grams and preferably less than 100 grams along any axis and more preferably less than 75 grams along the axis parallel to the waist opening.

The overall length of the secondary absorbent 68 should be adequate to extend beyond the ends of the primary absorbent 66, in order to be properly positioned to receive liquid which flows or seeps around the edges of the primary absorbent 66. This overall length is typically at least about 15 inches (382 mm) thus extending beyond the crotch

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portion 24 along the longitudinal centerline A—A of the subassembly 10. The length should be in the range of about 15 inches (382 mm) to about 19 inches (484 mm). Preferably, the length of the secondary absorbent 68 is about 17 inches (433 mm).

The width of the secondary absorbent 68 beyond the crotch portion 24 should be at least as wide as the width of the crotch portion 24. The width of the secondary absorbent 68 may be narrowed beyond the crotch portion 24 but may thus compromise the containment of liquid flowing or seeping from the primary absorbent. More preferably, the width outside the crotch portion is wider than in the crotch portion, and is from about 5 inches (127 mm) to about 12 inches (306 mm), alternatively from about 5.5 inches (140 mm) to about 7.5 inches (191 mm). Preferably, the width is about 6.5 inches (165 mm).

Referring to FIGS. 2, 3, and 4, the waist elastics 40, the body elastics 64, and the leg elastics 48, 50, are generally covered by the front and back layer elements 19, 21 of the body side layer 14.

Both outer cover layer 12 and body side layer 14 are compliant and soft feeling to the wearer. The following description of materials from which the outer cover layer 12 can be made applies equally to the material of the body side layer 14.

The outer cover layer 12 may be liquid pervious, permitting liquids to readily penetrate into its thickness, or impervious, resistant to the penetration of liquids into its thickness. Outer cover layer 12 may be made from a wide range of materials, such as natural fibers (e.g. wood or cotton fibers), synthetic fibers (e.g. polyester or polypropylene fibers) or from a combination of natural and synthetic fibers or reticulated foams and apertured plastic films. The outer cover layer 12 may be woven, nonwoven or film such as spunbonded, carded, or the like. A suitable outer cover layer 12 is carded, and thermally bonded by means well known to those skilled in the fabric art. Alternatively, the outer cover layer 12 is derived from a spunbonded web. In preferred embodiments, the outer cover layer is spunbonded polypropylene nonwoven with a wiseweave bond pattern having a grab tensile of 19 pounds as measured by ASTM D1682 and D1776, a Taber 40 cycle abrasion rating of 3.0 as measured by ASTM D1175 and Handle-O-Meter MD value of 6.6 grams and CD value of 4.4 grams using TAPPI method T402. Such spunbonded material is available from Kimberly-Clark Corporation, Roswell, Ga. The outer cover layer 12 has a weight of from about 0.3 oz. per square yard (osy) to about 2.0 osy, preferably about 0.7 osy.

The position and shape of the leg openings 44, 46 are important to avoid tightness in the crotch and groin area of the wearer, to obtain adequate buttocks coverage, and to prevent the garment 25 from tilting forward, e.g. tilting such that the front waist edge dips lower in relationship to the back waist edge. FIGS. 1 and 2 illustrate the most preferred design for leg fit and buttocks coverage. The shape of the curve across the top of the leg is important. If the curve is too deep, the garment 25 will shift downward and backward resulting in a short front waist, increased back length and bagginess in the seat of the garment. This would cause the garment 25 to appear tilted when worn as evidenced by an unevenness around the waist of the wearer.

Thus the majority of the edge 70 of the front portion of each leg opening 44, 46 is defined by a straight section 72 having a length "L2" at least about 70% of the length "L3" of the entire edge 70. The straight section 72 should form an angle with the centerline A—A of between about 75° and

about 100°, and most preferably about 90°. The essentially perpendicular angle formed between the centerline A—A and the front leg opening is measured using a line extending through the end points of the elastic sections.

With the garment subassembly 10 laid out flat as in FIG. 2, the majority of the edge 74 of the back portion of each leg opening is defined by a straight section 76 having a length "L4" at least about 70% of the length "L5" of the entire edge 74. The straight section 76 forms an acute angle with the longitudinal centerline A—A of the subassembly 10. More preferably, the straight section 76 of the edge 74 forms an acute angle α with the centerline A—A of the garment 25 of between about 30° and 65° and most preferably about 60°. The acute angle is measured using a line extending through the end points of the elastic sections.

The majority of the edge 78 of the crotch portion of each leg opening 44, 46 is defined by a straight section 80 having a length "L6." Preferably, the straight sections 80 are straight for at least about 70% of the entire lengths "L7" of the respective edges 78.

Referring to FIG. 1, each back leg edge portion 74 includes an arcuate section "A1" extending from one end 81 of the respective straight section 76 to a second end 82, thus connecting the respective back leg edge portion to the back end of edge 78 of the respective crotch portion.

Each front leg edge portion 70 includes an arcuate section "A2" extending from one end 84 of the respective straight section 72 to a second end 86 connecting the respective front leg edge portion 70 to the front end of edge 78 of the respective crotch portion.

The shape of the arcuate section "A2" at the inner groin area is important. If the arc is too shallow, tightness may be experienced at the inner groin area.

The preferred narrow crotch width reduces coverage of the buttocks. To compensate for such reduction, the arcuate section "A1" is preferably adjusted toward back waist portion 22, such that the end 82 of the arcuate section "A1" should be positioned slightly forward of centerline B—B as shown in FIGS. 1 and 2.

The waist, back leg, front leg and body elastics 40, 48, 50, 64 respectively are attached to the garment subassembly 10, generally between the outer cover layer 12 and the body side layer 14, using apparatus and processes described hereinafter.

Materials suitable for use as the elastics include a wide variety, but not limited to, of elastic threads, yarn rubber, flat rubber (e.g. as bands), elastic tape, film-type rubber, polyurethane, and, tape-like elastomer, or foam polyurethane or formed elastic scrim. Each elastic may be unitary, multipart, or composite in construction. Threads or ribbons, where used, may be multiple and may be applied as a composite. The elastomers used in the elastics may be latent and nonlatent.

Waist elastic 40 is typically about 0.5 inch (13 mm) wide. The elastic may comprise threads, ribbons, a film, or composite. The threads or ribbons may be multiple and may be applied as a composite. Preferably, the waist elastic is threads, more preferably four threads are used as the elastic and the threads are spaced about 0.17 inch (4.3 mm) apart. The threads may be made of any suitable elastomeric material. One suitable material is spandex such as Lycra® threads available from Dupont located in Wilmington, Del. Preferably, suitable waist elastics include threads having a total denier (g/1000 m) of about 3760 for 0.5 inch (13 mm) wide elastic. The denier may vary for each element of elastics. Adhesive 55 is used to bond the elastic between the

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outer cover layer 12 and the body side layer 14. A suitable adhesive includes, for example, Findley H2096 hot melt adhesive, available from Findley Adhesives, Milwaukee, Wis.

The leg elastics 48, 50, and crotch elastic 51, including multiple threads in each, are typically about 0.5 inch (13 mm) wide. The elastic may comprise threads, ribbons, a film or composite. The threads, ribbons, etc., may be multiple and may be applied as a composite. The front leg elastics and the crotch elastics may be threads, preferably numbering three threads which are spaced about 0.05 to about 0.50 inch, preferably about 0.10 to about 0.20, more preferably about 0.17 inch (4.3 mm) apart. Back leg elastics numbering up to six threads may have a width of about 0.75 inch (19 mm) and a thread spacing of about 0.05 to about 0.75 inch, preferably about 0.10 to about 0.20, more preferably of about 0.15 inch (3.8 mm) apart. The threads may be made of any suitable elastomeric material. One suitable material is spandex such as Lycra® threads available from Dupont, Wilmington, Del. Preferably, suitable leg elastics include threads having a total decitex (g/1000 m) of about 3760 for a 0.5 inch (13 mm) wide elastic. The decitex may vary for each element of elastics. Adhesive 55 is used to bond the several elastics 48, 50 to the outer cover layer 12, the body side layer 14, and the support sheet 53.

To provide a snug leg fit and to draw up the sides of the crotch portion 24 to a cradle to receive the primary absorbent, the leg elastics 48, 50, and the crotch elastics 51, are elongated when applied to the layers 12 and 14 respectively. Preferably, the leg elastics 48, 50 are applied in multiple segments, with the amount of elongation of each segment while being incorporated into the subassembly 10 being determined according to the position to be occupied by the respective segment. In the case of only front and back leg elastics, the front leg elastics are advantageously elongated less than the back elastics. In the case of front elastics, back elastics, and crotch elastics, the front and crotch elastics are preferably elongated less than the back elastics. Preferably, the elongation of front and crotch elastics are minimal up to between about 100% to about 300%, preferably depending on the decitex of the elastic threads used to about 150% and the elongation of back elastics along the leg openings are minimal to between about 100% to about 300% and preferably depending on the decitex of the elastic threads used to about 250%. The elongations may vary for separate elements and still be within the overall elongation for the composite of elastic elements. The differing tensions allow easier attachment of the primary absorbent pad 66, less tightness in the groin area, and less bunching of the crotch portion 24 caused by high leg elastic retraction. The back leg elastic is under higher elongation to help keep the seat of the garment from creeping up with movement during use. In certain cases, the elongation of the front and back elastics may be minimal when the outer layer is elastic and the front and back elastics are dimensioned to be that of the minimum size of the wearer.

Referring now to FIGS. 1, 6, and 7, the suggested six (back) and three (front) threads of elastic on the respective back and front leg elastics 48 and 50 are each represented as single element of elastic. The following description of the characteristics and use of the single threads applies to the usual multiple threads suggested above.

The composite of the elastics extending about each of the leg openings 44 and 46 comprises a portion of the back leg elastics 48, a portion of the front leg elastics 50, and one of the left and right crotch elastics 51. Referring specifically to FIGS. 1, 6, and 7, the back leg elastic 48 extends, as a first

section 48A, from a first locus 92 at or adjacent the edge 28 of the subassembly, width-wise across the subassembly at a substantially consistent acute angle α with the centerline A—A that takes it toward a first edge of the subassembly at front waist portion 18, and generally following the back edge 74 of the leg opening 46 along the straight section 76A and onto the first arcuate section "A1" toward the crotch portion 24, generally terminating in the first arcuate section "A1," at or near the crotch portion 24. Back leg elastic 48 extends, as a second section 48B, from the first arcuate section "A1" across the crotch portion to the second arcuate section "A1." From the second arcuate section "A1," the back leg elastic 48 extends, as a third section 48C, at an acute angle α with the centerline A—A away from the front waist portion 18, and generally following the back edge 74 of the leg opening 44 along the straight section 76B to a second locus 94 at or adjacent edge 34.

In the flat configuration shown for the subassembly in FIGS. 1, 6, and 7, sections 48A and 48C are elongated to between about 100% to about 300%, preferably depending on the decitex of the elastic threads used about 250%, while section 48B is substantially relaxed, and under no substantial elongation. Preferably, section 48B includes a modest amount of slack in the elastic.

The front leg elastic 50 extends, as a first section 50A, from a third locus 96 at or adjacent the side edge 26 of the subassembly width-wise across the subassembly and generally following the front leg edge portion 70 along its longitudinal straight section 72A, and onto the first arcuate section "A2" toward the crotch portion 24, generally terminating in the first arcuate section "A2," at or near the crotch portion 24. Front leg elastic 50 extends, as a second section 50B, from the first arcuate section "A2" across the crotch portion to the second arcuate section "A2." From the second arcuate section "A2," the front leg elastic 50 extends, as a third section 50C, width-wise across the subassembly and generally following the front leg edge portion 70 along its longitudinal straight section 72B to a fourth locus 98 at or adjacent side edge 32. In the flat configuration shown for the subassembly in FIGS. 1, 6, and 7, sections 50A and 50C are elongated to between about 100% to about 300%, preferably depending on the decitex of the elastic threads used about 150%, while section 50B is substantially relaxed, and under no substantial elongation. Preferably, section 50B includes a modest amount of slack in the elastic.

Thus, in the embodiment seen in FIG. 1, the front and rear leg elastics extend across the width W1 of the subassembly 10 as one or more continuous threads.

The crotch elastics 51 extend generally between the back and front leg elastics 48 and 50, with respective ends of the crotch elastics generally being disposed at or near the arcuate sections "A1" and "A2." Accordingly, the properties of the elastics about each leg opening result from the combined contributions of the respective back leg section (e.g. 48A), the respective front leg section (e.g. 50A), and the respective crotch elastic 51.

The reason for providing leg elastics in multiple sections is at least two-fold. First, using multiple sections of elastics facilitates placing of the elastics on the outer cover layer 12 while maintaining advantageous production speeds. As suggested in FIGS. 1, 8, and 9, the subassembly of e.g. FIG. 1 is made as a sequence of such subassemblies in a continuous web 100, with the width "W1" of the subassembly disposed in the "with machine" direction of the processing apparatus. In such arrangement, the front and back waist elastics 40, the front and back body elastics 64, and the front and back leg

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elastics 48, 50 can all be assembled into the subassembly by appropriate continuous feeding of respective continuous threads of elastics into the processing apparatus in the "with machine" direction while the web 100 continuously advances in the "with machine" direction at a constant speed.

Given the orientation of the crotch elastics at essentially 90° to the direction of advance of the web 100, placing the crotch elastics as a portion of a continuous element of either the front or back leg elastics would suggest either (1) momentarily and regularly stopping the advance of the web 100 while the crotch elastic is fed into place, or (2) severely slowing the web 100 and severely driving an elastics guide, in a direction transverse to the web in order to apply the crotch elastic while the web was thus slowed. In either scenario, severe stresses would be placed on the respective drive apparatus, as well as on the web. The invention contemplates, rather, that the crotch elastics are optionally placed in the subassembly 10 as a separate operation placing separate elastics segments, where the crotch elastics segments are first elongated and oriented transverse to the web 100, and are then placed on the web as the web passes the appropriate operating station (not shown) subsequent to placing the leg, body and waist elastics in the subassembly, though the sequence of placing the elastics is not critical.

Referring now to FIGS. 8-11, a first continuous web, which ultimately becomes cover layer 12, is presented against the assembly roll 102 by turning roll 104. A second continuous web, which ultimately becomes body side layer 14, passes under adhesive applicator 106 and over turning rolls 108 and 110, and is pressed against the assembly roll 102 by turning roll 110. Elastic threads 112 are fed from a continuous supply 114 of elastic thread, through feed nip 116, through thread guides 118 and sets of guide fingers 120A and 120B, and between cover layer 12 and body side layer 14 at the nip formed by assembly roll 102 and turning roll 110.

Referring especially to FIGS. 9 and 10, thread guides 118 and corresponding sets of guide fingers 120A and 120B are elements of lateral guides 122A and 122B respectively. Each of the lateral guides 122A and 122B is mounted on a transverse slide bar 124 for sliding transverse to the with machine direction of travel of the webs. Each lateral guide 122 is connected to a transverse drive mechanism 126 including linkage arms 128 and 130, vertical drive shaft 132, and a cam follower (not shown). The cam followers follow the corresponding cams inside the respective cam housings. The cams are linked to the machine drive shaft 140 by drive belt 142. Thus, the cams, and correspondingly the thread guides and the sets of guide fingers, move transversely with respect to the with machine direction of the webs as the drive shaft turns. The end result is that rotation of the processing line drive shaft 140 effects transverse motion of the thread guides and the sets of guide fingers, as indicated by the arrows 117 in FIG. 10, in cooperation with the design of the cams and cam followers.

Referring to FIG. 8, the guide fingers 120 are positioned close to the nip 144 so that they closely control the transverse positions of the elastics with respect to the webs 12 and 14 as the webs 12 and 14 enter the nip 144 and correspondingly trap the elastics between them, fixing the position of the elastics between them by means of adhesive 55 as shown in FIG. 3. Accordingly, the guide fingers 120 are preferably physically positioned, and provide guidance to the threads of elastic, within two inch of the nip 144. To the extent the fingers can be placed closer to the nip 144, they provide more positive guidance to the elastic. By

careful design of the guide fingers 120, and by careful control of the positioning of the guide fingers 120 with respect to nip 144, the guide fingers 120 can be advantageously positioned within two inches, advantageously within 0.75 inch of the line of contact defined at the nip between roll 102 and 110. Additionally, body elastics 64 and waist elastics 40 can be incorporated at nip 144 in the conventional manner of providing stationary feeds and guides at the nip.

The limitation on how close the guide fingers 120 can be placed to the nip is controlled by the ability to design fingers which can affirmatively guide the threads of elastic while avoiding having the fingers themselves drawn into the nip. The criticality of urging the fingers as ultimately close as possible to the nip can be attenuated by directing the threads 112 onto the adhesive-coated layer 14 ahead of nip 144, preferably instantaneously ahead of the nip 144, as suggested by the depiction in FIG. 8. By directing the threads of elastic onto layer 14 ahead of the nip, the open distance spanned by the threads between the fingers 120 and the adhesive-coated layer 14 is minimized, being held to less than 0.5 inch, for example 0.25-0.375 inch (6 mm to 10 mm).

The transverse movement of the lateral guides 122, and thus fingers 120, as the webs advance along the processing line, creates transverse positioning of the elastics threads 112 with respect to the with machine direction of the advancing webs 12 and 14. FIG. 11 shows the pattern of transverse movement of the sets of guide fingers 120A and 120B relative to the movement of the web in the with machine direction, along the processing line. In FIG. 11, the sets of fingers 120A and 120B are depicted at several locations along the front and back edges of the leg openings 44, 46, to indicate that it is the positioning of the sets of fingers 120A and 120B, and the dynamic changing of that positioning by the drive mechanism 126, that determines the instantaneous transverse location of the elastics in the web at any point and time while the elastics are being placed in the web at nip 144 as shown in FIGS. 8-11. Comparing FIGS. 1, 10, and 11, it is seen that the set of fingers 120A generally places the threads of the back leg elastics generally parallel to each other in the web, while the set of fingers 120B generally places the threads of the front leg elastics generally parallel to each other in the web, both along their respective portions of the designed paths defining the front 70 and back 74 edges of the leg openings 44 and 46.

FIG. 13 is a diagram of the transverse movement required of guide 122, in order to produce a given elastic thread pattern, given three different guide to nip distances. FIG. 13 illustrates that because of the gap between the elastic guide and the nip, the elastic guide movement never matches the required elastic pattern. The curves B, C, and D show that for a given elastic pattern, the guide movement amplitude and rates of change increase and become progressively more tortuous as the distance from the guide to the nip increases. Large, abrupt changes in guide movement cause shock and vibration and thus are deleterious to machinery. Therefore, it is advantageous to keep the guide as close to the nip as possible.

The threads of elastic deviate slightly from their parallel relationships with each other as the elastic threads traverse paths that deviate from the with machine direction, the distance between the threads 90 being generally constant as they emerge from the fingers 120. Such deviations from the parallel, resulting from the cross machine transverse of the elastics, are included herein within the phrase "generally parallel" as respects the relationships of the threads of elastic to each other.

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It will be understood that FIG. 11 represents only one garment in the continuous sequence of garment subassemblies 10 contained in the web 100 passing through nip 144. It will also be understood that the web passing through the nip 144 is further acted upon at cutter 146 as shown in FIG. 8 to cut away material from the web 100 in creating the leg openings 44 and 46.

In general, then, webs 12 and 14 are provided as substantially endless rolls from unwind stands (not shown). Web 14 is typically provided as front and back layer elements 19 and 21. Space 23 separates the elements 19 and 21, and generally corresponds with the central area of the crotch portion and the portion of the web 12 which is cut out to form leg openings 44 and 46. Adhesive 35 is applied to the front and back elements 19 and 21 of web 14 by adhesive applicator 106. Webs 12 and 14 are joined adhesively, with elastic threads being interposed between webs 12 and 14 at nip 144, and with space 23 interposed between the front and back elements 19, 21 of the body side layer 14. The transverse positions of the elastics change according to a pre-set path of transverse movements, driven by the drive shaft 140 which drives and times the several operations along the processing line. The threads of elastic 112, as placed by the guide fingers 120, traverse respective paths that ultimately follow the front and back edges of the leg openings 44 and 46, as defined at cutter 146, in registration with the advance of the web, and accordingly, with the advance of the series of garment subassemblies 10 being defined in the web at nip 144 and cutter 146. The portions of the threads of elastic located along the front and back edges of the leg openings are stretched. The portions traversing the crotch portion are substantially relaxed. The crotch portions of the elastic are separately placed in the subassembly 10 at a later processing station, preferably downstream from the cutter 146.

A second embodiment of the subassembly is illustrated in FIG. 12. In the second embodiment, the front edge 148 of back layer element 21 is disposed rearwardly of that same edge 148 as depicted in the embodiment of FIG. 11, while the guide fingers 120A traverse the same path as in FIG. 11. Accordingly, as the threads of elastic 112 extend across the crotch portion 24, the threads 112 are guided forwardly of edge 148, into unsecured space 23, and are thus not held between the layers 12 and 14, and are not controlled by the adhesive on layer 14. Rather, the tension is maintained on the threads of elastic 112 across the crotch portion 24, such that the threads retract along the edge 148 of the layer element 21 in a configuration that loosely resembles a rope under tension. The rope or the at least one elastic strand of the rope is subsequently cut such that the cut portions of the threads retract to positions generally defined by the intersection of the edge 148 of the back layer element and the path of the threads adhesively held between layer and the back layer element. Thus, the at least one cut threads 112 generally include loose intermediate ends 150 after being cut, as shown in FIG. 7.

The front layer element 19 is applied along the back edge 178 of the leg opening in a manner similar to the application of the back layer element 21.

Having thus described the invention in full detail, it will be readily apparent that various changes and modifications may be made without departing from the spirit of the invention. All such changes and modifications are contemplated as being within the scope of the present invention, as defined by the following claims.

What is claimed is:

1. A garment blank subassembly having a front body portion, a back body portion, and a crotch intermediate of

and extending from the front body portion to the back body portion and between a pair of leg openings in a garment to be assembled from the garment blank subassembly, the front body portion having first and second front leg edge portions along the leg openings, a front end opposite the first and second front leg edge portions and first and second front sides, the back body portion having first and second back leg edge portions along the leg openings, a back end opposite the first and second back leg edge portions and first and second back sides, the crotch having first and second crotch edge portions on opposing sides thereof along the leg openings, the garment blank subassembly having a length extending between the front and back ends, width extending between the first and second sides and a longitudinal centerline between the first and second front and back sides, each of the first and second back leg edge portions having an angular portion extending generally along a line forming an acute angle with the longitudinal centerline, the garment blank subassembly, when laid out flat, comprising:

(a) a first layer, extending from the first end through the crotch to the second end;

(b) a first elastic attached to the first layer, and extending from a first locus adjacent the first back side, as a first section of the first elastic, along the width of the garment blank subassembly, toward the front end at an acute angle with the longitudinal centerline and generally following the first back leg edge portion toward the crotch, as a second section of the first elastic across the crotch, and as a third section of the first elastic away from the first end at an acute angle with the longitudinal centerline and generally following the second back leg edge portion, to a second locus adjacent the second back side, wherein the first and third sections of the first elastic are stretched and the second section of the first elastic being substantially relaxed when the garment blank subassembly is laid out flat.

2. A garment blank subassembly as in claim 1, including a second elastic extending from a third locus adjacent the first front side, as a first section of the second elastic, along the width of the garment blank subassembly and generally following the first front leg edge toward the crotch at an angle essentially perpendicular to longitudinal centerline, as a second section of second elastic across the crotch, and as a third section of the second elastic along and generally following the second front leg edge portion at an angle essentially perpendicular to longitudinal centerline to a fourth locus adjacent the second front side, the second section of the second elastic being substantially relaxed when the garment blank subassembly is laid out flat.

3. A garment blank subassembly as in claim 2, the first and third sections of the second elastic being stretched when the garment blank subassembly is laid out flat.

4. A garment blank subassembly as in claim 3, comprising additionally a second layer, the first and third sections of the first elastic being attached to at least one of the first and second layers.

5. A garment blank subassembly as in claim 4, the second layer comprising a body side liner having a front layer element attached to the front portion of the first layer, and a back layer element attached to the back portion of the first layer, and including an unsecured space between the front layer element and the back layer element.

6. A garment blank subassembly as in claim 5, the second section of the first elastic being disposed in the unsecured space.

7. A garment blank subassembly as in claim 4, including a third elastic attached to at least one of the first and second

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layers along the first crotch edge portion and a fourth elastic attached to at least one of the first and second layers along the second crotch edge portion.

8. A garment blank subassembly as in claim 7, wherein the third and fourth elastics are stretched when the garment blank subassembly is laid out flat.

9. A garment blank subassembly as in claim 8,

(a) the first and third sections of the first elastic comprises additionally first arcuate portions, each arcuate portion having a first end connecting at the end of the respective first angular portion and a second end connecting the respective back leg edge portion to the respective first and second crotch edge portions, and wherein the second section of the first elastic extends across the crotch between the second ends of the first arcuate portions

(b) the first and third sections of the second elastic comprises additionally second arcuate portions, each arcuate portion having a first end connecting at the end of the respective first essentially perpendicular portion and a second end connecting the respective front leg edge portion to the respective first and second crotch edge portions, and wherein the second section of the second elastic extends across the crotch between the second ends of the second arcuate portions.

10. A garment blank subassembly as in claim 9, the second sections of the first and second elastic being severed in at least one location.

11. A garment blank subassembly as in claim 1, the first and third sections of the first elastic comprises additionally arcuate portions, each arcuate portion having a first end connecting at the end of the respective first angular portion and a second end connecting the respective back leg edge portion to the respective first and second crotch edge portions, and wherein the second section of the first elastic extends across the crotch between the second ends of the first arcuate portions.

12. A garment blank subassembly as in claim 11, the second section of the first elastic being severed in at least one location.

13. A garment blank subassembly as in claim 1, including a second elastic extending from a third locus adjacent the first front side, as a first section of the second elastic, along the width of the garment blank subassembly and generally following the first front leg edge toward the crotch, as a second section of second elastic across the crotch, and as a third section of the second elastic along and generally following the second front leg edge portion to a fourth locus adjacent the second front side.

14. A garment blank subassembly as in claim 13, the second sections of the first and second elastics being severed in at least one location.

15. A garment blank subassembly as in claim 4, wherein the second section of the first elastic being attached to at least one of the first and second layers.

16. A garment blank subassembly having a front body portion, a back body portion, and a crotch intermediate of and extending from the front body portion to the back body portion and between a pair of leg openings in a garment to be assembled from the garment blank subassembly, the front body portion having first and second front leg edge portions along the leg openings, a front and opposite the first and second front leg edge portions and first and second front sides, the back body portion having first and second back leg edge portions along the leg openings, a back and opposite the first and second back leg edge portions and first and second back sides, the crotch having first and second crotch

edge portions on opposing sides thereof along the leg openings, the garment blank subassembly having a length extending between the front and back ends, width extending between the first and second sides and a longitudinal centerline between the first and second front and back sides, each of the first and second back leg edge portions having an angular portion extending generally along a line forming an acute angle with the longitudinal centerline, the garment blank subassembly, when laid out flat, comprising:

(a) a first layer, extending from the first end through the crotch to the second end;

(b) a first elastic extending from a first locus adjacent the first front side, as a first section of the first elastic, along the width of the garment blank subassembly and generally following the first front leg edge toward the crotch at an angle essentially perpendicular to longitudinal centerline, as a second section of first elastic across the crotch, and as a third section of the first elastic along and generally following the second front leg edge portion at an angle essentially perpendicular to longitudinal centerline to a second locus adjacent the second front side, wherein the first and third sections of the first elastic are stretched when the garment blank subassembly is laid out flat and the second section of the first elastic is substantially relaxed when the garment blank subassembly is laid out flat.

17. A garment blank subassembly as in claim 16, comprising additionally a second layer, the first and third sections of the first elastic being attached to at least one of the first and second layers.

18. A garment blank subassembly as in claim 17, the second layer comprising a body side liner having a front layer element attached to the front portion of the first layer, and a back layer element attached to the back portion of the first layer, and including an unsecured space between the front layer element and the back layer element.

19. A garment blank subassembly as in claim 18, the second section of the first elastic being disposed in the unsecured space.

20. A garment blank subassembly as in claim 17, including a third elastic attached to at least one of the first and second layers along the first crotch edge portion and a fourth elastic attached to at least one of the first and second layers along the second crotch edge portion.

21. A garment blank subassembly as in claim 20, wherein the third and fourth elastics are stretched when the garment blank subassembly is laid out flat.

22. A garment blank subassembly as in claim 21, the first and third sections of the first elastic comprises additionally first arcuate portions, each arcuate portion having a first end connecting at the end of the respective first essentially perpendicular portion and a second end connecting the respective front leg edge portion to the respective first and second crotch edge portions, and wherein the second section of the first elastic extends across the crotch between the second ends of the first arcuate portions.

23. A garment blank subassembly as in claim 22, the second section of the first elastic being severed in at least one location.

24. A garment blank subassembly as in claim 16, the first and third sections of the first elastic comprises additionally first arcuate portions, each arcuate portion having a first end connecting at the end of the respective first essentially perpendicular portion and a second end connecting the respective front leg edge portion to the respective first and second crotch edge portions, and wherein the second section of the first elastic extends across the crotch between the second ends of the first arcuate portions.

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25. A garment blank subassembly as in claim 24, the second section of the first elastic being severed in at least one location.

26. A garment blank subassembly as in claim 16, the second section of the first elastic being severed in at least one location.

27. A garment blank subassembly having a front body portion, a back body portion, and a crotch intermediate of and extending from the front body portion to the back body portion and between a pair of leg openings in a garment to be assembled from the garment blank subassembly, the front body portion having first and second front leg edge portions along the leg openings, a front end opposite the first and second front leg edge portions and first and second front sides, the back body portion having first and second back leg edge portions along the leg openings, a back end opposite the first and second back leg edge portions and first and second back sides, the crotch having first and second crotch edge portions on opposing sides thereof along the leg openings, the garment blank subassembly having a length extending between the front and back ends, width extending between the first and second sides and a longitudinal centerline between the first and second front and back sides, each of the first and second back leg edge portions having an angular portion extending generally along a line forming an acute angle with the longitudinal centerline, the garment blank subassembly, when laid out flat, comprising:

(a) a first layer, extending from the first end through the crotch to the second end;

(b) a first elastic attached to the first layer, and extending from a first locus adjacent the first back side, as a first section of the first elastic, along the width of the garment blank subassembly, toward the front end at an acute angle with the longitudinal centerline and generally following the first back leg edge portion toward the crotch, as a second section of the first elastic across the crotch, and as a third section of the first elastic along and generally following the second front leg edge portion at an angle essentially perpendicular to longitudinal centerline to a second locus adjacent the second front side, the second section of the first elastic being substantially relaxed when the garment blank subassembly is laid out flat;

(c) a second elastic extending from a third locus adjacent the first front side, as a first section of the second elastic, along the width of the garment blank subassembly and generally following the first front leg edge portion toward the crotch at an angle essentially perpendicular to longitudinal centerline, as a second section of second elastic across the crotch, and as a third section of the second elastic away from the first end at an acute angle with the longitudinal centerline and generally following the second back leg edge portion, to a fourth locus adjacent the second back side, the second section of the second elastic being substantially relaxed when the garment blank subassembly is laid out flat and wherein the first and third sections of the first elastic and the first and third sections of the second elastic are stretched when the garment blank subassembly is laid out flat.

28. A garment blank subassembly as in claim 27, comprising additionally a second layer, the first and third sections of the first elastic being attached to at least one of the first and second layers.

29. A garment blank subassembly as in claim 28, the second layer comprising a body side liner having a front layer element attached to the front portion of the first layer, and a back layer element attached to the back portion of the first layer, and including an unsecured space between the front layer element and the back layer element.

30. A garment blank subassembly as in claim 29, the second section of the first elastic being disposed in the unsecured space.

31. A garment blank subassembly as in claim 30, including a third elastic attached to at least one of the first and second layers along the first crotch edge portion and a fourth elastic attached to at least one of the first and second layers along the second crotch edge portion.

32. A garment blank subassembly as in claim 31, wherein the third and fourth elastics are stretched when the garment blank subassembly is laid out flat.

33. A garment blank subassembly as in claim 27.

(a) the first section of the first elastic comprising additionally a first arcuate portion having a first end connecting at the end of the first angular portion and a second end connecting the back leg edge portion to the first crotch edge portion

(b) the third section of the first elastic comprising additionally a second arcuate portion having a first end connecting at the end of the second essentially perpendicular angle portion and a second end connecting the front leg edge portion to the second crotch edge portion, and wherein the second section of the first elastic extends across the crotch between the second end of the first arcuate portion and the second end of the second arcuate portion;

(c) the first section of the second elastic comprising additionally a third arcuate portion having a first end connecting at the end of the second angular portion and a second end connecting the back leg edge portion to the second crotch edge portion

(d) the third section of the second elastic comprising additionally a fourth arcuate portion having a first end connecting at the end of the first essentially perpendicular angle portion and a second end connecting the front leg edge portion to the first crotch edge portion, and wherein the second section of the first elastic extends across the crotch between the second end of the third arcuate portion and the second end of the fourth arcuate portion.

34. A garment blank subassembly as in claim 27, the second sections of the first and second elastics being severed in at least one location.

35. A garment blank subassembly as in claim 28, including a third elastic attached to at least one of the first and second layers along the first crotch edge portion and a fourth elastic attached to at least one of the first and second layers along the second crotch edge portion.

36. A garment blank subassembly as in claim 35, wherein the third and fourth elastics are stretched when the garment blank subassembly is laid out flat.

37. A garment blank subassembly as in claim 28, the second section of the first elastic being attached to at least one of the first and second layers and wherein the second section of the second elastic being attached to at least one of the first and second layers.

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SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

RADICACIÓN: 0-75409

EDICTO No. 2819

**LA SECRETARÍA GENERAL AD-HOC
HACE SABER:**

Que esta Superintendencia profirió Resolución No. 1889 de 31-ENE-2006. Que el contenido de la parte resolutive es como sigue: El Superintendente de Industria y Comercio.

RESUELVE

ARTICULO PRIMERO: Negar el privilegio de patente de invención para la solicitud correspondiente a "ARTICULO ABSORBENTE QUE EXHIBE MEJORADO AJUSTE AL CUERPO".

ARTICULO SEGUNDO: Notificar personalmente el contenido de la presente resolución al doctor Ramiro Castro Duque, o a quien haga sus veces, en su calidad de apoderado de Kimberly - Clark Worldwide, Inc., entregándole copia de la misma, advirtiéndole que contra ella procede el recurso de reposición interpuesto ante el Superintendente de Industria y Comercio, al momento de la notificación o dentro de los 5 días hábiles siguientes a ella.

NOTIFÍQUESE Y CUMPLASE

Dada en Bogotá, D.C., a los **31** DE **ENE** 2006

EL SUPERINTENDENTE DE INDUSTRIA Y COMERCIO,


JAIME RUBIO ESCOBAR

Para notificar a los interesados, se fija el presente EDICTO en lugar visible al público en la SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO, por el término de (10) diez días hábiles contados a partir de las 8:30 a.m. de hoy.

Secretaría General Ad-Hoc 21-FEB-2006  Este edicto se desflja hoy 06-MAR-2006 a las cinco (5:00 p.m.) 
Secretaría General Ad-Hoc
EDICTO No. 2819