121
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Javier Serna Barbosa
Ma. Amalia Serna Forero
Abogados

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
No. 06-112297- -00005-0000
Fecha: 2008-02-13 15:45:06 Dep. 2020 NUECREACIONE
Tra. 2 PATENTES Eve: 1 REGDEPOSITO
Act 538 PETICION Folios: 2

Señores
SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
SUPERINTENDENTE DELEGADO
PARA LA PROTECCION AL CONSUMIDOR
E. S. D.

EXPEDIENTE	**06-112297**
ASUNTO	**Solicitud de Patente de Invención**
TITULO	**"Proceso de terminado de borde de operaciones....."**
SOLICITANTE	**CONFECCIONES LEONISA S.A.**

JAVIER SERNA BARBOSA en mi condición de Apoderado de la sociedad **CONFECCIONES LEONISA S.A.** de conformidad con el poder protocolizado bajo el número 10012 que obra en esa entidad, me permito anexar en tiempo, el recibo de pago correspondiente al pago de los derechos por concepto de examen de patentabilidad de la solicitud de la referencia.

Con todo respeto,

JAVIER SERNA BARBOSA
C.C. 35.509.662
T.P.A 436 C.S.J.
Protocolo 10012

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103

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
No. 08-112297--00005-0000
Fecha: 2008-02-13 16:45:06 Dep: 2020 NUECREACIONE
TP: 2 PATENTES Eve: 1 REGDEPOSITO
Act: 536 PETICION Folios: 2

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

NIT : 800176089-2

RECIBO OFICIAL DE CAJA : 08 - 12,085
FECHA : FEBRERO 13 DE 2008

***** C O N S I G N A C I O N *****

DEPOSITANTE	TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PGO	Vr. PAGO
AMALIA SERNA	CONSIGNACION	BANCO DE BOGOTA	062754387	1919595	13/02/2008	4,534,000.00

***** C O N C E P T O *****

CANT.	RENTISTICO	CONCEPTO	TOTAL CONCEPTO
1	50005-01-01 SOLICITUDES	85 EXAMEN DE PATENTABILIDAD DE INVEN	420,000.00
		TOTAL : $	420,000.00

SON: CUATROCIENTOS VEINTE MIL PESOS

RESPONSABLE : _____

RECIBO DE CAJA APLICADO AL EXPEDIENTE No._____

Industria y Comercio
SUPERINTENDENCIA

124

2020
Bogotá, D.C.,

Doctor:
Javier Serna Barbosa
Apoderado

Oficio N°: 2671

ASUNTO:		
	Radicación Nº	06-112297
	Trámite	002
	Evento	001
	Actuación	440
	Folios	011

Con fundamento en lo previsto por el artículo 43 de la Decisión 486 de la Comisión de la Comunidad Andina, se le comunica que la oposición presentada por la doctora Clara Inés Álvarez Giraldo, en su calidad de apoderada de la sociedad C.I. Ellipse S.A., reúne los requisitos formales exigidos por la ley al momento de su presentación.

En cumplimiento de lo dispuesto en la citada norma, se le concede el término de sesenta (60) días hábiles siguientes a la fecha de notificación del presente oficio, para que haga valer sus argumentaciones y presente pruebas.

Notifíquese el presente oficio conforme a lo dispuesto en el numeral 5.2, literal e), del capítulo quinto del título primero de la Circular Única Nº 10 de 2001.

ALIX CARMENZA CESPEDES DE VERGEL
Jefe de la División de Nuevas Creaciones.

Retiro OI
12/03/08

El anterior oficio fue notificado por fijación en lista de fecha, 21 FEB 2008.

202021

Sede Centro: Carrera 13 No. 27-00 Pisos 2, 5, 7 y 10
Sede CAN: Tr. 40A No. 38-50 Conmutador: 3820840
Fax: 382 26 95. Línea 9800-910 165
Web: www.sic.gov.co e-mail: info@sic.gov.co
Bogotá D.C. - Colombia

Industria y Comercio
SUPERINTENDENCIA

125

2020
Bogotá, D.C.,

Doctor:
Javier Serna Barbosa
Apoderado

Oficio N°: 2672

ASUNTO:

Radicación Nº	06-112297
Trámite	002
Evento	001
Actuación	440
Folios	064

Con fundamento en lo previsto por el artículo 43 de la Decisión 486 de la Comisión de la Comunidad Andina, se le comunica que la oposición presentada por el doctor Mauricio Patiño Bonnet, en su calidad de apoderado de las sociedades C.I. Formas Intimas S.A., Compañía Internacional de Soluciones Creativas S.A. – Inscra S.A., Industrias Morarbe Ltda., y Comercializadora Internacional Tesco., reúne los requisitos formales exigidos por la ley al momento de su presentación.

En cumplimiento de lo dispuesto en la citada norma, se le concede el término de sesenta (60) días hábiles siguientes a la fecha de notificación del presente oficio, para que haga valer sus argumentaciones y presente pruebas.

Notifíquese el presente oficio conforme a lo dispuesto en el numeral 5.2, literal e), del capítulo quinto del título primero de la Circular Única Nº 10 de 2001.

Mehr Obren
M Mercedes Lopez T
21/02/08

ALIX CARMENZA CESPEDES DE VERGEL
Jefe de la División de Nuevas Creaciones.

El anterior oficio fue notificado por fijación en lista de fecha, 21 FEB. 2008.

202021

Sede Centro: Carrera 13 No. 27-00 Pisos 2, 5, 7 y 10
Sede CAN: Tr. 40A No. 38-50 Conmutador: 3820840
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Bogotá D.C. - Colombia

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SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
DIVISIÓN DE NUEVAS CREACIONES

2020
Bogotá, D. C., 13 de mayo de 2010

Doctor
Javier Serna Barbosa
Representante **Confecciones Leonisa S. A.**

ASUNTO		
	Radicación	**06-112297**
	Trámite	002
	Evento	001
	Actuación	430
	Oficio	№ 06610
	Folios	**048**

Patente de Invención	[X]	Patente de Modelo de Utilidad		[ ]	
Vía Nacional	[X]				
Vía PCT (fase nacional)	[ ]	Cap. I	[ ]	Cap. II	[ ]

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

1.1. Descripción: Folios: 4 a 11 tal como se radicó inicialmente

1.2. Reivindicaciones: Folios 12 a 13 tal como se radicó inicialmente

1.3. Dibujos: Folios 14 a 17 tal como se radicó inicialmente

1.4. Oposiciones:

1.4.1. Folios 41 a 117
C. I. Formas Intimas S.A.
C.I. Ellipse S. A.
Compañía Internacional De Soluciones Creativas S. A.
Industrias Morarbe Ltda.
Walter Ruiz (Comercializadora Internacional Tesco)

1.4.2. Folios 118 a 140
C.I. Ellipse S. A.

2. Objeto de la invención

- Título de la solicitud *(folio 1)*
  Proceso de Terminado de Bordes en Operaciones de Confección por Transferencia de Calor.
- Las reivindicaciones 1 a 7 de la solicitud en estudio se refieren a

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Procesos de terminado de bordes en operaciones de confección por transferencia de calor CARACTERIZADOS PORQUE se unen materiales, partes o piezas por medio de una película o material adhesivo con maquinaria por transferencia de calor y ciclos definidos de presión, tiempo, temperatura y velocidad.

- El anterior procedimiento busca *mejorar las propiedades de ropa, especialmente interior.*
- La Clasificación Internacional de Patentes (IPC) para esta solicitud es *C 09 J 7/00.*

3. De la solicitud de Patente

3.1. Reivindicaciones *(Artículo 30 D. 486)*

El capítulo reivindicatorio de la solicitud en estudio presenta los siguientes defectos:

- *El solicitante presenta una solicitud ambigua y totalmente inaceptablepor que es indefinida. Relaciona como objeto de su solicitud procesos pero no explica con detalle como se llevan a cabo los diversos pasos o etapas del mencionado proceso; señala que se unen materiales, partes o piezas (sin especificar cuales ni de que tipo materiales , partes o piezas) por medio de una película (no indica que tipo de película) o material adhesivo (no enseña cual ni de que tipo) con maquinaria (no precisa cual es la maquinaria a emplear) por transferencia de calor (no enseña como) y ciclos definidos de presión, tiempo, temperatura y velocidad (expresiones sumamente vagas e inaceptables). El solicitante debe recordar que las reivindicaciones deben* ***definir*** *la materia a proteger, ser* ***claras*** *y* ***concisas.***

Por lo anterior, el capítulo reivindicatorio no cumple con el requisito de definición, claridad, concisión o sustento por la descripción de acuerdo al art. 30 de la Decisión 486.y/o art.22 Tratado PCT.

4. Análisis de la(s) Oposición(es): *(Artículo 43 D. 486)*:

En referencia a la oposición número 1 (de C. I. Formas Intimas S.A., C.I. Ellipse S. A., Compañía Internacional De Soluciones Creativas S. A., Industrias Morarbe Ltda. Walter Ruiz (Comercializadora Internacional Tesco), esta puede ser tenida en cuenta y sus argumentos son:

- *No es novedosa, dados los documentos WO2006080027, US20050000622, US20060150302, US20040238103, US5379888, US7191720, Revista le Bon, Campaña 14 de 2006, Catalogo moda femenina No. 93 del 2° semestre de 1999, revista Bodywear global 08-2002, y revista Bodywear global 01-2002*
- *Falta de altura inventiva de la solicitud.*

El opositor sustenta muy bien su documento y está oficina, dado lo general de la presentación del objeto de la solicitud colombiana, encuentra todos los argumentos procedentes y coincide plenamente con ellos. Es conveniente aclarar que el documento US7191720 publicado en fecha posterior a la solicitud colombiana, equivale a US2004151864 (A1) publicado el 5 de agosto de 2004 y que por lo tanto puede afectar los requisitos de patentabilidad de la presente solicitud.

En referencia a la oposición número 2 de C.I. Ellipse S. A., esta puede ser tenida en cuenta y sus argumentos son:

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- *No es novedosa, dados documentos del fabricante de la maquinaria MACPI.*

Este opositor no sustenta adecuadamente su escrito y petición, dado que se limita a enseñar como realiza su apoderada el procedimiento, pero las pruebas no sirven para corroborar que el mencionado procedimiento se encontraba en el estado de la técnica. La oposición debería estar sustentada, algo que no ocurre en este caso.

5. Determinación del Estado de la Técnica

- La fecha que se ha tenido en cuenta para determinar el estado de la técnica es *3 de noviembre de 2006*
- Teniendo en cuenta la fecha indicada se realizó la búsqueda en el estado de la técnica de documentos relacionados con la solicitud encontrándose los siguientes documentos más relevantes:

N°	Documento	Titulo	Fecha de publicación
D1	*WO 2006080027*	**A seamless garment**	**3 de agosto de 2006**
D2	*US 20050000622*	**Method of producing garment blanks having seamless trim**	**6 de enero de 2005**
D3	*US 20060150302*	**Garments having seamless edge bands and processes for making**	**13 de Julio de 2006**
D4	*US 20040238103*	**Method of producing seamless elastic trim**	**2 de diciembre de 2004**
D5	*US 5379888*	**Sew free button assembly**	**10 de enero de 1995**
D6	*US 7191720 / US 2004151864*	**Method of manufacture for stitchless garment**	**20 de marzo de 2007**
D7	*Revista le Bon,*	*Campaña 14 de 2006*	
D8	*Catalogo moda femenina No. 93*	*Catalogo moda femenina*	*del 2° semestre de 1999*
D9	*Rrevista Bodywear global,*	**08-2002**	*2002*
D10	*Revista Bodywear global*	**01-2002**	*2002*
D11	**CO 93379572**	**Sistema mejorado para fabricar prendas de seguridad y producto obtenidos**	**24 de marzo de 1993**
D12	**CO 91343791**	**Mejoramientos en la fabricación de pendas de naturaleza plástica**	**4 de julio de 1991**
D13	**US 20020129434**	**Garments assembled without sewing**	**19 de septiembre de 2002**
D14	**US 2006/0003668**	**System and method for not-sew manufacturing**	**5 de enero de 2006**
D15	**US 2002/0151239**	**Not sew seamless technology**	**17 de octubre de 2002**
D16	**US 2003 0092355**	**Two ply support garment and method of making same**	**15 de mayo de 2003**
D17	**US 3653690**	**Safety garment and method of making same**	**4 de abril de 1972**
Dn	**Decenas de documento más**		

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6. Análisis de patentabilidad (Artículo 14 D. 486)

El solicitante pretende que se le proteja *Procesos de terminado de bordes en operaciones de confección por transferencia de calor CARACTERIZADOS PORQUE se unen materiales, partes o piezas por medio de una película o material adhesivo con maquinaria por transferencia de calor y ciclos definidos de presión, tiempo, temperatura y velocidad.*

Lo que el solicitante pretende que se le otorgue privilegio de exclusividad, es muy conocido en el arte; la unión de materiales, partes o piezas por medio de películas o materiales adhesivos con equipos que transmitan calor (u otros tipos de energía) se trabaja y mejora desde hace varios lustros; aún más cuando se trata de bordes de piezas especialmente textiles. El primer opositor argumenta de forma sustentada el por qué no existe novedad (por consiguiente tampoco altura inventiva) en la presente solicitud basado en una serie de documentos; el solicitante no contra-argumenta ni dice nada en su defensa. Esta oficina ha encontrado un alto número de documentos (de los cuales se presenta una muestra) que relacionan también lo que el solicitante quiere que se le proteja. Puede afirmarse que la solicitud presentada es tan general que no cumple con los requisitos exigidos por la legislación para que se conceda el privilegio solicitado.

7. Conclusión:

Los requisitos de patentabilidad de la presente solicitud se encuentran afectados así:

N°	Documento N°	Reivindicaciones afectadas	Requisito que afecta
D1	*WO 2006080027*	1 -7	Novedad Nivel Inventivo
D2	*US 20050000622*	1 -7	Novedad Nivel Inventivo
D3	*US 20060150302*	1 -7	Novedad Nivel Inventivo
D4	*US 20040238103*	1 -7	Novedad Nivel Inventivo
D5	*US 5379888*	1 -7	Novedad Nivel Inventivo
D6	*US 7191720 / US 2004151864*	1 -7	Novedad Nivel Inventivo
D7	*Revista le Bon*	1 -7	Novedad Nivel Inventivo
D8	*Catalogo moda femenina No. 93*	1 -7	Novedad Nivel Inventivo
D9	*Revista Bodywear global,08-2002*	1 -7	Novedad Nivel Inventivo
D10	*Revista Bodywear global 01-2002*	1 -7	Novedad Nivel Inventivo
D11	CO 93379572	1 -7	Novedad Nivel Inventivo
D12	CO 91343791	1 -7	Novedad Nivel Inventivo

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N°	Documento N°	Reivindicaciones afectadas	Requisito que afecta
D13	US 20020129434	1 -7	Novedad Nivel Inventivo
D14	US 2006/0003668	1 -7	Novedad Nivel Inventivo
D15	US 2002/0151239	1 -7	Novedad Nivel Inventivo
D16	US 2003 0092355	1 -7	Novedad Nivel Inventivo
D17	US 3653690	1 -7	Novedad Nivel Inventivo

En cumplimiento del artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le indica que debe dar respuesta dentro del término de SESENTA días contados a partir de la fecha de notificación de la presente comunicación. 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 en el numeral 5.2, literal e), del capítulo quinto del título primero de la Circular Única N° 10 de 2001.

Alix Carolina Céspedes De Vergel
Directora de Nuevas Creaciones (C)

Concepto Técnico No. **1526**
Examinador Técnico **202003**
El anterior requerimiento fue notificado por fijación en lista, de fecha 20 MAYO 2010

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SUPERINDUSTRIA Y COMERCIO.
No. RAD: 93379572000 FOLIOS: 15
FECHA (DD/MM/AA): 24/03/93 HORA (HH:MM:SS): 09:02:36
TRAMITE: 02 PATENTES 01 REGISTRO 01 SOLICITUD
DEPENDENCIA: 2020 DIVISION DE NUEVAS CREACIONES

(21) EXPEDIENTE No. 379.572

REV.

DIVISION DE PROPIEDAD INDUSTRIAL

PATENTE

(54) TITULO Sistema Mejorado Para Fabricar Prendas De seguridad y Productos Obtenidos.

(51) CLASIFICACION INTERNACIONAL[5] A41 H 43/04.

(71) SOLICITANTE Compañia Interamericana de Manufacturas Limitada. Intaiman

DOMICILIO Santafé de Bogotá.

(72) APODERADO Eduardo Morgueitio Galarza
Código 3196

BOGOTA, Marzo 19 de 1993.

203038
20907

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REPUBLICA DE COLOMBIA

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

DIVISION DE PROPIEDAD INDUSTRIAL

-SOLICITUD-

PATENTE DE INVENCION

379.572

1°b MAR 24/93 F.02

IDENTIFICACION

(74) Apoderado: EDUARDO MURGUEITIO GALARZA

(71) Solicitante(s) (Denominación o Apellidos y Nombres):

INTERAMERICANA DE MANUFACTURAS INTERMAN LTDA

Domicilio completo del solicitante: SANTAFE DE BOGOTA

Nacionalidad: COLOMBIANO | Pais Residencia: COLOMBIA

(72) Inventor(s): ? GUSTAVO DAVILA CAMARGO

(54) Título de la invención: SISTEMA MEJORADO PARA FABRICAR PRENDAS DE SEGURIDAD Y PRODUCTOS OBTENIDOS.

(51) Clasificación Internacional: A41 H 43/04

Objetivo de la invención:

CAMBIAR Y MODIFICAR LOS PROCESOS QUE HASTA EL MOMENTO SE HAN LLEVADO A CABO EN LA FABRICACION DE PRENDAS DE SEGURIDAD DE TIPO REFLECTIVO, A PARTIR DE MATERIAL SINTETICO, CON EL FIN DE MEJORAR DICHO SISTEMA Y SOLVENTAR LAS FALLAS Y LAS DEFICIENCIAS QUE HASTA EL MOMENTO SE HAN PRESENTADO PARA MEJORAR LA CALIDAD DE LOS PRODUCTOS OBTENIDOS.

PRIMERA SOLICITUD PRESENTADA EN OTRO PAIS

(31) Solicitud Nº	(32) Fecha de presentación	(33) País

INDICE DE DOCUMENTOS QUE SE ACOMPAÑA

- ☑ Poder al Abogado
- ☐ Recibo por $
- ☐ Recibo por $
- ☐ Recibo por $
- ☐ Estampillas $
- ☐ Certificación persona Jurídica
- ☑ Descripción (Forma P-102)
- ☑ Reivindicaciones
- ☒ Dibujos
- ☑ Extracto (Forma P-103)
- ☑ Extracto (Forma P-104) - Cartulina - 14 cm x 20 cm
- ☑ Tarjeta propietario (Forma P-105)
- ☐ Copia legalizada
- ☐ Otros _____
- ☐ _____
- ☐ _____

Se solicita la concesión de la patente de invención declarando que la invención es nueva y de su propiedad.

Bogotá Marzo 23 / 93

Firma _____

Radicado por _____ (Forma P-102)

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SISTEMA MEJORADO PARA FABRICAR PRENDAS DE SEGURIDAD Y PRODUCTOS OBTENIDOS.

D E S C R I P C I O N

La presente invención se relaciona con un sistema mejorado para la fabricación de prendas de seguridad, de tipo reflectivo como chalecos de seguridad para tránsito, a partir de material sintético como el cloruro de polivinilo sobre poliester nylon en telas o láminas y por fijación de elementos a través de la termocostura con base en troqueles y electrodos de fusión a partir del mismo material, eliminando la costura cosida de técnicas convencionales asegurando un producto de alta resistencia, completamente impermeable y de efectiva reflexividad en horas nocturnas cuando se aplica como chaleco para guías de tránsito.

El proceso viene mejorando una serie de factores conocidos dentro de la confección de éste tipo de prendas, que parte en sus etapas básicas del corte mediante patrón de la prenda, troquelado del cuello u orificio de aplicación, la ubicación de cobladillos periféricos o bordes de refuerzo a través de más de 6 pasos que constituyen las termocosturas periféricas, la fijación por calor de las correas de apriete, la fijación por costura simple de las bandas o franjas reflectivas anteriores y posteriores y la colocación de los broches de las correas.

Este sistema presenta desventajas en el procedimiento final sugún pueden resumirse así:

-Las franjas reflectivas por su fijación mediante costura permite filtraciones de agua, desmejorando la impermeabilidad de la prenda;

-La costura en sí, facilita desgarres y desprendimiento de las franjas reflectivas;

-La exposición directa de las franjas o bandas al medio exterior acelera su desgaste o erosión;

-El doblez extremo inferior de la parte delantera y trasera del chaleco así fabricado presenta termocostura con exceso de calor, desmejorando la apariencia del chaleco o prenda;

Con base en éstos factores y en procura de un mejoramiento en el proceso de fabricación y por ende en la prenda terminada, la invención ha propuesto un sistema de fabricación con reducción de pasos a cinco subetapas con introducción de mejoramientos en el diseño final del producto a saber:

a.- Corte del material polivinílico según un rectángulo de partida como cuerpo laminar de la prenda;

b.- Troquelado del contorno (hueco) oval del cuello;

c.- Troquelado en un solo paso de los bordes redondeados (4) del cuerpo laminar rectangular;

d.- Preparación de los avíos o complementos de la prenda dentro de una sola operación que comprende: bandas reflectivas, protectores de las bandas, refuerzos para dobladillo del borde periférico de la prenda y correas de ajuste a la cintura.

e.- Aplicación de calor por termosellado y costura en un solo paso para la fijación de las bandas reflectivas y su protección exterior de acetato, para los refuerzos del borde de la prenda en su contorno recto y curvo en los vértices y para la fijación de las correas laterales de la prenda.

f.- Finalmente aplicación de broches de las correas.

Este procedimiento introduce mejoras sustanciales como reducción de tiempo de fabricación, que según análisis de tiempos y movimientos representan un margen de ganancia de 480 segundos por

prenda en la etapa de montaje de los elementos (d) para el termosellado.

Adicionalmente se mejora el producto ya que al incluir una sola fase del termocostura, las bandas o franjas reflectivas se aplican por dicho medio al cuerpo del chaleco pero ésta vez la invención provee una lámina de acetato sobre dicha banda que por el termosellado queda adherido al chaleco. Igualmente la aplicación de las correas, por temosellado elimina el uso de costuras dándole a la unión por calor una integración de los dos elementos y en igual forma la disposición integral de los electrodos de sellado a lo largo del contorno del desarrollo rectangular del chaleco, asegura un sellamiento de los bordes en una sola aplicación de calor con notable reducción de tiempos y mejoramiento evidente en la calidad y acabado de la prenda.

-Las figuras anexas ilustran el propósito de la invención en lo que el producto o prenda obtenida se refiere. En efecto:

La figura 1 es una vista del desarrollo laminar o cuerpo de la prenda obtenida por el procedimiento aquí descrito;

La figura 2 es un detalle específico de la fusión entre el cuerpo de la prenda y la correa lateral o detalle A de la figura 1, y

La figura 3 es un detalle B específico del doblez por calor del borde redondeado del desarrollo rectangular de la prenda así fabricada.

El chaleco o prenda de seguridad se compone de un desarrollo laminar de cloruro de polivinilo sobre poliester nylon de forma rectangular 10 y dos planos 11 y 12 delantero y trasero

respectivamente, cuyos vértices rectos van redondeados, siendo el borde de la lámina recorrido por una doble costura 16 por termocostura, un orificio troquelado 13 de forma oval que constituye un cuello para aplicación y uso del chaleco, en tanto sobre los flancos delantero y trasero del cuerpo del chaleco van dispuestas un juego de franjas o bandas 14 de material reflectivo, protegidas en su termofijación al cuerpo laminar mediante una banda plástica de acetato, y un juego de correas 15 de sujeción al cuerpo del usuario.

La fijación de éstas correas 15 al plano o desarrollo de la prenda se hace mediante una termofijación por electrodo de dicha correa en una franja de la costura extrema 16 que se compone de dos surcos 17 en cuya separación se conforma una zona fusionada 18 con nervaduras de agarre producto de la fusión correa y costura extrema (detalle A - figura 2).

El vértice redondeado de la prenda tantao en su flanco delantero como trasero se obtiene a partir de una termocostura continua para conformar un doble surco 17

R E I V I N D I C A C I O N E S

1.- Mejoramientos en la fabricación de prendas a partir de material sintético caracterizados por el autosellado de costuras y bordes y aplicación de elementos de sujeción y de señalamiento con base en termofijación en una sola etapa a partir de electrodos que se aplican a un desarrollo laminar de cloruro de polivinilo sobre poliester - nylon de forma rectangular.

2.- Mejoramientos según lo señalado en el punto 1 caracterizados por la reducción de tiempo y movimientos con la aplicación por una vez de una termocostura periférica de modo que se logre sellamiento de bordes, aplicación de bandas de señalamiento reflectivo y correas de aseguramiento en una sola operación.

3.- Prendas obtenidas por el proceso descrito en los puntos 1 y 2 caracterizadas por un desarrollo rectangular de vértices redondeados, bordes termosellados de doble surco y correas termofijadas al cuerpo laminar en cuyos planos delantero y espaldar lleva fijadas por calor bandas reflectivas protegidas por películas de acetato sobre las mismas.

4.- Prendas de seguridad fabricadas por termofijación de elementos con base en los procedimientos de aplicación simultánea de calor para las costuras periféricas o rebordes, las correas de fijación y las bandas reflectivas de señalamiento dentro de una sola operación.

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Fig. 1

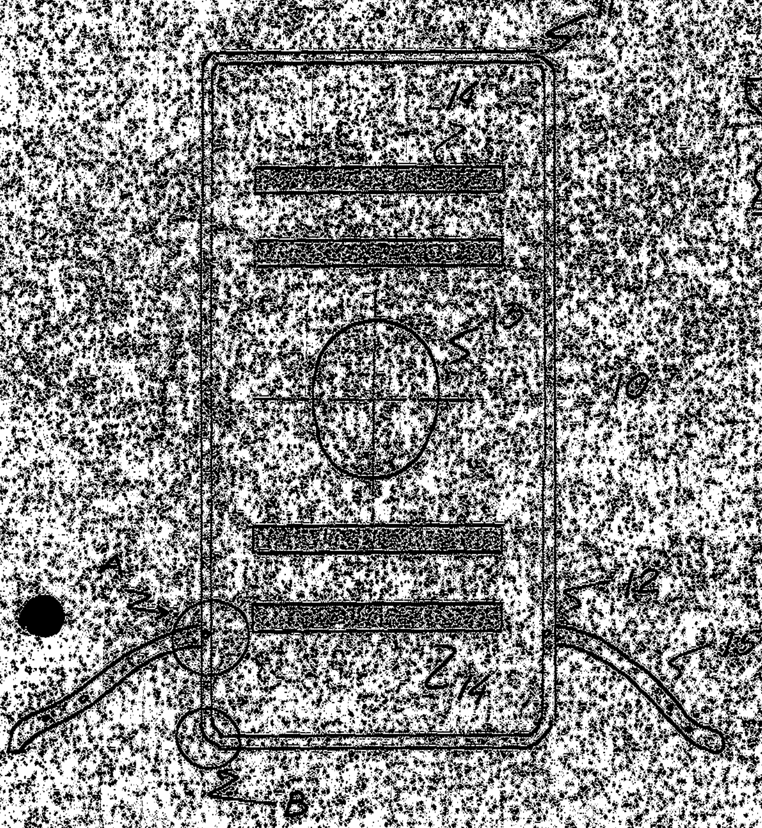


Fig. 2

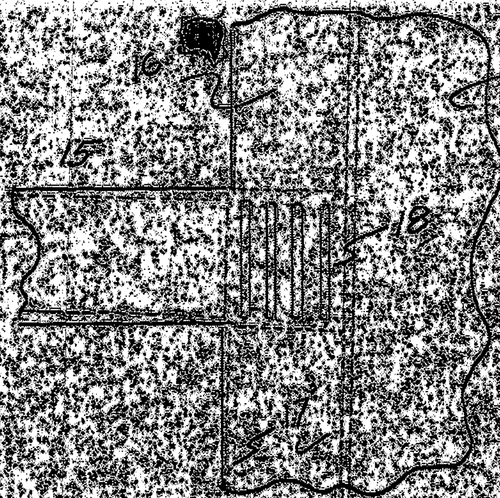
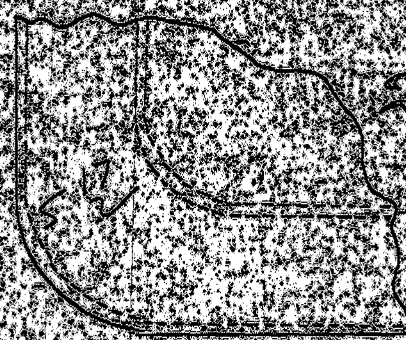


Fig. 3



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REPUBLICA DE COLOMBIA

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

DIVISION DE PROPIEDAD INDUSTRIAL

-SOLICITUD-

PATENTE DE INVENCION

SUPERINTENDENCIA INDUSTRIA Y COMERCIO RADICACION

Jul 10 4 41 PM '91

DIV. DE PROPIEDAD INDUSTRIAL RADICACION

343791

IDENTIFICACION

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(54) Título de la invención:

MEJORAMIENTOS EN LA FABRICACION DE PRENDAS DE NATURALEZA PLASTICA Y PRODUCTOS OBTENIDOS

(51) Clasificación internacional:

Motivo de la invención:

Proceso mejorado en la fabricación de prendas de vestir, particularmente de naturaleza sintética, (seguridad industria), reduciendo pasos y garantizando mayor seguridad, comodidad y calidad.

PRIMERA SOLICITUD PRESENTADA EN OTRO PAIS

(31) Solicitud Nº	(32) Fecha de presentación	(33) País

INDICE DE DOCUMENTOS QUE SE ACOMPAÑA

- ○ Poder al Abogado
- ○ Recibo por $
- ○ Recibo por $
- ○ Recibo por $
- ○ Estampillas $
- ○ Certificación parecer Jurídico
- ○ Descripción (Forma P-102)
- ○ Reivindicaciones
- ○ Dibujos
- ○ Extracto (Forma P-103)
- ○ Extracto (Forma P-104) -Cartulina- 14 cm x 20 cm
- ○ Tarjeta propietario (Forma P-105)
- ○ Cesión legalizada
- ○ Otros: _____

Se solicita la concesión de la patente de invención declarando que la invención es nueva y de su propiedad.

Constanza Romero Maldonado

RECIBIDO CON 11 FOLIOS

Bogota D.C. Julio 10/91

Marta B Parra C.

Firma

Radicado por _____ (Forma P-102)

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P A T E N T E D E I N V E N C I O N

TITULO MEJORAMIENTOS EN LA FABRICACION DE PRENDAS DE NATURALEZA PLASTICA Y PRODUCTOS OBTENIDOS

DESCRIPCION: La presente invención se relaciona con un proceso mejorado en la fabricación de prendas de trabajo, particularmente de naturaleza sintética en las cuales se utiliza de preferencia el cloruro de polivinilo PVC sobre una base de nylon y que en la técnica convencional utiliza el ensamble por termocostura para la fusión de las piezas.

- Las prendas fabricables por éste método son de aprovechamiento optimo en trabajos de seguridad y laboratorios a manera de overoles, delantales y petos que por su naturaleza plástica ofrecen amplias ventajas en la protección del usuario.

- La invención se basa en la introducción de mejoramientos en el proceso por reducción de pasos, aplicación de dispositivos de termofijación diseñados adecuadamente para el efecto de la provisión de prendas ensambladas por los procedimientos mejorados, en tonos bicolores con refuerzo incorporado.

- En la técnica convencional las prendas plásticas para éste tipo de trabajos precisan una serie de pasos desde el mismo corte la fijación de dobleces en los bordes, la fijación de tirantes y hebillas para la parte delantera así como las tiras de amarre en la parte posterior. de la misma, acciones que aún con la

utilización de dispositivos de termocostura presentan el inconveniente de esparcir por fuera de las costuras de unión parte del material plástico fundido, originando agrupaciones del mismo que desmejoran la calidad de presentación de la prenda. Más o menos entre 7 u 8 pasos se preveen en la técnica convencional de ensamble utilizada corrientemente.

- Dentro del marco de estas circunstancias, la invención ha provisto la reducción de pasos y la termocostura con alta eficiencia de los ensambles obviando la dispersión de plástico fundido y asegurando calidad de fabricación en la prenda. Particularmente la invención se refiere a un tipo de prenda delantal de uso práctico en laboratorios, acarreo de materiales o protector en general para trabajos que requieren deslizamiento de salpicaduras y fácil limpieza del mismo entre otros.

- Los dibujos acompañantes ilustram el alcance del invento en los cuales:
La Figura 1 presenta el dispositivo de termocostura propuesto por la invención, y la Figura 2 presenta el tipo de prenda obtenido como producto del proceso que se describirá y el refuerzo de aplicación.

El invento se basa en el proceso de ensamble de un delantal de trabajo de material plástico caracterizado por los siguientes pasos:

a.- Corte del conjunto de piezas plásticas A de PVC con base de nylon de un sólo color sobre lotes iniciales de 0.86 y 1.18 metros como medida standar.

este corte provee a la zona axilar cortes rectos inicialmente.

b.- Troquelado de la parte superior del plano o zona axilar de la pechera para configurar la curvatura axilar mediante arcos que se cortan sobre una recta sobre la parte delantera de la prenda.

c.- Troquelado o corte de una pieza de refuerzo B para la parte delantera, generalmente en otro tono o color diferente al del delantal y que sigue en configuración el perímetro del corte o troquelado curvo de la pechera y curvaturaaxilar.

d.- Montaje sobre la pieza cortada del delantal de dispositivos de tirante o correas C hebilladas para la pechera del delantal y laterales D para amarre del delantal en el final de la porción curvada axilar.

e.-Superposición de la pieza de refuerzo de otro color B sobre las correas y tirantes previamente montados sobre el área del delantal.

f.-Sellamiento por electrodo según el diseño especial de un molde preparado para el efecto del área configurada por el borde superior del delantal para proveer una termocostura de la base plástica del delantal, los extremos de tirantes y la pieza de refuerzo.

Hemos hablado de introducir en el proceso un dispositivo o molde de termocostura de diseño especial como el que se aprecia en la Figura 1, caracterizado por una pieza metálica o troquel en aluminio 10, copn unos bordes 11 o zonas de termocostura generalmente planas y unos extremos 12 a lado y lado de la porción recta que llevan a manera de rejilla unos compartimentos 13 y 13' (porción curva delmolde). cuya finalidad es facilitar la acumulación de material

plastico que durante la fusión por acción del electrodo pueda desplazarse por las costuras y presentar acumulaciones.

Este material cae en las concavidades a diferencia de otros procesos en los cuales por la planitud del molde se dispersa por fuera de las costuras de la prenda, desmejorando la calidad de presentación. Este molde 10 presenta una sección recta 14 y unos arcos 15 siguiendo el contorno del corte del lote de piezas de PVC inicialmente troquelado.

El punto del refuerzo a termofijarse y su color diferente a la pieza base tal como se aprecia en la figura 2, merece destacarse dado que se trata defabricar prendas de seguridad que dentro de las convencionales de seguridad se han introducido las siguientes combinaciones que se traen como información pero que se deben observar dentro de la práctica de la confección y que la invención considera dentro de la aplicación y funcionalidad, así:

FONDO A DE LA PRENDA	USO DE LA PRENDA	FRANJA O REFUERZO B
Negro	alta contaminación	Amarillo
Blanco	Area aséptica esteril.	Verde
Amarillo	Area alto trafico	Negra
Verde Optico	Area bajo tráfico	Amarilla

Cabe la ocación detallar que el molde metálico que sirve de conductor electrico para la termocostura de las piezas (base, refuerzos y extremos de tirantes) puede llevar su base o borde 11 de termocostura planas o labradas según el acabado que se le quiera imprimir a la prenda en dichas zonas, y se aplica generalmente sobre una base de madera durante el sellado.

R E I V I N D I C A C I O N E S

1.- Proceso mejorado para la confección de prendas con base en láminas plásticas que comprende los pasos de cortar piezas de fondo, piezas de refuerzo de bordes y piezas de sujección y disponer su colocación de superposición en los bordes de la pieza de fondo para proveer una unión en caliente de dichas piezas por aplicación de un molde con conección eléctrica.

2.- Proceso mejorado según el punto 1 en el cual la fijación de las piezas de unión previamente dispuestas en superposición sobre los bordes de la pieza de fondo se efectúa a través de un molde metálico diseñado para seguir el contorno de la parte extrema de la prenda en donde va fijado el refuerzo y los tirantes de la prenda, dicho molde caracterizado por llevar unas depresiones o concavidades a manera de rejillas receptoras del material fundido por la fijación en caliente evitando su dispersión por fuera de la costura

3.- Proceso mejorado según el punto 1 y 2 caracterizado por proveer prendas para trabajos de seguridad en tonop bicolor de conformidad con los standares universales con base en tonalidades que se fijan tanto en la pieza de fondo como en los refuerzos del borde superior de la prenda, mediante proceso

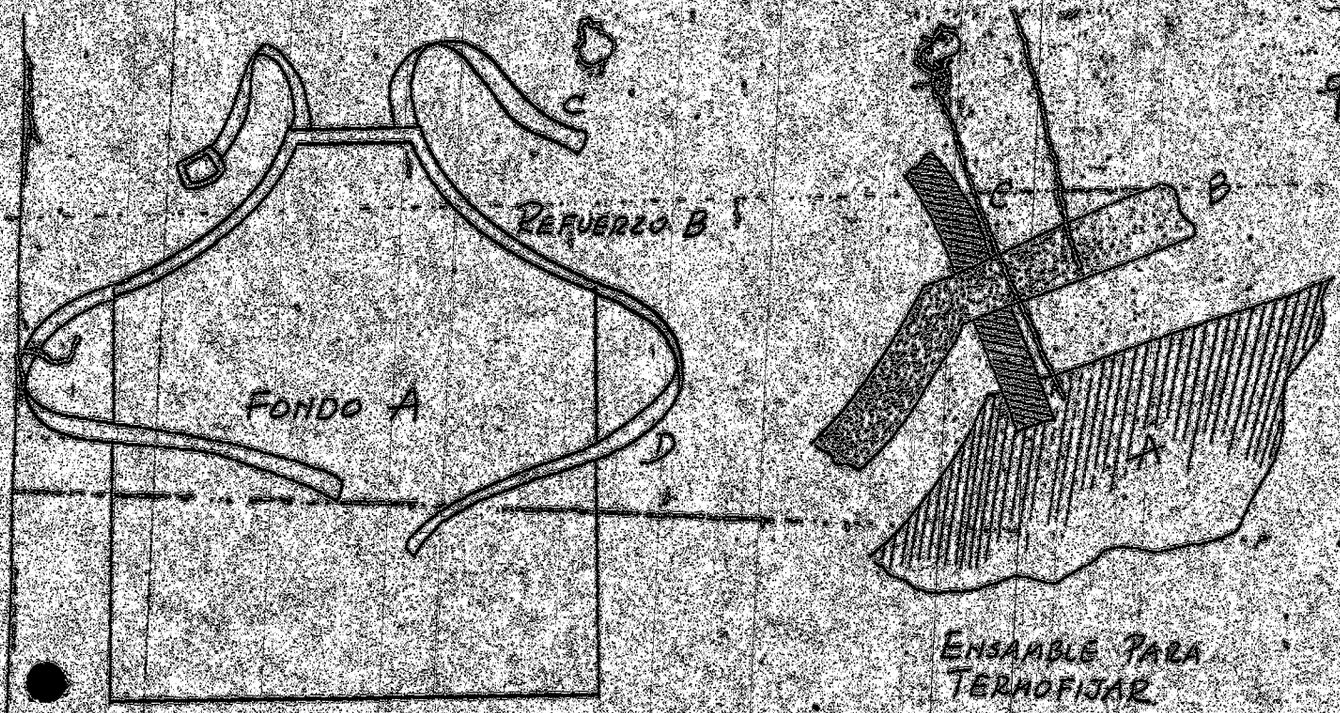


FIG. 2

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(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2002/0129434 A1**

Rabinowicz (43) **Pub. Date: Sep. 19, 2002**

(54) **GARMENTS ASSEMBLED WITHOUT SEWING**

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(21) Appl. No.: **10/141,015**

(22) Filed: **May 8, 2002**

Related U.S. Application Data

(63) Continuation of application No. 09/679,157, filed on Oct. 5, 2000.

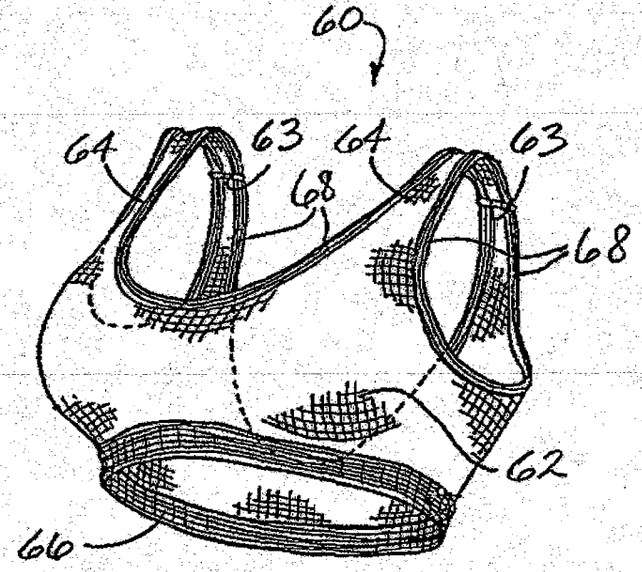
Publication Classification

(51) **Int. Cl.**[7] **A41B 1/00**; A41D 1/00

(52) **U.S. Cl.** **2/69**

(57) **ABSTRACT**

Elastic and/or decorative trim is attached along an edge of a fabric body of a garment without sewing. The trim comprises a textile material containing fibers of thermoplastic material. The fabric edge to which the trim is attached can be any type of fabric, not necessarily containing any thermoplastic fibers. The trim is attached by wrapping the trim around the fabric edge so that the edge is sandwiched between two opposing portions of the trim, and then localized regions of the trim are heated, preferably ultrasonically, to cause the thermoplastic material in the trim to become plastic and flow together from the opposing portions, thus penetrating through the fabric edge. The thermoplastic material is then allowed to cool and solidify, thereby attaching the trim to the fabric edge. Also disclosed are garments having ultrasonically formed joints between two or more fabric panels. Particular joints are described enabling non-ultrasonically bondable panels to be ultrasonically joined to other ultrasonically bondable panels.



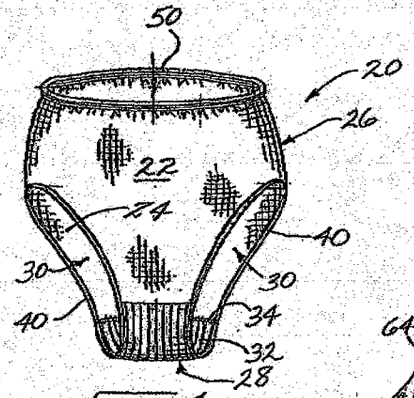


Fig. 1.

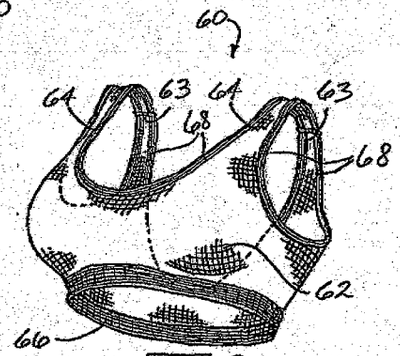


Fig. 2.

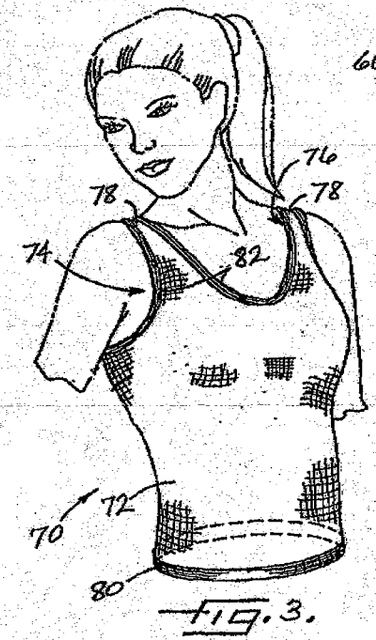


Fig. 3.

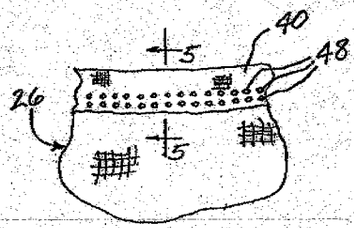


Fig. 4.

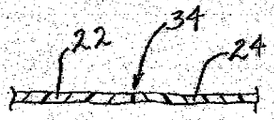


Fig. 8.

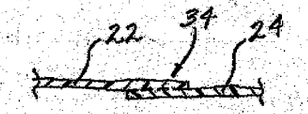


Fig. 9.

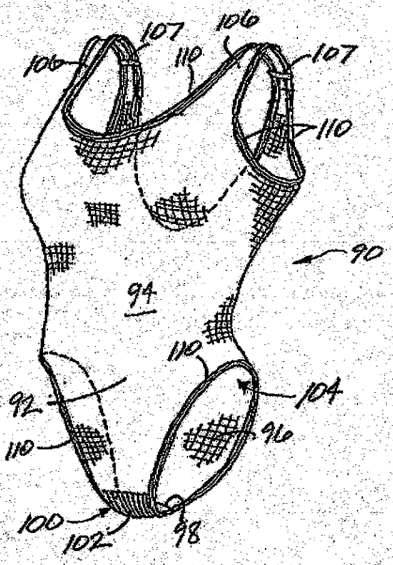


Fig. 7.

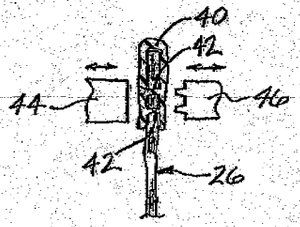


Fig. 5.

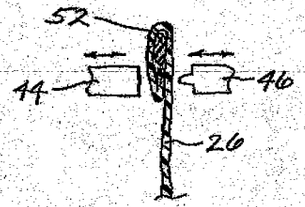


Fig. 6.

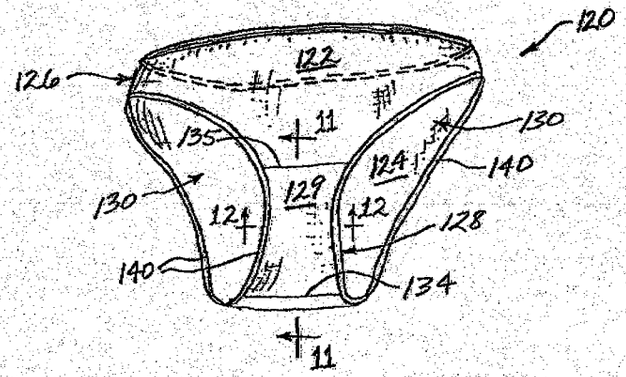


Fig. 10.

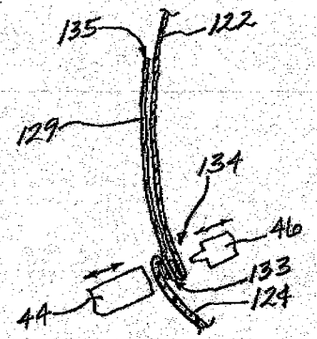


Fig. 11

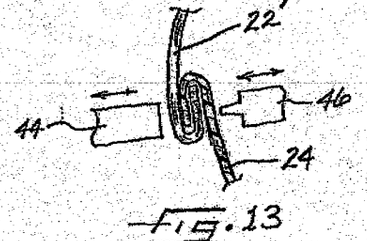


Fig. 13

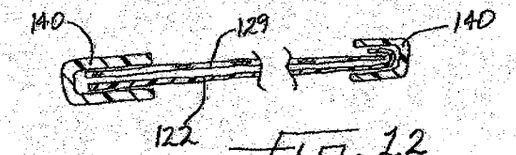


Fig. 12

GARMENTS ASSEMBLED WITHOUT SEWING

FIELD OF THE INVENTION

[0001] The present invention relates to garments and, more particularly, to garments assembled without sewing.

BACKGROUND OF THE INVENTION

[0002] Garments have traditionally been produced by a cut-and-sew technique in which a plurality of separate fabric pieces are joined together, typically by sewing with thread, to form the finished garment. The drawbacks of this method of production are well known, and much efforts have been made to devise alternative methods of production that can reduce or eliminate the amount of sewing required for assembling a garment. Major strides in this direction have been made, at least for certain types of garments, by applying circular knitting techniques to produce the main tubular body of the garment without seams. In general, however, it is still necessary to finish the garment by sewing, such as for applying decorative or elastic trim or banding around leg openings, neck openings, arm openings, waist openings, or the like, and for joining different portions of the garment that cannot be integrally knit together during the circular knitting process. For example, a so-called "seamless" panty still requires at least one seam, typically located in a crotch region of the panty, for joining together a front panel and a back panel of the tubular fabric blank from which the panty is made.

[0003] The formation of such seams and the attachment of elements such as elastic are to this day still performed by sewing with thread in the commercial production of most garments. This generally requires the manufacturer to keep an extensive inventory of dye-to-match sewing thread so that the thread will be the same color as the fabric of the garment. It would be desirable to eliminate the requirement of sewing with thread to assemble and finish a garment.

SUMMARY OF THE INVENTION

[0004] The present invention enables many types of garments to be assembled and finished without sewing with thread. In accordance with a first aspect of the invention, a trim is attached along an edge of a fabric body of a garment without sewing. The trim comprises a textile material containing fibers of thermoplastic material. The fabric edge to which the trim is attached can be any type of fabric, not necessarily containing any thermoplastic fibers. For example, the fabric can be all cotton or other natural fibers. The trim is attached by wrapping the trim around the fabric edge so that the edge is sandwiched between two opposing portions of the trim, and then localized regions of the trim are heated to cause the thermoplastic material in the trim to become plastic and flow together from the opposing portions, thus penetrating through the fabric edge. The thermoplastic material is then allowed to cool and solidify, thereby attaching the trim to the fabric edge. A preferred technique for locally heating the trim is to ultrasonically heat the trim with a sonic horn and anvil configured to contact the trim at the desired localized regions. The ultrasonically formed seams made in accordance with the present invention offer the potential for stronger seams than those made by conventional sewing in many cases, and the seams can be made faster than is typically the case with sewing. The seams also can be made soft and flexible so that they are as comfortable as or more comfortable than conventionally sewn seams.

[0005] The trim can be an elastic material. For instance, it is common to apply elastic banding around leg openings of garments such as briefs, panties, bodysuits, swimsuits, or the like, and elastic banding is also commonly attached about the waist of briefs and panties and along edges of brassieres and other types of garments. Such elastic banding often also serves a decorative function to provide a finished appearance along a fabric edge. Alternatively, the trim can be a decorative trim whose primary function is to provide a finished appearance along a fabric edge and to prevent raveling of the fabric, such as often applied around neck and/or arm openings of shirts and blouses. Such elastic and/or decorative trim can be attached without sewing in accordance with the present invention.

[0006] The localized regions at which the trim is heated and bonded can be intermittent and spaced along the length and/or along the width of the trim, or it can be a continuous line or lines extending along the trim. The localized regions can also form a decorative pattern. For example, the pattern of the localized regions can be designed to replicate the appearance of conventional stitching with thread, if desired.

[0007] Another aspect of the invention provides an alternative attachment of an elastic element along a fabric edge of a garment. In accordance with this embodiment of the invention, the fabric of the garment contains fibers of thermoplastic material, and the elastic element is laid on the fabric adjacent to the edge and the fabric is folded over the elastic element so that the elastic element is encased by the fabric and so that opposing portions of the fabric are in contact with each other. The opposing portions are then heated at localized regions thereof, such as by ultrasonic heating with a horn and anvil, to cause the thermoplastic material in the opposing portions to become plastic and flow together. The thermoplastic material is then allowed to cool and solidify, thereby bonding the fabric to itself and creating a tunneled elastic along the fabric edge. An advantage of this embodiment of the invention is that the elastic material need not be in a shape or comprise a material suitable for ultrasonic or other thermal bonding.

[0008] In yet another aspect of the invention, fabric portions of a garment can be joined together by ultrasonic bonding. In one embodiment, a panty comprises a fabric body having a front panel and a back panel. The fabric body contains fibers of thermoplastic material, and the front and back panels are ultrasonically bonded together in a crotch region of the panty. The panels can be joined with a lap joint, or they can be joined with a butt joint. An additional fabric panel can be provided in the crotch region for added material thickness, if desired. The additional fabric panel and the front and back panels can be joined together at a lap joint, which can be configured in various ways. Preferably, the front and back panels are ultrasonically bondable and the additional fabric panel is sandwiched at an end edge thereof between the front and back panels where they overlap each other. Side edges of the additional fabric panel can be sandwiched between the fabric of the panty and an ultrasonically bondable trim attached along the edge. Accordingly, the additional fabric panel need not, although it can, be ultrasonically bondable.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The above and other objects, features, and advantages of the invention will become more apparent from the following description of certain preferred embodiments thereof, when taken in conjunction with the accompanying drawings in which:

[0010] **FIG. 1** is a perspective view of a panty in accordance with one preferred embodiment of the invention;

[0011] **FIG. 2** is a perspective view of a brassiere in accordance with another preferred embodiment of the invention;

[0012] **FIG. 3** is a perspective view of a shirt or blouse in accordance with a further embodiment of the invention;

[0013] **FIG. 4** is a fragmentary, magnified view of a portion of a fabric edge of a garment with a trim applied thereto;

[0014] **FIG. 5** is a cross-sectional view taken on line 5-5 of **FIG. 4**;

[0015] **FIG. 6** is a cross-sectional view similar to **FIG. 5**, showing an alternative embodiment of the invention for attaching an elastic element to a garment;

[0016] **FIG. 7** is a perspective view of a bodysuit or one-piece swimsuit in accordance with the present invention;

[0017] **FIG. 8** is a cross-sectional view through a butt joint between two fabric panels in accordance with the present invention;

[0018] **FIG. 9** is a cross-sectional view through a lap joint between two fabric panels in accordance with the present invention;

[0019] **FIG. 10** is a perspective view of a panty in accordance with yet another embodiment of the invention, shown in an inside-out orientation;

[0020] **FIG. 11** is a cross-sectional view taken on line 11-11 through the gusset portion of the panty in **FIG. 10**;

[0021] **FIG. 12** is a cross-sectional view taken on line 12-12 through the gusset portion of the panty in **FIG. 10**; and

[0022] **FIG. 13** is a cross-sectional view through a joint between an ultrasonically bondable fabric panel and a non-ultrasonically bondable fabric panel in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0023] The present invention now will be described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout.

[0024] **FIGS. 1, 2, 3, 7,** and **10** show various types of garments, given by way of non-limiting example, to which the present invention can be applied. Although the illustrated examples relate to various items of women's apparel, it will be understood that the invention is in no way limited to women's apparel, but applies to a wide variety of both men's and women's garments. The invention is based on the principle of eliminating the process of sewing with thread to assemble and finish garments of various types. One aspect of the invention relates to the attachment of decorative and/or elastic trim or banding along edges of a garment. **FIG. 1** depicts a panty **20** comprising a front panel **22** and a back panel **24** having opposite sides joined to or integrally knit with opposite sides of the front panel such that the front and back panels collectively form a generally tubular fabric body **26**. Lower portions of the front and back panels are joined together in a suitable fashion so as to form a crotch or gusset portion **28** of the panty that extends between the wearer's legs and so as to form a pair of leg openings **30**. The gusset portion **28** of the panty may comprise a gusset panel **32** having a knit construction differing from that of the rest of the fabric body **26**, as shown, or alternatively the knit construction can be the same throughout the fabric body. In the illustrated embodiment, the gusset panel **32** is integrally knit with the front panel **22** and is joined to the back panel **24** along a joint or seam **34**.

[0025] Attached along the edges of the front and back panels that encircle the leg openings **30** is a trim or banding **40**, which can be a decorative and/or elastic textile material. In accordance with the first aspect of the invention, the trim **40** contains a sufficient quantity of thermoplastic fibers that the trim is thermally bondable to itself as well as to other textile materials likewise containing a sufficient quantity of thermoplastic fibers. More particularly, in accordance with preferred embodiments of the invention, the trim **40** is ultrasonically bondable to itself and to other ultrasonically bondable materials.

[0026] **FIGS. 4** and **5** depict one embodiment of the invention with respect to attachment of the trim **40** to the edge of the fabric body **26** of a garment. The trim **40** advantageously comprises a strip of textile material that is wrapped over the edge of the fabric to which the trim is to be attached so that the edge of the fabric is sandwiched between opposing portions of the trim, as shown in **FIG. 5**. The trim **40** is then attached to the fabric edge by compressing the opposing portions of the trim and the fabric edge together between a pair of cooperating tools that heat localized regions of the trim so as to cause the thermoplastic fibers in the localized regions to become plastic and flowable. The flowable thermoplastic material from the opposing portions of the trim permeates through the fabric **26** and flows together so as to create continuous columns or filaments **42** of thermoplastic material that are joined to both of the opposing portions of the trim and penetrate through the fabric **26**. The heating is then stopped so that the filaments **42** cool and solidify, thereby affixing the trim **40** to the fabric **26**.

[0027] Preferably, the localized heating of the trim **40** is effected by ultrasonic techniques. Thus, as shown in **FIG. 5**, an ultrasonic horn **44** is positioned adjacent one side of the trim **40** and an anvil **46** is positioned adjacent the opposite side of the trim. In general, raised areas of the anvil surface will contact the trim and press the trim against the horn such

that only areas of the trim contacted by the raised areas are heated and bonded, whereas depressed or recessed areas of the anvil surface will not press the trim against the horn and thus the areas of the trim corresponding to such recessed areas will not be heated and bonded. Accordingly, the anvil's surface can be configured in various ways to achieve various patterns of heated and bonded areas of the trim. The horn **44** and anvil **46** can be relatively movable toward each other to compress and ultrasonically heat the trim and fabric therebetween, and away from each other to allow the fabric to be moved or removed. For instance, the horn **44** and anvil **46** may have a relatively short length in comparison with the length of the fabric edge along which the trim **40** is to be attached; accordingly, the trim **40** may be ultrasonically attached to the fabric in a succession of discrete lengthwise increments of the trim, each increment being compressed and heated between the horn and anvil and then the fabric edge and/or the horn and anvil being moved to bring a succeeding increment of the trim and fabric edge between the horn and anvil for bonding. Alternatively, the horn and anvil can be set at a fixed distance from each other to form a sort of nip through which the fabric and trim can be moved on a continuous basis by a suitable drive mechanism, and the anvil **46** can be a rotating wheel. The wheel can be free-wheeling so as to be frictionally driven by the fabric as the *fabric* moves through the nip, or the wheel can be rotatably driven so as to effect or assist in effecting the movement of the *fabric* through the nip. The outer surface of the anvil wheel can be patterned in any desired fashion to impart a desired pattern to the trim as it moves through the nip and is bonded by the horn and anvil. For example, the anvil wheel can be configured to bond the trim in a pattern resembling various types of stitching such as zigzag stitching, straight-line stitching, etc.

[0028] The horn **44** and anvil **46** can be configured such that the trim **40** is heated and bonded at a plurality of localized regions **48** that are spaced apart from one another as shown in **FIG. 4**. If desired, such localized regions **48** can be designed to replicate the appearance of stitching with thread. Thus, as shown in **FIG. 4**, the regions **48** replicate the appearance of a plurality of needle penetrations at uniform spacing along the trim, such as would be created by a conventional sewing operation. Alternatively, the localized regions at which ultrasonic bonding occurs can be designed to create any other desired type of pattern.

[0029] A significant advantage of the first aspect of the invention is that the fabric **26** to which the trim **40** is attached need not, although it can, contain thermoplastic fibers. For instance, the fabric **26** can be made up entirely or substantially of *non-thermoplastic* fibers such as cotton, wool, silk, rayon, or the like. This is possible because the mechanism responsible for bonding of the trim to the fabric and to itself is the *permeation* of the *flowable thermoplastic material* from the opposing portions of the trim through the fabric so as to create the columns or filaments **42** joining the opposing portions of the trim to each other. As such, the trim **40** *preferably contains* at least about 60 percent thermoplastic fibers by weight. Suitable thermoplastic fibers include but are not limited to polyamides (PA), such as nylon 6, nylon 6,6, nylon 4,6, nylon 8, nylon 6,10, nylon 11, and nylon 12; polyolefins, such as polypropylene (PP), polyethylene (PE), polytetrafluoroethylene (PTFE), and polyphenylene ether (PPE or PPO); amorphous and/or crystalline polyesters; or polyimides.

[0030] The fabric **26**, as noted above, can also contain thermoplastic fibers, *although it need not do so*. It may often be the case that the fabric **26** that is chosen for a particular garment contains thermoplastic fibers for reasons unrelated to the need to ultrasonically attach trim **40** to the garment. For instance, many fabrics commonly available in the marketplace comprise blends of natural and synthetic fibers, the selection of the natural and synthetic fibers and their relative percentages being chosen for reasons such as appearance, texture, elasticity, comfort, breathability, drape, shrinkage characteristics, durability, wrinkle-resistance, and other reasons. In many cases the synthetic component(s) of the fabric may comprise a thermoplastic material.

[0031] In the case of undergarments in particular, fabrics that tend to be favored generally comprise a *relatively high* percentage of cotton and a correspondingly low percentage of synthetic fibers, because such fabrics typically are more breathable and therefore more comfortable against the skin than fabrics having a high percentage of synthetic fibers. For instance, it is common in many garments, and in particular among undergarments, for the percentage of thermoplastic fibers in the fabric to be about 20 percent or less. Generally, the attachment of an ultrasonically bondable material to such a fabric would not be possible by ultrasonic bonding, because it is typically necessary for the components being ultrasonically banded together to each comprise at least about 60 percent thermoplastic fibers. However, in accordance with the present invention, a trim **40** comprising at least about 60 percent thermoplastic fibers can be ultrasonically bonded to a fabric **26** even if the fabric contains 20 percent or less thermoplastic fibers. Indeed, the fabric can be entirely devoid of thermoplastic fibers when the technique of the present invention is employed.

[0032] Referring again to **FIG. 1**, the panty **20** includes a *waistband* **50**. The waistband **50** can be formed in various ways. For instance, in the case of the fabric body **26** being knit on a circular knitting machine, the waistband **50** can comprise a turned welt integrally knit at one end of the fabric tube from *which the fabric body* **26** is cut. Alternatively, the waistband **50** can comprise a banding or trim that is ultrasonically bonded to the upper edge of the fabric body **26** in *the manner described* in connection with **FIGS. 4 and 5** above.

[0033] Yet another alternative technique for forming the waistband **50** is to form a *tunneled elastic* as shown in **FIG. 6**. In accordance with this aspect of the invention, the fabric **26** comprises an ultrasonically bondable fabric as described above. An elastic element **52** such as an elastic cord or strip is placed against one side of the fabric **26** adjacent the edge thereof, and the edge of the fabric is folded over the elastic *element* **52** so as to encase the *elastic element* between opposing portions of the *fabric*. The *opposing* portions of the fabric are then ultrasonically bonded to each other by a suitable horn **44** and anvil **46**. An advantage of this technique for forming a tunneled elastic is that the elastic element **52** need not, although it can, be an ultrasonically bondable material. The ultrasonic bond between the opposing portions of the fabric **26** can be located so as not to penetrate through the *elastic element* **52**, if desired. The tunneled elastic construction can be employed as the waistband **50** for the panty **20**, and/or can be employed for elasticizing the leg openings **30** of the panty.

[0034] The above-described aspects of the invention are applicable to other types of garments beyond panties. For instance, **FIG. 2** depicts a brassiere **60** to which the invention can be applied. The brassiere **60** comprises a generally tubular fabric body **62** for encircling the upper torso, and *includes a pair of shoulder straps* **64**. The bottom edge of the brassiere *can include a band* **66** for providing a finished appearance to the edge and for preventing raveling of the fabric. A trim **68** is attached along the edges of the fabric in the region of the shoulder straps **64** and along the upper edge of the fabric body **62**. Typically, the trim **68** is elastic, although the invention as applied to brassieres is not limited to elastic trims. The band **66** can also be an elastic trim, but again is not limited to elastic materials; furthermore, the band **66** can instead be a turned welt in the case of circular knitting of the fabric body **62**. Any or all of the band **66** and trim **68** can be attached in the manner described above in connection with **FIGS. 4 and 5**. Alternatively, a tunneled elastic constructed in the manner described above in connection with **FIG. 6** can be formed along the bottom edge of the brassiere **60** and/or at the edges of the shoulder straps and/or along the upper edge of the fabric body **62**.

[0035] **FIG. 3** *depicts* a shirt or blouse **70** to which the invention can be applied. The blouse **70** comprises a generally tubular fabric body **72** for fitting over the torso, and includes arm openings **74** and a neck opening **76**, and a pair of shoulder straps **78**. The bottom edge of the blouse can include a band **80** for providing a finished appearance to the edge and for preventing raveling of the fabric. A decorative *trim* **82** is attached along the edges of the fabric encircling the arm openings **74** and the neck opening **76**. Any or all of the band **80** and trim **82** can be attached in the manner described above in connection with **FIGS. 4 and 5**. Typically, the band **80** and trim **82** are non-elastic, although the invention as applied to shirts or blouses is not limited to non-elastic bands and trims. Moreover, a tunneled elastic *constructed* in the manner described above in connection with **FIG. 6** can be formed along the bottom edge of the blouse **70** and/or about the arm and/or neck openings of the blouse.

[0036] **FIG. 7** depicts a bodysuit or swimsuit **90** to which the invention can be applied. The suit **90** comprises a generally tubular fabric body **92** having a front panel **94** that *covers the front* of the *upper and lower torso*, *and a back* panel **96** that covers the back of at least the lower torso and optionally the upper torso also, depending on the style of the *suit*. Lower portions of the front and back panels **94** and **96** are joined together along a seam **98** to form a gusset **100** that extends between the legs. The gusset can include a gusset panel **102** having a knit construction differing from that of the other parts of the suit, if desired. The gusset panel **102** in the illustrated embodiment is integrally knit with the front panel **94**. The suit defines a pair of leg openings **104** and *includes a pair of shoulder straps* **106**. A banding or trim **110** is attached along the edges of the fabric body encircling the leg openings and along the edges of the shoulder straps and the upper edge of the fabric body. The trim **110** can be an ultrasonically bondable material attached in the manner described above in connection with **FIGS. 4 and 5**. Alternatively, a tunneled elastic construction as shown in **FIG. 6** *can be formed along* any or all of *the edges* of the *suit* **90**.

[0037] A further aspect of the invention is depicted in **FIGS. 8, 9, and 12**, in the garments **20**, **60**, **70**, and **90** described above in connection with **FIGS. 1, 2, 3, and 7**, respectively, there are fabric panels that must be joined *together to create the finished* garment. Thus, in the panty **20** of **FIG. 1**, even though the fabric body **26** may be circularly knit as a one-piece tubular construction, the front panel **22** and back panel **24** must be attached together along at least *one seam or joint* **34** *in order to create the finished panty*. Likewise, for the brassiere **60** of **FIG. 2**, even though the fabric body **62** may be circularly knit as a one-piece tubular *construction*, *formation* of the shoulder straps requires joining a front panel and a back panel of each strap along at least one seam or joint **63** therebetween. The shoulder straps of the blouse **70** of **FIG. 3** and the shoulder straps of the bodysuit **90** of **FIG. 7** similarly require the formation of seams or joints **107** (**FIG. 7**), and the bodysuit **90** further requires at least one seam or joint **98** in the gusset region of the *garment*. Any or all of these seams or joints can be made by ultrasonic bonding in accordance with the present invention.

[0038] As an illustrative example, **FIGS. 8 and 9** show two alternative joint constructions between the front panel **22** and the back panel **24** of the panty of **FIG. 1**. In **FIG. 8**, the joint **34** between these panels comprises a butt joint, while the joint in **FIG. 9** is a lap joint. In each case, both panels **22** and **24** must be ultrasonically bondable fabrics, i.e., containing at least about 60 percent thermoplastic fibers by weight. For example, the fabric may be a blend of about 60 percent nylon and 40 percent cotton. The joint **34** is effected by placing the surfaces of the fabric panels **22** and **24** that are to be bonded together in contact with each other, and engaging the adjoining surfaces of the panels between an ultrasonic *horn and anvil* to locally heat and bond the panels at the joint.

[0039] **FIG. 13** shows an alternative embodiment of a joint **34'** in accordance with the invention. The joint **34'** has the advantage that one of the fabric panels need not, *although it can*, be ultrasonically bondable. Thus, the fabric panel **22'** is shown as being a non-thermoplastic fabric, while the fabric panel **24** is a fabric that is ultrasonically bondable, i.e., preferably containing at least about 60 percent thermoplastic fibers. The joint **34'** is made by sandwiching an edge of the non-ultrasonically bondable panel **22'** between opposing portions of the ultrasonically bondable panel **24** by *folding the edge of the panel* **24** *over* the edge of the panel **22'**, thus creating a lap joint. The lap joint is then ultrasonically bonded so that the thermoplastic material in the panel **24** permeates through the fabric panel **22'** in a manner similar to that described above in connection with **FIG. 5**, thus attaching the panel **22'** to the panel **24**. Advantageously, the panel **22'** can comprise substantially or entirely non-thermoplastic fibers such as cotton or other natural fibers. The invention thus enables ultrasonic bonding to be employed even though one of the panels being joined is not an ultrasonically bondable material.

[0040] **FIGS. 10 and 11** illustrate an application of this technique to the creation of a panty **120**, shown in an inside-out orientation. The panty **120** comprises a front panel **122** and a back panel **124** joined or integrally knit together to form a generally tubular fabric body **126**. Lower portions of the front and back panels are joined together in a suitable fashion so as to form a crotch or gusset portion **128** of the panty that extends between the wearer's legs and so as to form a pair of leg openings **130**. The gusset portion **128**

also includes an additional fabric panel or liner 129 that lines the inner surface of the gusset portion and thus is against the wearer's body. One end edge 133 of the liner 129 is joined with lower edges of the front panel 122 and back panel 124 at a joint 134. The opposite end edge 135 of the liner 129 preferably is left unattached to the front panel 122 except at the side edges thereof, as further described below.

[0041] The joint 134 is shown in detail in FIG. 11. The joint is made by sandwiching the edge 133 of the liner 129 between overlapping edges of the front and back panels 122 and 124, and locally heating the joint with an ultrasonic horn 44 and anvil 46 such that thermoplastic material from the overlapping edges of the front and back panels permeates through the edge of the liner 129, and then cools and solidifies to join all three panels together. An advantage of the joint 134 is that the liner 129 need not, although it can, comprise an ultrasonically bondable fabric. For example, the liner 129 can be an all-cotton panel for absorbency and breathability against the wearer's body.

[0042] As shown on the left-hand side of FIG. 12, the liner 129 can be attached to the panel 122 of the panty by sandwiching edges of the liner 129 and the panel 122 between opposing portions of an ultrasonically bondable trim 140 folded over the edges of the liner and panel and bonded thereto in the manner described above in connection with FIGS. 4 and 5. Alternatively, as shown on the right-hand side of FIG. 12, the edge of the panel 122 can be folded over the edge of the liner 129 such that each side edge of the liner 129 is sandwiched between opposing portions of the panel 122, and the opposing portions can be ultrasonically bonded to each other and the liner. In this case, the trim 140 is not needed for joining the liner to the garment, although it can be included, if desired. An elastic element (not shown) can also be disposed between the opposing portions of the panel 122 to form a tunneled elastic construction as described above in connection with FIG. 6, if desired.

[0043] Clearly, although not illustrated in the drawings, the construction of the gusset 128 described above can also be applied to garments other than panties, including but not limited to bodysuits, swimsuits, and the like. Moreover, the general principle of attaching a liner to a garment by sandwiching the edges of the liner between folded-over opposing portions of an ultrasonically bondable component of the garment and then ultrasonically bonding the opposing portions to each other and to the liner, can be applied to many types of garments having liners, including but not limited to panties, brassieres, blouses, bodysuits, swimsuits, skirts, dresses, and others. It will also be recognized, of course, that instead of sandwiching the edges of the liner between opposing portions of the component of the garment, the component of the garment could be sandwiched between opposing portions of the liner and ultrasonically bonded thereto, provided the liner is an ultrasonically bondable fabric, in which case the component of the garment need not be ultrasonically bondable.

[0044] The invention thus provides garments and methods allowing many if not all of the conventional sewing operations performed in the assembly and finishing of garments to be replaced by thermal bonding operations. Preferably, ultrasonic bonding is employed because of the high speed at which the joints can be made. The ultrasonic bonding process also lends itself to a greater degree of control over the bonding process so that desired characteristics of the joint can be obtained. In this regard, preferably the dwell time and frequency of the ultrasonic energy applied to the joint are selected so as to obtain a "soft" joint that is comfortable when against the wearer. The particular dwell time and frequency for achieving such a soft joint depend largely on the type of fabric materials being joined, and thus no general rule of thumb can be given for selecting these variables.

[0045] Many modifications and other embodiments of the invention will come to mind to one skilled in the art to which this invention pertains having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the invention is not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

What is claimed is:

1. A garment having an elastic element attached without sewing, comprising:

a fabric body having a fabric edge; and

a trim comprising a textile material attached to the fabric edge so as to extend at least partway therealong, the textile material including fibers of thermoplastic material and being wrapped around the fabric edge such that the fabric edge is sandwiched between opposing portions of the textile material, and the opposing portions of the textile material being heated at localized regions thereof so as to cause thermoplastic material in the opposing portions to become plastic and penetrate through the fabric edge and flow together, the thermoplastic material then being allowed to cool and solidify so as to bond the opposing portions to each other and to the fabric edge.

2. The garment of claim 1, wherein the fabric body comprises less than about 20 percent thermoplastic fibers by weight and the trim comprises at least about 60 percent thermoplastic fibers by weight.

3. The garment of claim 2, wherein the fabric body comprises substantially entirely non-thermoplastic fibers.

4. The garment of claim 1, wherein the garment comprises a panty having a waist opening and two leg openings, each opening being circumscribed by a fabric edge, and wherein the trim comprises an elastic textile material and is attached to the fabric edge at least at the waist opening so as to form a waistband for the garment.

5. The garment of claim 1, wherein the garment comprises a panty having a waist opening and two leg openings, each opening being circumscribed by a fabric edge, and wherein the trim comprises an elastic textile material and is attached to the fabric edges at least at each of the leg openings.

6. The garment of claim 5, wherein the trim is also attached to the fabric edge at the waist opening so as to form a waistband for the garment.

7. The garment of claim 6, wherein the trim at each opening is attached to the fabric body by ultrasonic bonding.

8. The garment of claim 1, wherein the garment comprises a panty, the fabric body including a front panel and a back panel each including fibers of thermoplastic material, an edge of the front panel being ultrasonically bonded to an edge of the back panel in a crotch region of the garment.

9. The garment of claim 8, wherein an ultrasonically bonded lap joint is formed between the front and back panels.

10. The garment of claim 8, wherein an ultrasonically bonded butt joint is formed between the front and back panels.

11. The garment of claim 1, wherein the garment comprises a brassiere.

12. The garment of claim 1, wherein the garment comprises a bodysuit having leg openings, the trim comprising an elastic textile material and being attached at least about the leg openings.

13. The garment of claim 1, wherein the garment comprises a shirt or blouse having a neck opening, the trim being attached at least about the neck opening.

14. The garment of claim 1, wherein the trim is ultrasonically heated and bonded at a plurality of localized regions spaced apart along a length of the fabric edge.

15. The garment of claim 1, wherein the trim is ultrasonically heated and bonded at localized regions forming a decorative pattern.

16. A garment having elastic attached without sewing, comprising:

a fabric body having a fabric edge, the fabric edge including fibers of thermoplastic material, and

an elastic element attached to the fabric edge so as to extend at least partway therealong, the fabric edge being folded over the elastic element such that the elastic element is encased by the fabric and opposing portions of the fabric edge are in contact with each other, and the opposing portions of the fabric edge being heated at localized regions thereof so as to cause thermoplastic material in the opposing portions to become plastic and flow together, the thermoplastic material then being allowed to cool and solidify so as to bond the opposing portions to each other, thereby forming a tunneled elastic.

17. The garment of claim 16, wherein the opposing portions of the fabric edge are ultrasonically bonded to each other.

18. The garment of claim 16, wherein the garment comprises a panty having a waist opening, the elastic element extending about the waist opening.

19. A garment, comprising:

a generally tubular fabric body for encircling at least a lower portion of a torso of a wearer and having a front panel and a back panel joined together at lower portions thereof so as to form a gusset portion of the garment that extends between the wearer's legs, at least one of the front and back panels comprising an ultrasonically bondable fabric and the front and back panels being ultrasonically bonded together at a joint in the gusset portion.

20. The garment of claim 19, wherein one of the front and back panels comprises an ultrasonically bondable panel and the other of the panels comprises a non-ultrasonically bondable panel, an edge of the ultrasonically bondable panel being folded over an edge of the non-ultrasonically bondable panel so as to sandwich the edge of the non-ultrasonically bondable panel between opposing portions of the ultrasonically bondable panel, and the opposing portions being ultrasonically bonded to each other and to the non-ultrasonically bondable panel.

21. The garment of claim 19, wherein both of the front and back panels comprise ultrasonically bondable panels.

22. The garment of claim 21, further comprising a liner attached to the garment adjacent an inner surface of the gusset portion, an edge of the liner being sandwiched between an edge of the front panel and an edge of the back panel, the edges of the front and back panel being ultrasonically bonded to each other and to the liner.

23. The garment of claim 22, wherein the liner comprises a non-ultrasonically bondable material.

24. A garment, comprising:

a generally tubular fabric body including at least one fabric panel having an inner surface that faces a wearer of the garment, the fabric panel having opposite edges; and

a fabric liner disposed against the inner surface of the at least one fabric panel and having opposite edges joined to the opposite edges of the fabric panel;

wherein at least one of the fabric panel and liner comprises an ultrasonically bondable fabric the opposite edges of which are folded over the corresponding opposite edges of the other of the fabric panel and liner and are ultrasonically bonded to attach the liner to the panel.

25. The garment of claim 24, wherein the other of the fabric panel and liner comprises a non-ultrasonically bondable fabric.

26. The garment of claim 25, wherein liner is the non-ultrasonically bondable fabric.

* * * * *

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(54) SYSTEM AND METHOD FOR NOT-SEW MANUFACTURING

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(63) Continuation-in-part of application No. 10/001,286, filed on Nov. 30, 2001.

(60) Provisional application No. 60/330,119, filed on Oct. 16, 2001.

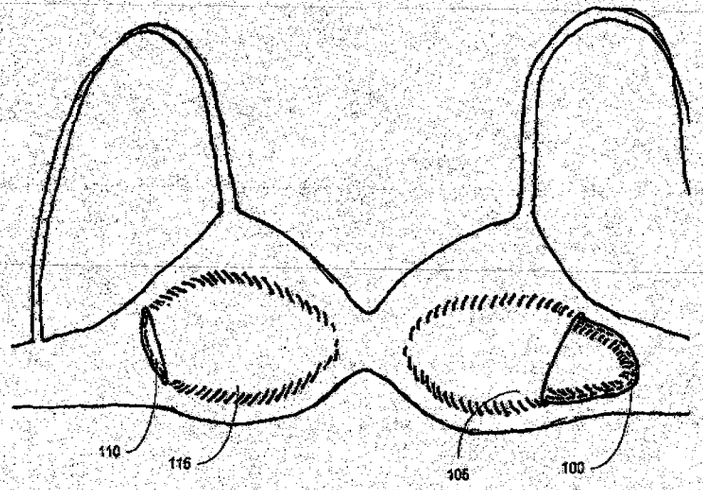
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(52) U.S. Cl. 450/39

(57) ABSTRACT

A method and system for making garments is disclosed that does not require sewing and is amenable to continuous manufacturing. This method and system makes possible a seamless garment finish that is more comfortable than a finish having seams and other imperfections due to the need to tuck/sew edges and joints. The disclosed seamless technology employs a thin film of adhesive that is preferably an ether-based polyurethane although other comparable adhesives are acceptable. This adhesive is prelaminated on at least one surface prior to lamination to another surface under conditions to control adhesion, stretch, breathability, and longevity of the garment. Lamination also allows for a seamless finish without fraying at the edges resulting in even displacement of pressure against the skin of the wearer for greater comfort. Disclosed seamless manufacturing techniques can be applied in an iterative fashion to manufacture inserts and support elements incorporated into laminated garments.



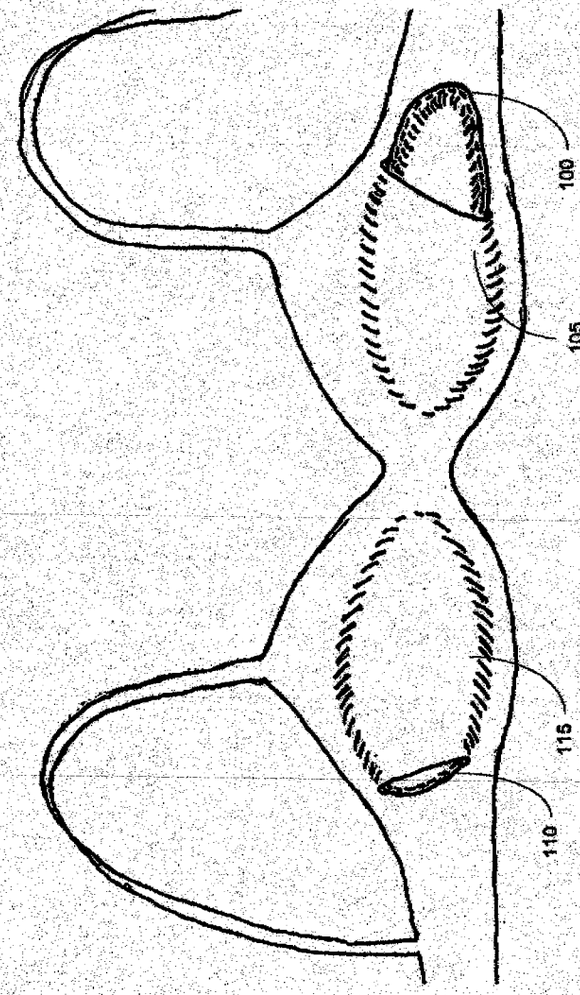


FIGURE 1

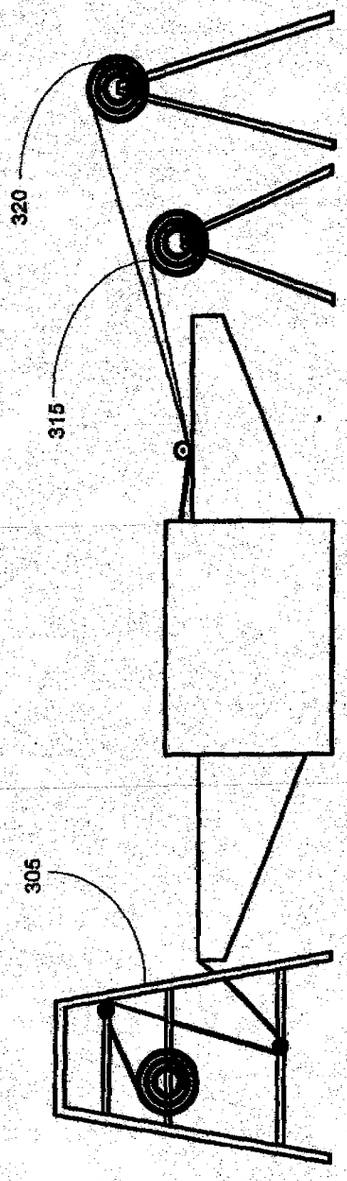


FIGURE 2

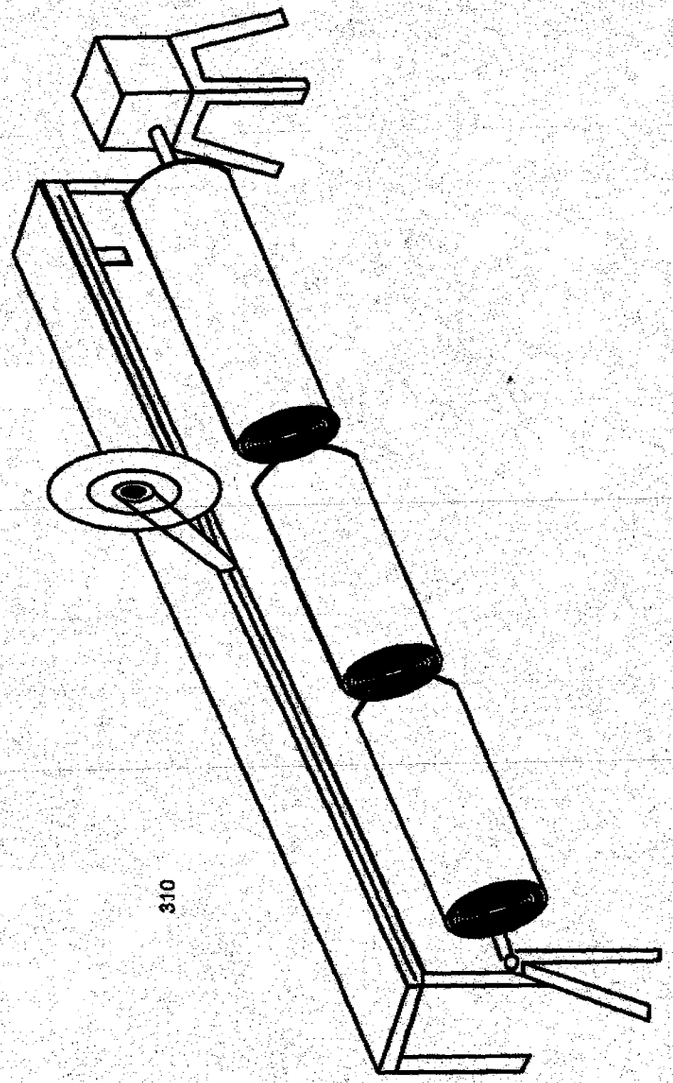


FIGURE 3

A57
472

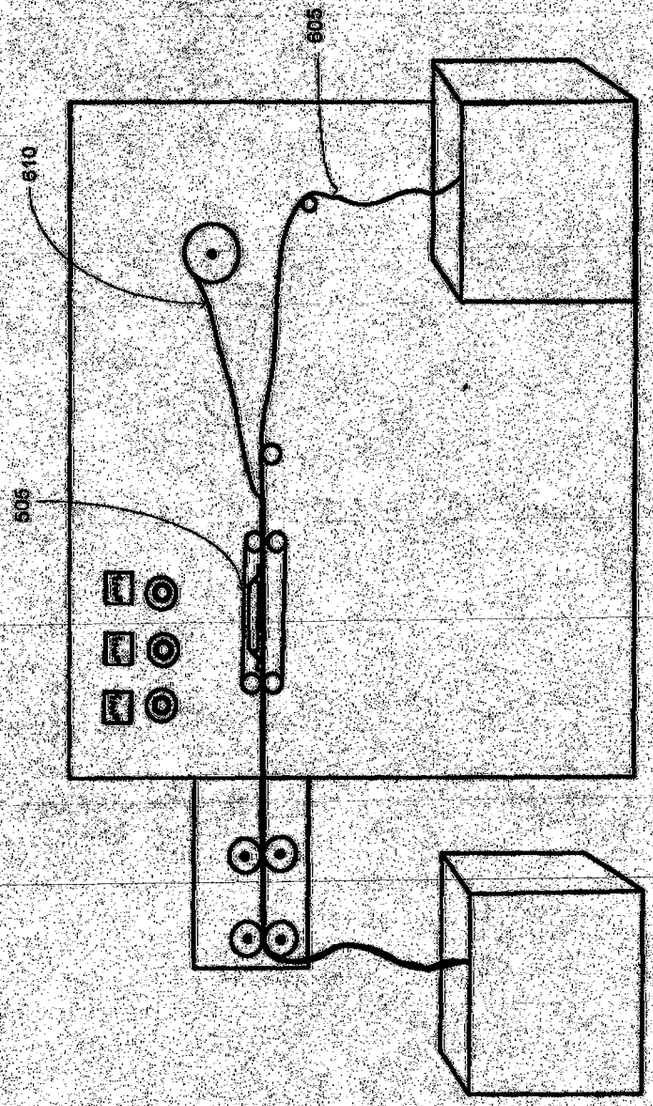


FIGURE 4

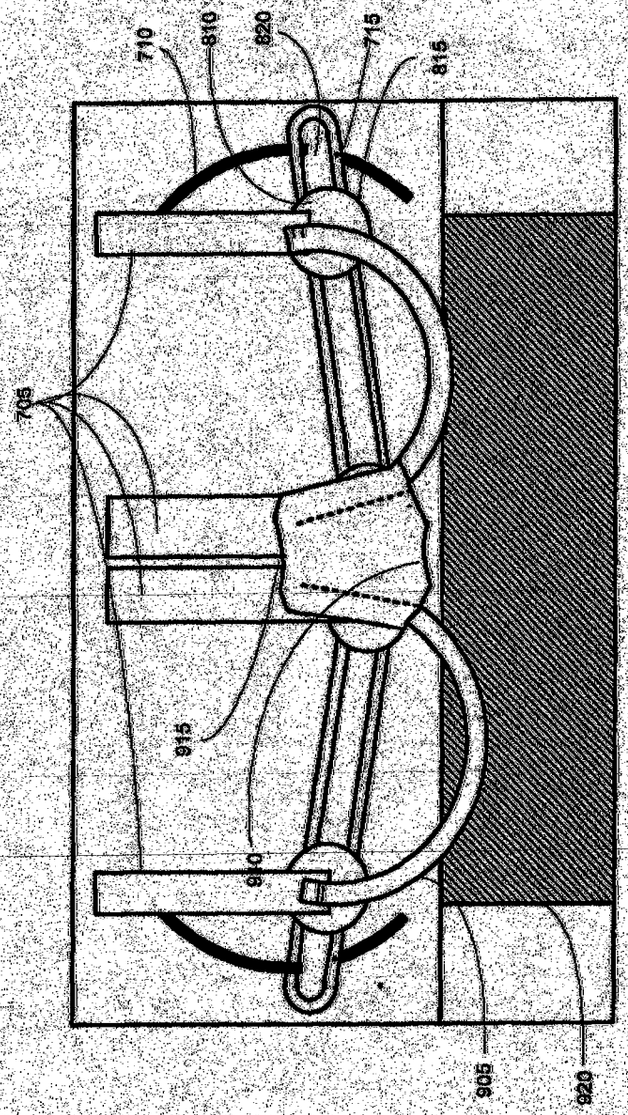


Figure 5

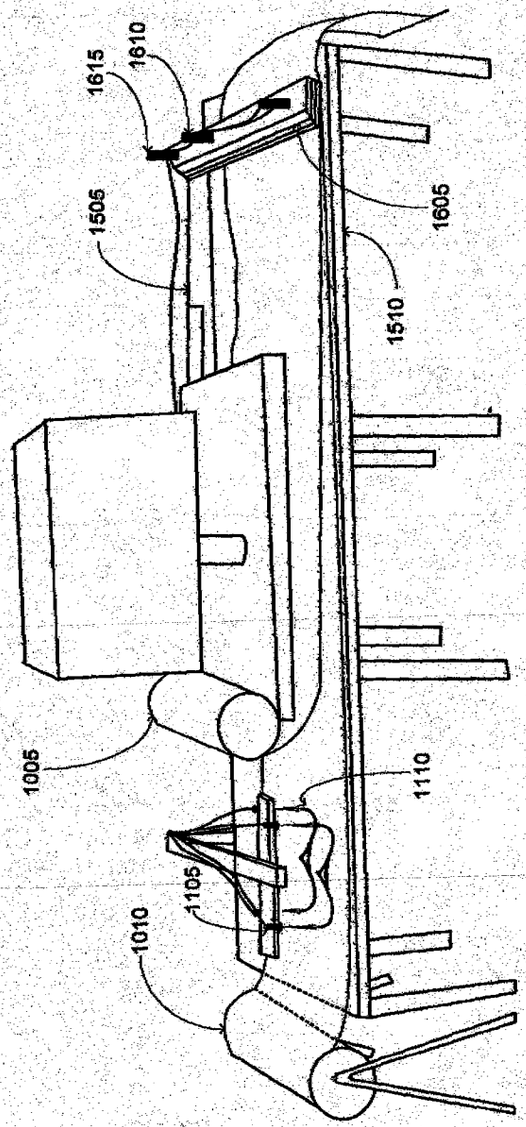


FIGURE 6

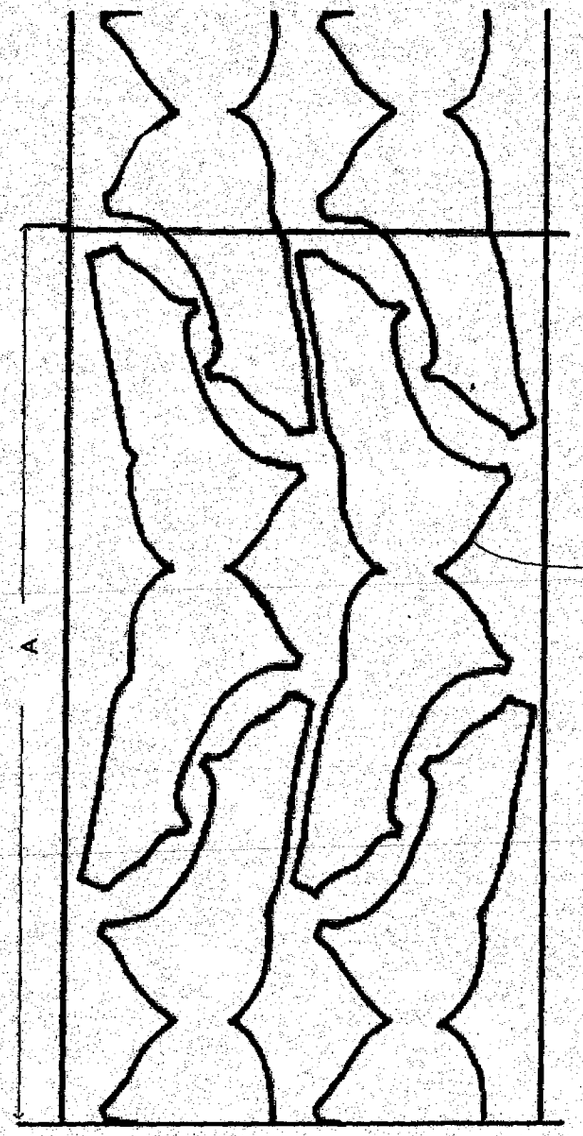


FIGURE 7

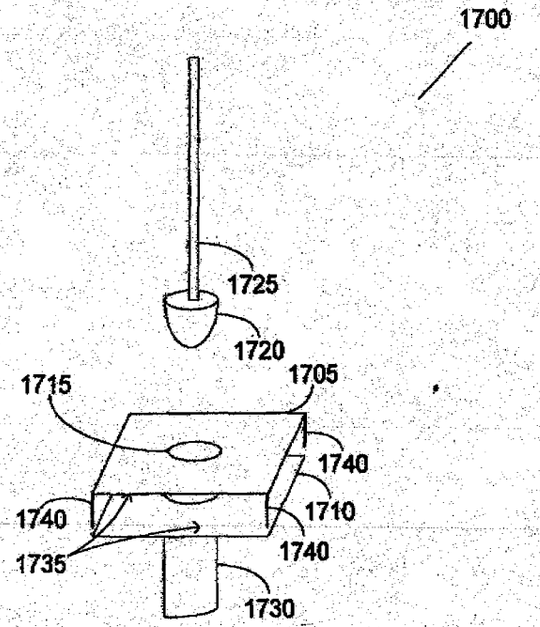


FIGURE 8

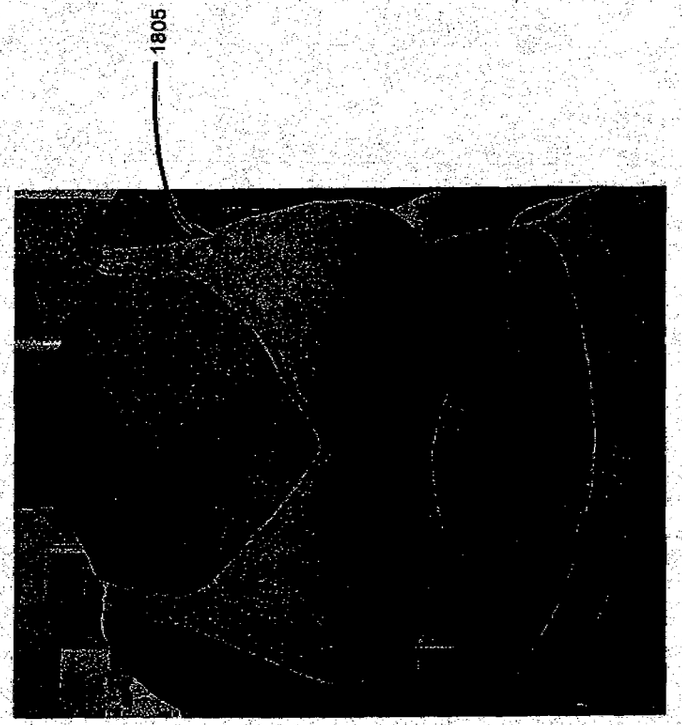


FIGURE 9

SYSTEM AND METHOD FOR NOT-SEW MANUFACTURING

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application, claiming priority from the pending provisional U.S. Patent Application No. 60/412,674 filed on Sep. 19, 2002, is also a continuation-in-part of co-pending non-provisional U.S. patent application Ser. No. 10/001,286 filed on Nov. 30, 2001, which includes a claim of priority to the U.S. provisional Application 60/330,119 filed on Oct. 16, 2001, U.S. patent application Ser. No. 09/569,004 filed on May 11, 2000 and Ser. No. 09/690,800 filed on Oct. 17, 2000), which in turn claims priority to the U.S. patent application Ser. No. 09/309,441 filed on May 11, 1999 and which issued as U.S. Pat. No. 6,152,265. All of these applications and patents are herein incorporated by reference in their entirety.

FIELD OF THE INVENTION

[0002] The present invention relates generally to manufacturing of garments via fabric lamination and an intermediate pre-laminating step and without requiring stitching. More specifically, the laminate fabric has particular utility in conjunction with women's undergarments, such as panties and brassieres as well as undergarments in general by providing cost-efficient construction of reinforced garments with desired texture, function and porosity.

NOTICE REGARDING COPYRIGHTED AND TRADEMARKED MATERIAL

[0003] A portion of the disclosure of this patent document contains material in the drawings subject to copyright protection. In addition, NOT-SEW™ SEAMLESS TECHNOLOGY, and "nothing smoother" are trademarks and slogans variously protected against use in a manner interfering with the business of the owner of said marks. The assignee of the marks has no objection to the facsimile reproduction by anyone of the patent document or the patent disclosure as it appears in the Patent and Trademark Office file or records, but otherwise reserves all right whatsoever including said copyrights.

BACKGROUND OF THE INVENTION

[0004] This application incorporates the U.S. patent application Ser. No. 10/001,286 filed on Nov. 30, 2001 by reference in its entirety for its teachings and disclosure. This application also incorporates the U.S. Provisional Patent Application No. 60/330,119 filed on Oct. 16, 2001 by reference in its entirety for its teachings and disclosure.

[0005] The use of laminates and other reinforcing materials to provide additional support or control at selective portions of an undergarment is generally well known. For example, Pramstel et al U.S. Pat. No. 4,776,9116 and Bell et al. U.S. Pat. No. 4,701,964 disclose the utilization of a powdered adhesive material. The utilization of the 'silk screen for applying the powdered adhesive limits the manufacturing speed and overall efficiencies in the fabrication of such a laminate and the resultant undergarments.

[0006] The selective reinforcement of portions of a foundation garment by an intermediate plastic layer having adhesive qualities is also shown in Byrne U.S. Pat. No. 3,228,401. In that patent the plastic reinforcing material is applied to the fabric as a flowable paste that flows into the fabric to embed the individual threads forming the fabric. The flowing of the plastic into the fabric results in an undesired stiffening of the fabric, changing its hand, a technical term for the feel, softness and appeal of the fabric, resulting in irritation to the skin of the wearer. Similarly, U.S. Pat. Nos. 3,225,768 and 3,320,346 issued to Gulfizzi et al show a cloth and plastic laminate for a breast support such as a bathing suit with the elastomeric polyethylene polymer bonding two fabrics together with the plastic flowing within the interstices of the fabric. Likewise, Scott U.S. Pat. No. 3,327,707 uses an elastomeric adhesive to secure a stomach control panel to a foundation garment with the adhesive flowing into the girdle fabric to lock itself around the individual stretch yarns.

[0007] The utilization of stiffening panels or other elements within undergarments or other apparel products is also generally known, for instance, U.S. Pat. No. 3,021,844, issued to Blagg et al., shows a brassiere reinforced in the breast cup area by a stiffening liner; U.S. Pat. No. 3,750,679 is similarly directed to a brassiere having a plurality of plastic stays positioned below the cup portion; U.S. Pat. No. 2,915,067 illustrates stiffening elements adhesively secured to the lower cup portion of a brassiere, or waist band of a girdle; U.S. Pat. No. 4,172,002 teaches laminating a pair of mold able fabric as a brassiere undercup support element.

[0008] Brassieres present additional manufacturing challenges due to issues related to comfort, appearance and marketing. Typically, brassieres may be sheer, lined, or padded for reasons of appearance and comfort. There are essentially two varieties of lined or padded bras—cut-and-sew, and molded. The cut-and-sew variety creates the shape of its cup and padding by assembling pre-cut components while molded brassieres are provided cups by heat or pressure based shaping of materials and pads. Sheer or unlined brassieres have no lining whatsoever often resulting in nipples showing through, a quality that is often regarded with disfavor by many, but not all, customers. Lined brassieres are both more comfortable than sheer brassieres and are better at concealing nipples while retaining a more realistic look when worn. Typically lined brassieres contain an additional layer that is one eighth to a quarter inch thick. Padded brassieres are heavier than lined brassieres and are often designed to enhance the apparent size of the bust or provide increased comfort to the wearer. Padded brassieres are almost always sewn with the undesirable feel of sewn edges and inserts.

[0009] With regard to brassieres, hanger appeal refers to the customer's first impression when they see the garment on the hanger at retail. In particular, a lightly lined brassiere has greater hanger appeal than an unlined version, specifically because the unlined bras droop in the breast due to the lack of support, whereas the lined version is better at holding its shape. Thus, the consumer can immediately envision how it will look when worn without having to try it on. Thus, a manufacturing challenge is to make a lined brassiere without uncomfortable seams that is economical to make, perspiration resistant, does not discolor with use or light and still provide a good hand and hanger appeal. To this end lamination has been attempted unsuccessfully for both lined and padded brassieres.

[0010] U.S. Pat. No. 4,372,321 provides a brassiere having a unitary molded breast cup including an intermediate lower cup support panel adhesively bonded to the cup by a polyester hot melt adhesive typically applied through a screen that allows dotted coverage of the surface. Such an adhesive pattern makes the orientation of the adhesive a factor in controlling the overall laminate elongation characteristics. U.S. Pat. No. 3,313,645 discloses another method for forming a laminate or molded article such as brassiere cups with an intermediate plastic layer while U.S. Pat. Nos. 4,376,445 and 4,419,997 are directed to molded cup brassiere in which the cup is formed of a laminate consisting of two layers of stretchable material which include a non-stretchable crown portion, a substantially non-stretchable longitudinal cup portion and a unitary multi-directional stretchable periphery portion. These attempts fail at providing the lightness associated with lined brassieres while requiring the use of plastic cups and the like. It should also be noted that making large cup sizes is a problem with the molding technique described above. In general, it is not possible to economically make cup sizes larger than a size 38 due to problems associated with material thinning, fraying, and other quality issues.

[0011] Lining or padding is typically made from either fiber or foam that simply lack the stretch needed to bubble mold. Therefore, when making a padded, seamless bra, manufacturers have historically turned to form molding.

[0012] Foam molding does not require much stretch at all; instead, male and female molds are heated and pressed together to essentially melt the foam or fiber padding into the desired shape. This method is however, not suitable for providing cups in a completed bra since the pads are molded first, and then assembled into the garment later. The reason for this limitation is that once the underwire has been placed into the bra, e.g., as channeling, it is almost impossible to place the bra within the male and female molds in a manner that will not damage the garment by placing stress on the underwire. The molds tend to press against the wires in a manner that unacceptably increases the likelihood of tearing the outer fabric.

[0013] Some problems in providing thinner and different lamination to manufacture flexible laminated fabrics have been addressed. U.S. Pat. No. 3,989,268 is directed to a method for preparing a fabric laminate by laminating two fabrics by means of regularly recurring spaced geometric units of substantially dry adhesive film sandwiched between the outer fabric surfaces, with the result laminate having a raised pattern portion as determined by the adhesive pattern. U.S. Pat. No. 3,497,415 forms a laminate including fabrics of different elasticity secured together with a conventional adhesive, such that the laminate characteristics are primarily determined by the elasticity of the two fabric layers and U.S. Pat. No. 4,135,025 teaches varying the stretch characteristics of a fabric by selective insertion of different warp and weft threads into the fabric.

[0014] Similarly, aforementioned U.S. Pat. No. 5,447,462, incorporated herein in its entirety by reference, discloses fabric laminates formed such that both the characteristics and orientation of the adhesive layer, primarily a polyamide material, plays an important role in the laminate elongation characteristics. The adhesive comprises an integral adhesive, web which has differential elongation characteristics, characterized as offering different magnitudes of resistance to elongation when subjected to distortion in its different directions. Moreover, the adhesive web is confined to between the fabric layers without any appreciable penetration into the individual fabrics forming the laminate. The use of such an adhesive web is undesirable from the perspective of low-cost, high quality manufacturing due to the required handling during manufacturing, the desired stability of the adhesive upon repeated exposure to moisture and perspiration and introduction of pores without employing excessively thick adhesive layers.

[0015] In view of the above discussion it is clear that laminated brassieres are difficult to manufacture due to the various restrictions and desirable properties. For instance, this task is made difficult due to the presence of support wires in channeling in laminated brassieres that further requires that any cup molding step not stress or stretch the fabric excessively or damage the garment irreparably.

[0016] Therefore, it is desirable to improve manufacturing techniques and reduce cost for the mass production of laminated garments, typically including laminated support panels, e.g., panties and brassieres and other undergarments, with better adhesives, inserts and manufacturing procedures to resist damage due to garment wear and tear caused by exposure to moisture, heat and perspiration while providing superior feel and comfort to a person wearing the garment.

SUMMARY OF THE INVENTION

[0017] A method and system for designing and making garments is disclosed without requiring sewing to either join or finish one or more edges. This method and system, referred to as Not-Sew™ technology makes possible several advantages properties. For instance, a seamless garment finish is more comfortable than a finish having seams and other imperfections due to the need to tuck/sew edges and joints. Seamless undergarments are less apparent under close fitting outer clothing, thus, creating a more pleasant appearance and greater aesthetic appeal. In addition, lamination allows for the edges of a garment to remain unsewn by providing a fraying resistant seamless finish due to the presence of the adhesive. This results in even displacement of pressure against the skin of the wearer and greater comfort than other seamless garments. Not-Sew™ manufacturing techniques are more efficient and less costly than traditional sewing techniques. The Not-Sew™ technology employs a film of adhesive that is preferably an ether based polyurethane although other adhesives are acceptable. This adhesive is prelaminated and laminated under conditions to control adhesion, stretch, breathability, and longevity of the garment.

[0018] The disclosed invention further encompasses efficient manufacturing techniques for manufacturing of laminated garments. These techniques include continuous production from rolls, including "slit" rolls, of material rather than a "shirred" method using small pieces of fabric and material. Such techniques reduce or eliminate the time for repeated loading and unloading of sheets. Continuous production techniques include cutting of patterns to yield a greater number of garments and/or undergarments from a given amount of material by reducing wastage. In addition, the invention encompasses the manufacturing of brassieres with large cup sizes, such as cup sizes greater than 38 C, and

even cup sizes as large as 44 DD. The larger cup sizes are believed to be made possible, without intending to be bound by any theory, by the providing of a lining that also acts as a heat buffer, extra support and an extra layer of adhesives by the method and system disclosed by the invention. The invention also encompasses brassieres with inserts to make push-up brassieres for an improved appearance.

[0019] The invention also encompasses universal tooling for manufacturing stabilizers with channeling with low tolerances. Pieces so manufactured may have sealing and other operations performed, if desired, in a single operation machine stage.

[0020] The invention is further described in detail with the help of illustrative figures described briefly next.

DESCRIPTION OF THE DRAWINGS

[0021] FIG. 1 illustrates a brassiere with an insert, shown in both inserted into a pocket and partially withdrawn positions, to provide an uplift in appearance;

[0022] FIG. 2 is an illustration of a pre-lamination machine with fabric and adhesive rolls loaded thereon and suitable for continuous manufacturing that seamlessly incorporates the batch procedure;

[0023] FIG. 3 is a view of a cutting arrangement for preparing rolls of a desired width for prelamination;

[0024] FIG. 4 provides an illustrative view of a prelamination setup showing the adhesive and fabric feeds;

[0025] FIG. 5 illustrates an example universal tool for making center-front stabilizers;

[0026] FIG. 6 illustrates feeding of fabric and prelaminated fabric in a lamination machine suited for continuous production line with alignment of pieces with the aid of lasers in the course of a production line based manufacturing set-up;

[0027] FIG. 7 shows an illustrative pattern placement for reducing wastage by interleaving patterns in continuous manufacturing using rolls, including slit rolls;

[0028] FIG. 8 shows a bubble molding apparatus and process for creating a cup in a brassiere; and

[0029] FIG. 9 shows an example brassier with a cup size of 44 double D manufactured in accordance with the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0030] Lamination based manufacturing of garments although known in the art, is not as widely used as might be expected in view of the labor intensive nature of standard sewing techniques. One of the reasons is that the nature of the known adhesives was not suitable to provide long-lasting comfortable garments. Plastic does not allow for ready exchange of gases resulting in excessive building of moisture, odors and provides a less than desirable feel for the wearer. Other adhesives are susceptible to hydrolysis, particularly in undergarments, upon exposure to sweat, and other bodily fluids. Applicants have also determined that adhesives in the form of films are preferable to adhesives in the form of webs for laminating fabrics together. This is due so, in part, the improved consistency in adhesion following lamination made possible by films.

[0031] On the other hand, lamination makes possible easy construction of reinforced garments such that the reinforcement is in areas in need of reinforcement. Such reinforcement does not make the garment excessively bulky while providing desirable fabric feel close to the skin. The outer layer of an exemplary laminated garment can be selected for other properties such as removing moisture, appearance and the like without compromising on the feel of the garment or its durability. The glue that holds this all together is the adhesive used to laminate the plurality of layers together.

[0032] Aforementioned art describes various laminated garments and adhesives that are deficient in one or more respects. Applicants have discovered that use of thin films of adhesives, such as polyurethanes, is particularly suitable for manufacturing laminated garments. Preferably the thickness of the thin film is at least 0.5 mils and less than 20 mils, and ranges there between. More preferably the thickness of the film is from 0.5 mils to 2.0 mils. Even more preferably the thickness of the film is from 1.0 mils to 3.0 mils and most preferably the thickness of the film is from 1.0 mils to 1.5 mils. The use of a thin film enables pre-lamination, as described later, and adhesion while maintaining porosity, stretch, softness of hand, and avoiding imparting a bulky feel to the laminated garment.

[0033] Suitable films and webs of adhesives for practicing various embodiments of the invention exhibit high resistance to moisture and perspiration, in addition to possessing elastomeric and thermoplastic properties. An example film comprises ether-based polyurethane, and suitable lubricants, if any. The proportion of lubricants in such films is typically less than 1%, preferably less than 0.5% and even more preferably less than 0.1%. The preferred lubricant resists discoloration caused by exposure to UV or moisture/perspiration without intending to be bound by theory. An example film comprising a suitable lubricant is the "NO-SEW ADHESIVE FILM" manufactured and supplied by JPS Elastomerics of Holyoke, Mass. (also supplied as item #1310). Additional exemplary films comprise treated ester-based polyurethane and suitable lubricants, if any. The films can be composites of various thermoplastic materials. Preferably the adhesive film comprises at least 50% ether-based polyurethane, even more preferably 90% ether-based polyurethane and most preferably at least 99% ether-based polyurethane.

[0034] Resistance to moisture, perspiration, and hydrolysis is desirable in laminated garments and particularly in undergarments. Hydrolytic stability testing of polyester-based polyurethane and polyether-based polyurethane adhesives revealed that polyether-based polyurethane is preferable to polyester-based polyurethane. Polyurethanes are a thermoplastic material that exhibit elastomeric properties although they do not have internal cross-links to any appreciable degree. This makes them suitable for use as adhesives in lamination, especially in view of the tackiness of ether-based polyurethanes at suitable temperatures below their melt points, or glass transition temperatures. Typical glass transition temperatures are greater than or about 200° and may often be as high as 375 oF. Of course, a consideration is the stability of the fabric being laminated at the temperatures for making the adhesive tacky or actually melt. Next, the resistance to moisture (and perspiration) of various polyurethanes is discussed to illustrate the need to shift to better adhesives in preparing laminated garments.

[0035] FIG. 1 illustrates insert 100 half inserted in pocket 105 in a brassiere manufactured by the lamination techniques of the invention. FIG. 1 also illustrates the brassiere with insert 110 fully placed in pocket 115. The pocket may be manufactured by various methods including those described next. A slit in a laminated sheet provides a pocket in an embodiment of the invention. In another preferred embodiment, another prelaminated sheet is laminated in areas where the slit is made to provide the requisite edge finish and prevent fraying with age.

[0036] The Nu-Sew™ technology enables construction of a variety of different garments, including complex garments requiring inserts, supports and wires, with a simple procedure that interfaces well with traditional manufacturing techniques. In order to attach two layers, one of the layers is prelaminated with the adhesive layer by first heating the adhesive to a softness sufficient for tacking it to the fabric layer. This tacking helps in case of handling thin films since often the fabric layer itself is quite thin and the tacking step allows the adhesive and fabric to reinforce each other. The tacking temperature is preferably below the temperature for melting the adhesive, even more preferably at least 2 oF below the melt temperature for the adhesive film.

[0037] Following prelamination, the other layer is placed as desired on the prelaminated layer followed by application of additional heat and pressure for a defined amount of time, often termed cycle time to complete the lamination process. Naturally, the temperature for lamination is dependent on the particular adhesive film employed. Preferably, in the case of ether-based polyurethane films having thickness of less than 4 mils, the lamination temperature is about 300° F., more preferably the lamination temperature is about 350° F., and even more preferably the lamination temperature is about 375° F. These temperatures are accurate to about 20° F. It should be noted that the respective times for application of heat and pressure need not be the same. Consequently, use of a single cycle time in a described example embodiment of the invention is not intended to be a limitation on the scope of the invention. Different shaped panels can be placed in a desired manner to provide greater support or stability to particular areas. The entire garment can consist of as few as two layers.

[0038] FIG. 2 illustrates a pre-lamination machine in operation with re-winding machine 305 shown. FIG. 3 shows roll-slitter 310 for preparing rolls of a desired width. Pre-lamination machine of FIG. 2 also shows fabric 315 and adhesive 320 rolls as they are fed into it.

[0039] Support for undergarments like brassieres includes padding, providing wires in sleeves known as channeling, contoured cups for imparting a desired shape and support, and the like. Providing wires for supporting breasts for increased comfort is done by inserting wires in a pair of sleeves to hold the wire securely placing it relative to the other wire accurately and firmly as well as provide padding of wire for comfort of the wearer. Naturally, this requires construction of sleeves, typically by stitching resulting in significant expense due to the need for accuracy and extensive positioning, sewing, and insertion of wires. The entire process is termed "channeling." Similar operational details are encountered in making stiff collars for shirts and other garment shape imparting components.

[0040] In an example embodiment of the invention, two layers of non-stretch fabric, for instance taffeta, are laminated together to create a center-front-stabilizer channeling that prevents stretching of fabric between the cups in a brassier as a substitute for aforementioned channeled wires. FIG. 4 illustrates pre-lamination of channeling material with a heating source 305, which may be radio frequency (RF) as shown or other methods of providing heat, and liquid adhesive 610, and fabric 605 in an continuous process of pre-lamination to produce a pre-laminated channeling with an adhesive having desirable resistance to hydrolysis.

[0041] FIG. 5 illustrates a universal tool for further producing center-front stabilizers. Stops 705, for instance, prepared from foam, provide aids for positioning the center-front stabilizer assembly. Stops 705 are adjustable in many ways to allow production of various center-front stabilizers using the same tooling. For instance, pitch canal 710 allows adjustment of their relative pitch with a selected position maintained by pitch canal clamp 715. FIG. 5 also shows the universal tool with further adjustments including compensating seal pitch adjuster 810 held by diameter adjustment clamp 815 in diameter adjustment canal 820. Also shown for positioning the center of the center-front stabilizer is center-front spacing adjuster 825 held by center-front spacing clamp 805.

[0042] FIG. 5 also shows a center-front stabilizer held in the universal tool. Channeling 905, is held with center 915 of the center-front stabilizer and other end 910 of the center-front stabilizer stabilized with suitable stops, the entire assembly placed on bed 920 to carry out lamination operations and sealing of the ends of the channeling to hold the wires held therein. Advantageously the surface (not shown) that presses on the assembly also may carry one or more stops to support various parts of the center-front stabilizer.

[0043] FIG. 6 shows a lamination machine with top fabric roll 1005 and pre-laminated fabric roll 1010 being fed into the lamination machine. FIG. 6 further shows the use of lasers 1105 to help accurately, reproducibly and speedily place inserts, such as center-front stabilizers, on the spots 1110 formed by the lasers for continuous manufacturing. Following placement the lamination process produces a composite that may be cut to prepare a plurality of brassieres after adding one or more of buckles, clamps, hooks, and/or straps.

[0044] FIG. 8 illustrates an advantage of continuous production in reducing wastage. Traditional manufacturing by the sheet fed method typically prepares a composite sheet. Continuous manufacturing allows placement of interleaved brassiere blanks 1210 as shown with reduced wastage due to the eventual recovery of blanks that fall outside the boundaries of the sheet in the next cycle of lamination. The interleaved pattern may be varied, and need not be periodic only (quasi-crystalline placement patterns are also intended to be included). A typical production procedure allows side feeding of material corresponding to the size of the lamination platen in a cycle rather than the traditional front-loading of individual sheets. Thus, rolls and slit rolls of material are advantageously combined with the need to place inserts and other structures that preclude the use of rollers for providing the lamination heat and pressure.

[0048] FIG. 6 also shows a typical lamination machine with its platen that may be raised or lowered. FIG. 6 further illustrates *an example feeding mechanism* in a lamination machine. Shown is pneumatic piston drive 1605 for pulling a specified length of material for lamination. The lamination machine, in FIG. 6, further shows *feed clamp* 1605 for holding the material being pulled in by the pneumatic piston drive 1605. Feed clamp 1605 for holding the material is, in turn, controlled and driven by one or more synchronized pneumatic feed clamp pistons 1610. In addition, initial loading/release toggle 1615 facilitates the start or stopping of a production run.

[0046] Many lining patterns are possible including those *included* in the patent applications incorporated by reference herein. These lining patterns do more than merely add to cushion, they actually provide support and allow the manufacturing of larger *cup sizes which had not been commercially* possible for laminated brassiers.

[0047] FIG. 8 illustrates some steps in the bubble molding process for creating a cup, including large cup sizes, in a brassiere by application of heat and pressure. Bubble molding is a method typically used for unlined bras and is ideal for what is known as "post molding." Post molding is basically molding a completed bra as the final steps of its production, when it has been fully assembled. A typical bubble molding machine 1700 has a top plate 1705 and bottom plate 1710 (these hold the flat bra in place clamped between the top plate 1705 and bottom plate 1710) with matching holes 1715, a "bullet" shaped heated mold 1720, driven, eg. via rod 1725, that comes down into the hole 1715—stretching the fabric and heating the inner cup, while a heated can 1730 below the hole, into which the bullet 1720 is passed heats the outer layer of the cup being bubble molded as well. To ensure a firm grip and minimal, if any, damage to the brassiere, the inside surfaces 1735 of the top plate 1705 and bottom plate 1710 are padded. Moreover, the top and bottom plates are aligned and guided through any one of many possible mechanisms such as the depicted pins 1740. Alternative embodiments may include lasers beams, precision machined gears and other mechanisms known in the *art to ensure* proper alignment between the top plate 1705 and bottom plate 1710, along with a workpiece clamped between them.

[0048] As previously mentioned, bubble molding has not worked well with lined or padded bras. The reason for this is that bubble molding requires a great deal of stretch and give from the fabrics used, and whereas it is easy enough to find fabrics that will do this, it is not so easy to find lining or padding that will fit this criteria.

[0049] The use of a woven moldable stretch fabric allows production of a lined bra using the bubble molding method. A woven spacer *fabric that*, although a moldable stretch fabric, also has the thickness, and stiffness needed to meet the definition of a lined bra. Accordingly, the lining is first pre-laminated on one side with the adhesive film, cut to the desired cup shape, placed according to the garment's pattern within the "sandwich." Since the plates on a bubble molding machine are padded and not heated, there is no stress on the fabric around the underwires, if any, that are provided for supporting breasts encased in the cups when the brassiere is being worn.

[0050] In addition, the invention encompasses the manufacturing of brassieres with large cup sizes, such as cup sizes greater than 38 C, and even cup sizes as large as 44 DD. The larger cup sizes are believed to be made possible, without intending to be bound by any theory, by the providing of a lining that also acts as a heat buffer, extra support and an extra layer of adhesive(s) by the method and system disclosed by the invention. The invention also encompasses brassieres with inserts to make push-up brassieres for an improved appearance. Furthermore, it should be noted that the bubble *molding apparatus and method* disclosed herein admits of various variations including temperature, number of molds, making of intermediate sized cups and adding material/adhesives in the course of making larger cups, providing inserts, and other push-up elements to the brassiere, and the like.

[0051] FIG. 9 illustrates an example lined brassiere with bubble molded cups of size 44 DD (pronounced as double *D*), the brassiere *having a desired soft feeling* and hanger appeal, adequate support as well as unsewn edges 1805 that resist fraying.

[0052] Although the invention can be utilized to make a variety of different garments of greater or lesser complexity, *the general method* and applications remain the same. That is, two or more layers of fabrics (or other components, such as underwires) are laminated together with layer(s) of adhesive in between, *using heat and pressure* to soften the adhesive and press it into the fibers of the material. Different shaped panels can be pre-cut and positioned to provide greater support or stability in needed areas, or the entire garment may simply consist of two or more layers which are first laminated and then cut to the desired shape.

[0053] At this point, garments may be modified further by molding (such as with bra cups), by using ultrasonic or radio-frequency seals (such as for attaching straps), or even by sewing (for joining ends).

[0054] Fabrics are selected that a) have two-way stretch, b) are moldable, c) are not treated with dyes or softeners that will inhibit the adhesive, and d) fabrics to be laminated together have like physical properties compatible with being laminated together. The 'like physical properties' is not a limitation on the scope of the invention but merely a detail *in this embodiment* so that when the fabrics are stretched, molded, etc., they will act together and not put unnecessary strain on the adhesive.

[0055] Tests are then run to determine the optimum thickness and meltpoint of the film, in order to create the best bond and least strain (from heat of the laminating process) for said fabric(s). The main components of the N-S bra are the inner and outer layers of fabric, these act as a kind of sandwich for the *majority* of the other components (such as underwires, channeling, padding, stabilizing, and support fabrics, etc.). The inner side of one of these fabrics, as well as one side of all components to be placed within the "sandwich, is pre-laminated with the desired adhesive."

[0056] Pre-lamination is a process whereby the N-S film adhesive, typically an ether/based polyurethane film, preferably 1 to 1.5 mils (thousandths of an inch) thick is tacked to the fabrics to be used. The tacking is accomplished by using a lower temperature and less pressure than that of the actual laminating to avoid loss of the adhesive in the fibers of the fabric while allowing for easier handling of both adhesive and fabrics. Many fabrics are thin and susceptible to damage by excessive heat. Thus, *tacking* a thin adhesive film results in the combination being stronger and easier to handle in addition to providing better control over the subsequent lamination process itself. In this regard it should be noted that often adhesives lack a well defined melting point since they are similar to glassis and tend to soften progressively with *increasing* temperature. Consequently, the *temperature for* pre-laminating can be advantageously empirically determined to suit a particular fabric and production setup within the scope of the invention.

[0057] With pre-lamination completed, any components (pads, stabilizers, channeling) to be placed within the "sandwich" are die-cut or slit to the proper size/shape. In the case of channeling, underwires are inserted into the channels and sealed. The outer fabrics (both the pre-laminated and the *non-laminated*) are often cut into sheets corresponding in size to the bra patterns (three or four or even more can be cut from a single sheet). The bottom sheet (pre-laminated) is placed (adhesive side up) *on* the bed of the laminating press (a pressurized press with both top and bottom heated plates) using a system of pins and holes, which have been pre-located on the corners of the sheets. Using lasers to locate the proper placement, the internal components are placed upon the sheet (adhesive side up as well).

[0058] The top sheet is placed on top using the same system of pins and holes. The "sandwich" is then laminated corresponding to the temperature, cycle-time, and pressure designated by the previous testing. Using a "bubble molding" machine, the cups of the bra are molded to the proper *circumference to complete the manufacturing process.*

[0059] *The invention provides a practical* and cost effective method and system to manufacture laminated garments with a comfortable seamless finish and reduced visibility under tight-fitting clothing. The unfinished edges do not exhibit fraying resulting in even displacement of pressure against the skin of the wearer and even greater comfort than other seamless garments. Moreover, the disclosed manufacturing techniques are more efficient and less costly than traditional sewing techniques. In addition, use of sewing to add loops, belts, straps and other additions to a laminated *garment or portion thereof prepared* in accordance with the invention allows the invention to synergistically extend the range of methods and technologies for manufacturing garments.

[0060] Advantageously, an adhesive made in the form of a film provides more consistent physical properties than webs, powders, or liquid adhesives. This, naturally, is of significance in imparting resistance to delamination and fraying, the peeling apart of laminated surfaces. Moreover, an adhesive made from ether-based polyurethane resins (versus the known untreated ester-based polyurethane resins) is superior to previously employed adhesives. The disclosed cycle-time, temperature and pressure engineered processes (both adhesive and machinery) optimize adhesion, stretch, breathability, and longevity of garment *manufactured* in accordance therewith.

[0061] The disclosed method and system teach producing garments without, or with reduced amounts of, traditional sewing techniques. In lieu of sewing, fabrics are joined using a *laminating process* that is superior due to its unique adhesive and manufacturing process. It is particularly applicable to the manufacturing of intimate apparel (bras, panties), shapewear, and activewear, which because of their complex construction—that often need to withstand much more stretch than other garments—typically requires a great deal of *bulky and expensive* stitching.

[0062] Alternative *means for placing* or aligning fabrics, the order of cutting the fabrics and other similar details are not intended to be limiting in the described embodiments that are primarily intended to be illustrative.

[0063] It will be appreciated that the various features described herein may be used singly or in any combination thereof. Thus, the present invention is not limited to only the embodiments specifically described herein. While the foregoing description and drawings represent a preferred embodiment of the present invention, it will be understood that various additions, modifications, and substitutions may be made therein *without* departing from the spirit and scope of the present invention as defined in the accompanying claims. In particular, it will be clear to those skilled in the art that the present invention may be embodied in other specific forms, structures, and arrangements, and with other elements, and components, without departing from the spirit or essential characteristics thereof. One skilled in the art will appreciate that the invention may be used with many modifications of structure, arrangement, and components and otherwise, used in the practice of the invention, which are particularly adapted to specific environments and operative requirements without departing from the principles of the present invention. The presently disclosed embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims, and not limited to the foregoing description.

1. A fabric laminate comprising at least a *first fabric*, a second fabric and a heat sensitive adhesive layer, the adhesive layer pre-laminated on the first fabric in the form of a film tacked to the first fabric by application of pressure and temperature less than that required for lamination followed by placement of the adhesive layer between opposed surfaces of the first and second fabrics for adhesively securing *said first and second fabrics together along* their opposed surfaces in a lamination step by positioning the second fabric on the pre-laminated first fabric and applying sufficient pressure and temperature.

2. A method of manufacturing the laminated garment of claim 1, the method comprising the steps of:

determining a melt temperature of the adhesive layer;

selecting a tacking temperature below the melt temperature of the adhesive layer;

placing the adhesive layer on the first fabric layer;

applying a tacking pressure and the tacking temperature to the adhesive layer and the first fabric layer to generate a first preliminated *fabric layer*;

placing the first preliminated fabric layer against the second *fabric layer* sandwiching the adhesive layer between the first fabric layer and the second fabric layer;

applying a lamination pressure for a pressure cycle time to the sandwich;

applying a lamination temperature for a temperature cycle time to the sandwich such that the lamination temperature is not less than the melt temperature of the adhesive layer; and

shaping the laminated garment.

3. A method for manufacturing a laminated garment of claim 2 further including the step of elevating the laminated sandwich to shape the laminated garment.

4. A method for manufacturing a laminated garment of claim 3 further including the step of finishing the edges following the step of elevating with a top surface to contain fraying fibers generated by the elevating step.

5. A method of molding a cup in a laminated garment of claim 1, the method comprising the steps of:

placing a woven moldable stretch fabric between a prelaminated first fabric, the prelaminated first fabric having tacked on a first fabric a layer of adhesive, and a second fabric to create a pre-bubble mold assembly;

laminating the pre-bubble mold assembly by applying sufficient pressure and temperature for a cycle time;

placing the laminated pre-bubble mold assembly in a bubble molding assembly between padded bolding first and second plates; and

applying heat in a die connected to the first plate via a first hole and applying heat and pressure via a plunger pressed through an opening aligned with a second hole in the second plate that is aligned with the first hole.

6. The method of molding a cup in a laminated garment of claim 5 further comprising the step of selecting a plunger shape corresponding to a desired size and shape for the cup.

7. The method of molding a cup in a laminated garment of claim 5 wherein the plunger creates a cup size selected from greater than a C size, and at least a DD size.

8. The method of molding a cup in a laminated garment of claim 5 further comprising shaping, prior to bubble molding, the woven moldable stretch fabric to have an embossed trim just inside a hemline corresponding to the cup, with an ornamentally shaped die, to form a slot, or to form a slot to receive a wire insert adjacent to the woven moldable stretch fabric.

9. The method of molding a cup in a laminated garment of claim 8 wherein the die is scalloped.

10. The method of molding a cup in a laminated garment of claim 8 wherein the woven moldable stretch fabric is a spacer fabric shaped to adhesively receive a center front stabilizer channeling.

11. A brassiere for providing support to at least one breast of a wearer, the brassiere comprising:

at least two layers that are laminated together by an adhesive layer between them by application of heat and pressure;

a third layer of woven stretch fabric having an adhesive layer prelaminated thereon, sandwiched between the at least two layers;

at least one cup formed by a bubble molding process such that the at least two layers and the third layer in the area suitable for bubble molding are shaped into a cup having a desired size by the application of pressure and

at least one unsewn edge finished by lamination only.

12. The brassiere of claim 11 further having at least one strap reinforced by laminating a woven, stretch fabric between the at least two layers.

13. The brassiere of claim 11 wherein the adhesive layer is applied to one of the at least two layers in a prelaminating step at a temperature and pressure sufficient to make the adhesive layer tacky without melting followed by contacting another layer of the at least two layers to the prelaminated layer and laminating at sufficient temperature and pressure to melt the adhesive into the fibers of these at least two layers.

14. The brassiere of claim 11 further including at least one wire in association with the at least one cup.

15. An insert for providing support to the brassiere of claim 11 by providing support and definition to at least two cups placed in the brassiere, the insert comprising:

a bottom layer that is initially prelaminated with an adhesive layer by connecting them at a temperature and pressure that is not sufficient to completely melt the adhesive;

a set of precisely placed wire inserts to define the separation between the cups in a brassiere;

a top layer, made from a stretch nylon fabric, placed on the prelaminated side of the bottom layer so as to sandwich the wire inserts between the top and the bottom layers following lamination of the top and bottom layers by application of a pressure and temperature sufficient to melt the adhesive for a prescribed cycle time; and

a shape formed by elevating the laminated top and bottom layers to yield the insert having two appropriately spaced apart wires.

16. A method for continuous manufacturing of garments comprising inserts, the method comprising the steps of:

placing at least one insert on a section of material;

sandwiching the at least one insert prior to lamination;

drawing a length of material including the section of material into a lamination machine;

laminating the at least one insert by application of pressure and temperature; and

removing laminated material from the lamination machine.

17. The method of claim 16 wherein the step of placing the at least one insert is carried out with a placing aid.

18. The method of claim 17 wherein the first placing aid is one or more of a spot formed by at least one focused light source, at least one stop, and a spot formed by at least one laser.

19. A method for continuous manufacturing of inserts, including inserts for the method of claim 16, comprising insert components, the method comprising the steps of:

setting a universal tool to a set of specifications including desired curvature and spacing;

placing a first insert component with the aid of a first placing aid;

placing another insert component overlapping the at least one insert component

with the aid of a second placing aid;

laminating the at least one insert component to the another insert component by application of pressure and temperature; and

removing a laminated insert from the lamination machine.

20. The method of claim 19 wherein the first placing aid is one or more of a spot formed by at least one focused light source, at least one stop, and a spot formed by at least one laser.

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(54) NOT-SEW SEAMLESS TECHNOLOGY

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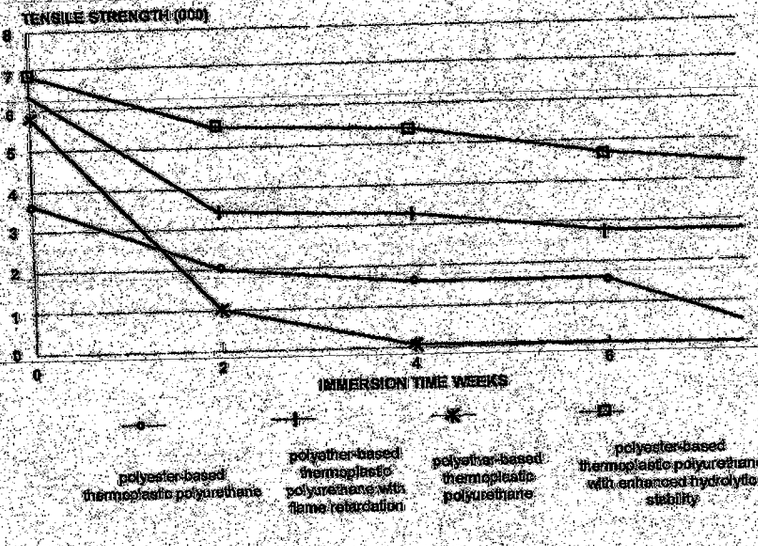
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(57) ABSTRACT

A method and system for designing and making garments is disclosed that does not require sewing. This method and system makes possible a seamless garment finish that is more comfortable than a finish having seams and other imperfections due to the need to nek/sew edges and joints. The disclosed seamless technology employs a thin film of adhesive that is preferably an ether-based polyurethane, although other adhesives are acceptable. This adhesive is prelaminated on at least one surface prior to lamination to another surface under conditions to control adhesion, stretch, breathability, and longevity of the garment. Lamination also allows for a seamless finish without fraying at the edges resulting in even displacement of pressure against the skin of the wearer for greater comfort. Disclosed seamless manufacturing techniques can be applied in an iterative fashion to manufacture inserts and support elements that are subsequently incorporated into laminated garments following additional lamination steps.



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NOT-SEW SEAMLESS TECHNOLOGY

FIELD OF THE INVENTION

[0001] The present invention relates generally to manufacturing of garments via fabric lamination and an intermediate pre-laminating step and without requiring stitching. More specifically, the laminate fabric has particular utility in conjunction with women's undergarments, such as panties and brassieres as well as undergarments in general by providing cost efficient construction of reinforced garments with desired texture, function, and porosity.

NOTICE REGARDING COPYRIGHTED AND TRADEMARKED MATERIAL

[0002] A portion of the disclosure of this patent document contains material in the drawings subject to copyright protection. In addition, NOT-SEW™ SEAMLESS TECHNOLOGY, and "nothing smoother" are trademarks and slogans variously protected against use in a manner interfering with the business of the owner of said marks. The assignee of the marks has no objection to the facsimile reproduction by anyone of the patent document or the patent disclosure as it appears in the Patent and Trademark Office file or records, but otherwise reserves all rights whatsoever including said copyrights.

BACKGROUND OF THE INVENTION

[0003] The use of laminates and other reinforcing materials to provide additional support or control at selective portions of an undergarment is generally well known. For example, Pruneski et al. U.S. Pat. No. 4,770,911.0 and Bell et al. U.S. Pat. No. 4,701,964 disclose the utilization of a powdered adhesive material. The utilization of the silk screen for applying the powdered adhesive limits the manufacturing speed and overall efficiencies in the fabrication of such a laminate and the resultant undergarments.

[0004] The selective reinforcement of portions of a foundation garment by an intermediate plastic layer having adhesive qualities is also shown in Byrne U.S. Pat. No. 3,228,401. In that patent the plastic reinforcing material is applied to the fabric as a flowable paste that flows into the fabric to embed the individual threads forming the fabric. The flowing of the plastic into the fabric results in an undesired stiffening of the fabric, changing its hand, a technical term for the feel, softness and appeal of the fabric, resulting in irritation to the skin of the wearer. Similarly, U.S. Pat. Nos. 3,228,768 and 3,320,546 issued to Galitzki et al show a cloth and plastic laminate for a breast support such as a bathing suit with the elastomeric polyethylene polymer bonding two fabrics together with the plastic flowing within the interstices of the fabric. Likewise, Stern U.S. Pat. No. 3,327,707 uses an elastomeric adhesive to secure a stomach control panel to a foundation garment with the adhesive flowing into the girdle fabric to lock itself around the individual stretch yarns.

[0005] The utilization of stiffening panels or other elements within undergarments or other apparel products is also generally known, for instance, U.S. Pat. No. 3,021,844, issued to Hagg et al., shows a brassiere reinforced in the breast cup area by a stiffening liner; U.S. Pat. No. 3,750,673 is similarly directed to a brassiere having a plurality of plastic stays positioned below the cup portion; U.S. Pat. No. 2,915,067 illustrates stiffening elements adhesively secured to the lower cup portion of a brassiere, or waist band of a girdle; U.S. Pat. No. 4,172,002 teaches laminating a patch of mold able fabric as a brassiere undercup support element.

[0006] Brassieres present additional manufacturing challenges due to issues related to comfort, appearance and marketing. Typically, brassieres may be sheer, lined, or padded for reasons of appearance and comfort. There are essentially two varieties of lined or padded bras—cut-and-sew, and molded. The cut-and-sew variety creates the shape of its cup and padding by assembling pre-cut components while molded brassieres are provided cups by heat or pressure based shaping of materials and pads. Sheer or unlined brassieres have no lining whatsoever often resulting in nipples showing through, a quality that is often regarded with disfavor by many, but not all, customers. Lined brassieres are both more comfortable than sheer brassieres and are better at concealing nipples while retaining a more realistic look when worn. Typically lined brassieres contain an additional layer that is one eighth to a quarter inch thick. Padded brassieres are heavier than lined brassieres and are often designed to enhance the apparent size of the bust or provide increased comfort to the wearer. Padded brassieres are almost always sewn with the undesirable feel of sewn edges and inserts.

[0007] With regard to brassieres, hanger appeal refers to the customer's first impression when they see the garment on the hanger at retail. In particular, a lightly lined brassiere has greater hanger appeal than an unlined version specifically because the unlined bras droop in the breast due to the lack of support, whereas the lined version is better at holding its shape. Thus, the consumer can immediately envision how it will look when worn without having to try it on. Thus, a manufacturing challenge is to make a lined brassiere without uncomfortable seams that is economical to make, perspiration resistant, does not discolor with use or light and still provide a good hand and hanger appeal. To this end lamination has been attempted unsuccessfully for both lined and padded brassieres.

[0008] U.S. Pat. No. 4,372,321 provides a brassiere having a unitary molded breast cup including an intermediate lower cup support panel adhesively bonded to the cup by a polyester hot melt adhesive typically applied through a screen that allows dotted coverage of the surface. Such an adhesive pattern makes the orientation of the adhesive a factor in controlling the overall laminate elongation characteristics. U.S. Pat. No. 3,317,645 discloses another method for forming a laminate or molded article such as brassiere cups with an intermediate plastic layer while U.S. Pat. Nos. 4,375,445 and 4,819,997 are directed to molded cup brassiere in which the cup is formed of a laminate consisting of two layers of stretchable material which include a non-stretchable crown portion, a substantially non-stretchable longitudinal cup portion and a unitary multi-directional stretchable periphery portion. These attempts fail at providing the lightness associated with lined brassieres while requiring the use of plastic cups and the like.

[0009] Lining or padding is typically made from either fiber or foam that simply lack the stretch needed to bubble mold. Therefore, when making a padded, seamless bra, manufacturers have historically turned to form molding.

[0010] Form molding does not require much stretch at all; instead, male and female molds are heated and pressed

together to essentially melt the foam or fiber padding into the desired shape. This method is however, not suitable for providing cups in a completed bra since the pads are molded first, and then assembled into the garment later. The reason for this limitation is that once the underwire has been placed into the bra, e.g., as channeling, it is almost impossible to place the bra within the male and female molds in a manner that will not damage the garment by placing stress on the underwire. The molds tend to press against the wires in a manner that unacceptably increases the likelihood of tearing the outer fabric.

[0011] Some problems in providing thinner and differential lamination to manufacture flexible laminated fabrics have been addressed. U.S. Pat. No. 3,383,269 is directed to a method for preparing a fabric laminate by laminating two fabrics by means of regularly recurring spaced geometric units of substantially dry adhesive film sandwiched between the outer fabric surfaces, with the result laminate having a raised pattern portion as determined by the adhesive pattern. U.S. Pat. No. 3,497,415 forms a laminate including fabrics of different elasticity secured together with a conventional adhesive, such that the laminate characteristics are primarily determined by the elasticity of the two fabric layers and U.S. Pat. No. 4,135,025 teaches varying the stretch characteristics of a fabric by selective insertion of different warp and weft threads into the fabric.

[0012] Similarly, aforementioned U.S. Pat. No. 5,447,462, incorporated herein in its entirety by reference, discloses fabric laminates formed such that both the characteristics and orientation of the adhesive layer, primarily a polyamide material, plays an important role in the laminate elongation characteristics. The adhesive comprises an integral adhesive, web which has differential elongation characteristics, characterized as offering different magnitudes of resistance to elongation when subjected to distortion in its different directions. Moreover, the adhesive web is confined to between the fabric layers without any appreciable penetration into the individual fabrics forming the laminate. The use of such an adhesive web is undesirable from the perspective of low-cost, high quality manufacturing due to the required handling during manufacturing, the desired stability of the adhesive upon repeated exposure to moisture and perspiration and introduction of pores without employing excessively thick adhesive layers.

[0013] In view of the above discussion it is clear that laminated brassieres are difficult to manufacture due to the various restrictions and desirable properties. For instance, this task is made difficult due to the presence of support wires in channeling in laminated brassieres that further requires that any cup molding step not stress or stretch the fabric excessively or damage the garment irreparably.

[0014] Therefore, it is desirable to improve manufacturing techniques and reduce cost for the mass production of laminated garments, typically including laminated support panels, e.g., panties and brassieres and other undergarments, with better adhesives, inserts and manufacturing procedures to resist damage due to garment wear and tear caused by exposure to moisture, heat and perspiration while providing superior feel and comfort to a person wearing the garment.

SUMMARY OF THE INVENTION

[0015] A method and system for designing and making garments is disclosed without requiring sewing to either join or finish edges. This method and system, referred to as Not-Sew™ technology makes possible several advantages properties. For instance, a seamless garment finish is more comfortable than a finish having seams and other imperfections due to the need to tack/sew edges and joints. Seamless undergarments are less apparent under close fitting outer clothing, thus, creating a more pleasant appearance and greater aesthetic appeal. In addition, lamination allows for the edges of a garment to remain unsewn by providing a fraying resistant seamless finish due to the presence of the adhesive. This results in even displacement of pressure against the skin of the wearer and greater comfort than other seamless garments. Not-Sew™ manufacturing techniques are more efficient and less costly than traditional sewing techniques. The Not-Sew™ technology employs a film of adhesive that is preferably an ether-based polyurethane although other adhesives are acceptable. This adhesive is prelaminated and laminated under conditions to control adhesion, stretch, breathability, and longevity of the garment.

DESCRIPTION OF THE DRAWINGS

[0016] FIG. 1 graphically presents data on comparison of hydrolytic stability measured by tensile strength of polyester-based thermoplastic polyurethane, polyester-based thermoplastic polyurethane with enhanced hydrolytic stability, polyether-based thermoplastic polyurethane with flame retardation, or polyether-based thermoplastic polyurethane;

[0017] FIG. 2 graphically presents data on comparison of hydrolytic stability measured by elongation of polyester-based thermoplastic polyurethane, polyester-based thermoplastic polyurethane with enhanced hydrolytic stability, polyether-based thermoplastic polyurethane with flame retardation, or polyether-based thermoplastic polyurethane;

[0018] FIG. 3 graphically presents data on comparison of hydrolytic stability measured by 100% tensile modulus of polyester-based thermoplastic polyurethane, polyester-based thermoplastic polyurethane with enhanced hydrolytic stability, polyether-based thermoplastic polyurethane with flame retardation, or polyether-based thermoplastic polyurethane;

[0019] FIG. 4 graphically presents an Arrhenius plot of data on hydrolytic stability of thermoplastic polyester-based polyurethane resin;

[0020] FIG. 5 graphically presents an Arrhenius plot of data on hydrolytic stability of thermoplastic polyether-based polyurethane resin;

[0021] FIG. 6 illustrates the preparation of an example insert by a method that includes lamination following pre-lamination;

[0022] FIG. 7 illustrates the preparation of a center-front-stabilizer channeling requiring placement of wires and support elements into a laminated support piece manufactured by pre-lamination followed by placement of the support pieces and then lamination;

[0023] FIG. 8 illustrates the structure of a center-front-stabilizer channeling prepared by lamination in an embodiment of the invention;

[0025] FIG. 10 shows half of an example brassier manufactured in accordance with the invention;

[0026] FIG. 11 shows an example lining for a brassiere cup prior to bubble molding;

[0027] FIG. 12 shows another example lining for a brassiere cup prior to bubble molding;

[0028] FIG. 13 shows a bubble molding process for creating a cup in a brassiere; and

[0029] FIG. 14 shows an example brassier manufactured in accordance with the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0030] Lamination based manufacturing of garments although known in the art, is not as widely used as might be expected in view of the labor intensive nature of standard sewing techniques. One of the reasons is that the nature of the known adhesives was not suitable to provide long-lasting comfortable garments. Plastic does not allow for ready exchange of gases resulting in excessive buildup of moisture, odors and provides a less than desirable feel for the wearer. Other adhesives are susceptible to hydrolysis, particularly in undergarments, upon exposure to sweat, and other bodily fluids. Applicants have also determined that adhesives in the form of films are preferable to adhesives in the form of webs for laminating fabrics together. This is due to, in part, the improved consistency in adhesion following lamination made possible by films.

[0031] On the other hand, lamination makes possible easy construction of reinforced garments such that the reinforcement is in areas in need of reinforcement. Such reinforcement does not make the garment excessively bulky while providing desirable fabric feel close to the skin. The outer layer of an exemplary laminated garment can be selected for other properties such as removing moisture, appearance and the like without compromising on the feel of the garment or its durability. The glue that holds this all together is the adhesive used to laminate the plurality of layers together.

[0032] Aforementioned art describes various laminated garments and adhesives that are deficient in one or more respects. Applicants have discovered that use of thin films of adhesives, such as polyurethanes, is particularly suitable for manufacturing laminated garments. Preferably the thickness of the thin film is at least 0.5 mils and less than 20 mils, and ranges there between. More preferably the thickness of the film is from 0.5 mils to 2.0 mils. Even more preferably the thickness of the film is from 1.0 mils to 5.0 mils and most preferably the thickness of the film is from 1.0 mils to 1.5 mils. The use of a thin film enables pre-lamination, as described later, and adhesion while maintaining porosity, stretch, softness of hand, and avoiding imparting a bulky feel to the laminated garment.

[0033] Suitable films and webs of adhesives for practicing various embodiments of the invention exhibit high resistance to moisture and perspiration, in addition to possessing elastomeric and thermoplastic properties. An example film comprises ether-based polyurethane, and suitable lubricants, if any. The proportion of lubricants in such films is typically less than 1%, preferably less than 0.5% and even more preferably less than 0.1%. The preferred lubricant resists discoloration caused by exposure to UV or moisture/perspiration without intending to be bound by theory. An example film comprising a suitable lubricant is the "NOT-SEW ADHESIVE FILM" manufactured and supplied by JRS Elastomerics of Holyoke, Mass. (also supplied as item #3410). Additional exemplary films comprise treated ester-based polyurethane and suitable lubricants, if any. The films can be composites of various thermoplastic materials. Preferably the adhesive film comprises at least 50% ether-based polyurethane, even more preferably 90% ether-based polyurethane and most preferably at least 99% ether-based polyurethane.

[0034] Resistance to moisture, perspiration, and hydrolysis is desirable in laminated garments and particularly in undergarments. Hydrolytic stability testing of polyester-based polyurethane and polyether-based polyurethane adhesives revealed that polyether-based polyurethane is preferable to polyester-based polyurethane. Polyurethanes are a thermoplastic material that exhibit elastomeric properties although they do not have internal cross-links to any appreciable degree. This makes them suitable for use as adhesives in lamination, especially in view of the tackiness of ether-based polyurethanes at suitable temperatures below their melt points, or glass transition temperatures. Typical glass transition temperatures are greater than or about 200° F. and may often be as high as 375° F. Of course, a consideration is the stability of the fabric being laminated at the temperatures for making the adhesive tacky or actually melt. Next, the resistance to moisture (and perspiration) of various polyurethanes is discussed to illustrate the need to shift to better adhesives in preparing laminated garments.

[0035] FIG. 1 illustrates measurement over time of the tensile strength of polyester-based thermoplastic polyurethane, polyester-based thermoplastic polyurethane with enhanced hydrolytic stability, polyether-based thermoplastic polyurethane with flame retardation, or polyether-based thermoplastic polyurethane respectively. The samples were tested after immersion in water at 85° C. for various periods of time to accelerate the effects of water immersion. As is readily observed, polyester-based polyurethane with enhanced hydrolytic stability was slightly better than polyether-based polyurethane while polyester-based polyurethane had the worst performance. Stability in the presence of moisture and/or perspiration is significant in garments, and undergarments in particular. Perspiration, typically present in high stress points in garments, is more corroding than moisture due to the presence of substances other than water alone.

[0036] FIG. 2 illustrates changes in the elongation properties of polyester-based thermoplastic polyurethane, polyester-based thermoplastic polyurethane with enhanced hydrolytic stability, polyether-based thermoplastic polyurethane with flame retardation, or polyether-based thermoplastic polyurethane respectively. These samples were also tested after immersion in water at 85° C. for various periods of time to accelerate the effects of water immersion. As is readily observed, polyether-based polyurethanes, with or without flame retardation, performed better than polyester-based polyurethanes with polyester-based polyurethane with enhanced hydrolytic stability having only a slightly worse elongation after four weeks in water at 85° C. than the polyether-based polyurethanes.

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[0037] **FIG. 3** illustrates measurement over time of the 100% tensile modulus of polyester-based thermoplastic polyurethane, polyester-based thermoplastic polyurethane with enhanced hydrolytic stability, polyether-based thermoplastic polyurethane with flame retardation, or polyether-based thermoplastic polyurethane respectively. These samples were also tested after immersion in water at 85° C. for various periods of time to accelerate the effects of water immersion. As is readily observed, polyester-based polyurethane again has the worst performance with polyether-based polyurethanes exhibiting stable characteristics over eight week of immersion in water. As noted in previous tests, polyester-based polyurethane with enhanced hydrolytic stability performed acceptably as well.

[0038] **FIG. 4** is an Arrhenius plot determined by using actual water immersion data taken over various time periods and temperatures to determine when the original tensile strength of the polyester-based polyurethane material falls to 30% of the original tensile strength if the material were to be immersed in water at room temperature. **FIG. 5** is a similar Arrhenius plot corresponding to polyether-based polyurethane material. As shown, polyether-based polyurethane has significantly greater resistance to hydrolysis at room temperature than polyester-based polyurethane at 9700 days compared to 740 days. These time durations are significant with respect to the expected life of a garment even without accounting for hot washes and the inevitable harsh treatment accompanying regular use.

[0039] Therefore, polyether-based polyurethanes, polyester-based polyurethane with enhanced hydrolytic stability are preferable as thermoplastic adhesives for preparing laminated garments. Advantageously, such adhesives should exhibit hydrolytic stability (measured by retention of greater than 50% of the tensile strength or similar metric) of greater than 740 days, preferably greater than 800 days, even more preferably greater than one thousand days, even more preferably greater than five thousand days and most preferably of greater than or equal to nine thousand days.

[0040] The Not Sew™ technology enables construction of a variety of different garments, including complex garments requiring liners, supports and wires, with a simple procedure that interfaces well with traditional manufacturing techniques. In order to attach two layers, one of the layers is prelaminated with the adhesive layer by first heating the adhesive to a softness sufficient for tacking it to the fabric layer. This tacking helps in case of handling thin films since often the fabric layer itself is quite thin and the tacking step allows the adhesive and fabric to reinforce each other. The tacking temperature is preferably below the temperature for melting the adhesive, even more preferably at least 20° F. below the melt temperature for the adhesive film.

[0041] Following prelamination, the other layer is placed as desired on the prelaminated layer followed by application of additional heat and pressure for a defined amount of time, often termed cycle time to complete the lamination process. Naturally, the temperature for lamination is dependent on the particular adhesive film employed. Preferably, in the case of ether-based polyurethane films having thickness of less than 4 mils, the lamination temperature is about 300° F., more preferably the lamination temperature is about 350° F., and even more preferably the lamination temperature is about 375° F. These temperatures are accurate to about 20° F. It should be noted that the respective times for application of heat and pressure need not be the same. Consequently, use of a single cycle time in a described example embodiment of the invention is not intended to be a limitation on the scope of the invention. Different shaped panels can be placed in a desired manner to provide greater support or stability to particular areas. The entire garment can consist of as few as two layers.

[0042] Support for undergarments like brassieres includes padding, providing wires in sleeves known as channeling, contoured cups for imparting a desired shape and support, and the like. Providing wires for supporting breasts for increased comfort is done by inserting wires in a pair of sleeves to hold the wire securely placing it relative to the other wire accurately and firmly as well as provide padding of wire for comfort of the wearer. Naturally, this requires construction of sleeves, typically by stitching resulting in significant expense due to the need for accuracy and extensive positioning, sewing, and insertion of wires. The entire process is termed "channeling." Similar operational details are encountered in making stiff collars for shirts and other garment shape imparting components.

[0043] In an example embodiment of the invention, two layers of non-stretch fabric, for instance taffeta, are laminated together to create a center-front-stabilizer channeling that prevents smashing of fabric between the cups in a brassier as a substitute for aforementioned channeled wires. **FIG. 6** illustrates some significant details from such an embodiment. First fabric **600** is pre-laminated with an adhesive having desirable resistance to hydrolysis. Wire **605** is placed with a desired precision to form spaced apart pairs **610** on first fabric **600** on top of the pre-laminated side of first fabric **600**. Second fabric **625** is then placed on top of first fabric **600** and pressed at a predetermined temperature and pressure for the duration of a cycle-time to laminate the two fabrics. Pairs of wires enclosed in box **630** are die-cut to obtain center-front-stabilizer channeling for insertion into a brassiere. The die-cut center-front-stabilizer channeling preferably appears as shown in **FIG. 6**.

[0044] **FIG. 7** illustrates one of the example methods for efficiently placing accurately spaced apart wires to make center-front-stabilizer channelings. First fabric **700** following pre-lamination with an adhesive receives wire **705** placed thereon on the pre-laminated side with the aid of setter **710** having a corresponding slot **715**. A small segment of setter over first fabric **720** shows slots **725** with wires **730** placed therein. After removal of setter **710**, second fabric **735** is placed on first fabric **700** to sandwich wire **705**. Application of predetermined pressure, cycle-time, and temperature results in laminating first fabric **700** and second fabric **735** with the thermoplastic adhesive, preferably a thin film of polyether-based polyurethane with a known melt-point, impregnating the fibers of the fabrics.

[0045] **FIG. 8** shows a typical support piece, in this case a center-front-stabilizer channeling **800**, having wires or support inserts **805**, for instance of metal or plastic or another stiff material, placed therein. Center-front-stabilizer channeling **800** has smooth edge **810** following a die-cut in accordance with a template from a larger laminated workpiece in a manner similar to that shown in FIGS. **6-7**, although this is not a requirement of the invention since individual preformed pieces can be pre-laminated and then, following placement of wires and the like, laminated as well.

[0046] **FIG. 9** illustrates an embodiment for pre-laminating fabric in accordance with the invention. Arrangement **900** includes feed roller **905**, supplying a thin adhesive film **915**, and feed roller **910** supplying a fabric **920**. Fabric **920** and thin adhesive film **915** are fed into pre-laminating setup **925** for application of a temperature and pressure less than that required for lamination for a specified duration. This application of pressure and temperature results in 'tacking' thin adhesive film **915** on fabric **920** for ease in subsequent handling. In the illustrated embodiment, but not as a limitation, the pressure is applied with the aid of two surfaces **930** that may be in the form of rollers for continuous operation or opposed surfaces of a press for discontinuous operation or combinations thereof. Following tacking, pre-laminated fabric **935** is collected, for instance on roller **940** for subsequent lamination.

[0047] **FIG. 10** shows a portion of an example brassiere manufactured in accordance with the invention. Brassiere **1000** has a support insert **1005** formed as a center-front stabilized channeling placed between two fabric layers prior to lamination. Following lamination, the cups are formed, for instance by a bubble molding process, and a die-cut produces smooth edge **1005** that is resistant to fraying despite the unfinished edge because exposed fibers therein are held by the adhesive. Additional details for manufacturing an exemplary garment are described next.

[0048] **FIGS. 11 and 12** illustrate example shapes of liners in the cup area that are suitable for making bubble molded cups. The use of the illustrated cup linings has opened a new design feature by allowing creation of an embossed, or raised trim just inside the bustline. This can be ornamented by using a scalloped or other ornamentally shaped die. Since the lining does not reach to the die-cut edge of the bustline with the edge surrounding that border, between the edge of the lining and the die-cut bustline, tightly sealed with the adhesive following lamination, a well-defined, embossed edge is created by the moldable woven liner material. This strategy avoids the problems of containing the fibers of the lining because it is often too thick to be effectively held in place by the adhesive at an edge. Moreover, this results in an ornamentally cut to produce a novel and decorative feature in the form of an embossed, or raised trim just inside the bustline.

[0049] The lining patterns **1100** and **1200** respectively of **FIGS. 11 and 12** are further designed to disguise the underwire channeling by placing such wires, for instance in a center-front stabilizer channeling in slots **1105** and **1205** respectively. Such placement results in greater comfort due to the lining being at the same level as the wires as well as greater aesthetic appeal. The scalloped edge in the liner for creating the embossed or raised trim is shown as **1110** and **1210** respectively.

[0050] **FIG. 13** illustrates some steps in the bubble molding process for creating a cup in a brassiere by application of heat and pressure. Bubble molding is a method typically used for unlined bras and is ideal for what is known as "post molding." Post molding is basically molding a completed bra as the final stage of its production, when it has been fully assembled. A typical bubble molding machine **1300** has a top plate **1305** and bottom plate **1310** (these hold the flat bra in place clamped between the top plate **1305** and bottom plate **1310**) with matching holes **1315**, a "bullet" shaped heated mold **1320**., driven, e.g. via rod **1325**, that comes down into the hole **1315**—stretching the fabric and heating the inner cup, while a heated can **1330** below the hole, into which the bullet **1320** is pressed heats the outer layer of the cup being bubble molded as well. To ensure a firm grip and minimal, if any damage to the brassiere, the inside surfaces **1335** of the top plate **1305** and bottom plate **1310** are padded. Moreover, the top and bottom plates are aligned and guided through any one of many possible mechanisms such as the depicted pins **1340**. Alternative embodiments may include lasers beams, precision machined gears and other mechanisms known in the art to ensure proper alignment between the top plate **1305** and bottom plate **1310**, along with a workpiece clamped between them.

[0051] Bubble molding has not worked well with lined or padded bras. The reason for this is that bubble molding requires a great deal of stretch and give from the fabrics used, and whereas it is easy enough to find fabrics that will do this, it is not so easy to find lining or padding that will fit this criteria.

[0052] The use of a woven moldable stretch fabric allows production of a lined bra using the bubble molding method. A woven spacer fabric that, although a moldable stretch fabric, also has the thickness and stiffness needed to meet the definition of a lined bra. Accordingly, the lining is first pre-laminated on one side with the adhesive film, cut to the desired cup shape, placed according to the garment's pattern within the "sandwich." Since the plates on a bubble-molding machine are padded and not heated, there is no stress on the fabric around the underwires, if any, that are provided for supporting breasts encased in the cups when the brassier is being worn.

[0053] **FIG. 14** illustrates an example lined brassiere **1400** with bubble molded cups **1405** and **1410**, a desired soft feeling and hanger appeal, as well as unsewn edges that resist fraying. Cup **1410** is depicted by broken line to indicate that it is hidden behind cup **1405**. Brassiere **1400** includes strap **1415** for gripping the torso. Strap **1415** may have a buckle, hook with complementary eye, or other gripping means including knots, or may be a closed loop to be slipped on the body of the wearer. Such means are familiar design variations and are not shown. Moreover, strap **1415** may include additional familiar design features such as twists, or neck hugging shapes by variously joining with straps **1420** and **1425**. Straps **1415-1425** variously define loops for providing a grip such as around the shoulders, arms, neck, torso, chest and the like of the wearer in various more detailed and specific embodiments of the invention. In addition, brassiere **1400** can be combined with matching panties and other undergarments to match colors, texture, design, or even the laminated seamless edge finish. Typically, such additional undergarments may wrap around additional body parts such as a leg or thigh. Such combinations include brassiere **1400** being part of a one piece design as in familiar one-piece swimsuits.

[0054] Brassiere **1400** is illustrated as placed over support **1430** with the cups substantially retaining their shape without assistance or fillers to provide hanger appeal by more realistically indicating their appearance when worn. It is possible to fashion cups for brassieres in all size ranges from the industry standard description 32 A through D to 38 A through D and even larger sizes to 44 A through D. Here cup

size is indicated by the alphabetical suffix chosen from A, B, C, and D with D representing the largest cup size and A representing the smallest cup size customarily made. In addition, edge 1435 of the brassiere 1400 is lasking sew lines enhancing comfort and visual appeal.

[0055] Although the invention can be utilized to make a variety of different garments of greater or lesser complexity, the general method and applications remain the same. That is, two or more layers of fabrics (or other components, such as underwires) are laminated together with layer(s) of adhesive in between, using heat and pressure to soften the adhesive and press it into the fibers of the material. Different shaped panels can be pre-cut and positioned to provide greater support or stability to needed areas, or the entire garment may simply consist of two or more layers which are first laminated and then cut to the desired shape.

[0056] At this point, garments may be modified further by molding (such as with bra cups), by using ultrasonic or radio-frequency seals (such as for attaching straps), or even by sewing (for joining ends).

[0057] To address the process in greater detail, the step-by-step manufacturing of a brassiere, similar to that shown in FIG. 10, from start to finish in described in an embodiment of the invention.

[0058] Fabrics are selected that a) have two-way stretch, b) are moldable, c) are not treated with dyes or softeners that will inhibit the adhesive, and d) fabrics to be lamiuated together have like physical properties compatible with being laminated together. The "like physical properties" is not a limitation on the scope of the invention but merely a detail in this embodiment so that when the fabrics are stretched, molded, etc., they will act together and not put unnecessary strain on the adhesive.

[0059] Tests are then run to determine the optimum thickness and melt-point of the film, in order to create the best hand and least strain (from heat of the laminating process) for said fabric(s). The main components of the N-S bra are the inner and outer layers of fabric, these act as a kind of sandwich for the majority of the other components (such as underwires, channeling, padding, stabilizing, and support fabrics, etc.). The inner side of one of these fabrics, as well as one side of all components to be placed within the "sandwich, is pre-laminated with the desired adhesive."

[0060] Pre-lamination is a process whereby the N-S film adhesive, typically an ether-based polyurethane film, preferably 1 to 1.5 mils (thousandths of an inch) thick is tacked to the fabrics to be used. The tacking, is accomplished by using a lower temperature and less pressure than that of the actual laminating to avoid loss of the adhesive in the fibers of the fabric while allowing for easier handling of both adhesive and fabrics. Many fabrics are thin and susceptible to damage by excessive heat. Thus, tacking a thin adhesive film results in the combination being stronger and easier to handle in addition to providing better control over the subsequent lamination process itself. In this regard it should be noted that often adhesives lack a well defined melting point since they are similar to glasses and tend to soften progressively with increasing temperature. Consequently, the temperature for pre-laminating can be advantageously empirically determined to suit a particular fabric and production setup within the scope of the invention.

[0061] With pre-lamination completed, any components (pads, stabilizers, channeling) to be placed within the "sandwich" are die-cut or slit to the proper size/shape. In the case of channeling, underwires are inserted into the channels and sealed. The outer fabrics (both the pre-laminated and the non-laminated) are often cut into sheets corresponding in size to the bra patterns (three or four or even more can be cut from a single sheet). The bottom sheet (pre-laminated) is placed (adhesive side up) on the bed of the laminating press (a pressurized press with both top and bottom heated plates) using a system of pins and holes, which have been pre-located on the corners of the sheets. Using lasers to locate the proper placement, the internal components are placed upon the sheet (adhesive side up as well).

[0062] The top sheet is placed on top using the same system of pins and holes. The "sandwich" is then laminated corresponding to the temperature, cycle-time, and pressure designated by the previous testing. Using a "bubble molding" machine, the cups of the bra are molded to the proper circumference to complete the manufacturing process.

[0063] The invention provides a practical and cost effective method and system to manufacture laminated garments with a comfortable seamless finish and reduced visibility under tight-fitting clothing. The unfinished edges do not exhibit fraying resulting in even displacement of pressure against the skin of the wearer and even greater comfort than other seamless garments. Moreover, the disclosed manufacturing techniques are more efficient and less costly than traditional sewing techniques. In addition, use of sewing to add loops, belts, straps and other additions to a laminated garment or portion thereof prepared in accordance with the invention allows the invention to synergistically extend the range of methods and technologies for manufacturing garments.

[0064] Advantageously, an adhesive made in the form of a film provides more consistent physical properties than webs, powders, or liquid adhesives. This, naturally, is of significance in imparting resistance to delamination and fraying, the peeling apart of laminated surfaces. Moreover, an adhesive made from ether-based polyurethane (versus the known untreated ester-based polyurethane resins) is superior to previously employed adhesives. The disclosed cycle-time, temperature and pressure engineered processes (both adhesive and machinery) optimize adhesion, stretch, breathability, and longevity of garment manufactured in accordance therewith.

[0065] The disclosed method and system teach producing garments without, or with reduced amounts of, traditional sewing techniques. In lieu of sewing, fabrics are joined using a laminating process that is superior due to its unique adhesive and manufacturing process. It is particularly applicable to the manufacturing of intimate apparel (bras, panties), shapewear, and activewear, which because of their complex construction—that often need to withstand much more stretch than other garments—typically requires a great deal of bulky and expensive stitching.

[0066] Alternative means for placing or aligning fabrics, the order of cutting the fabrics and other similar details are not intended to be limiting in the described embodiments that are primarily intended to be illustrative.

[0067] It will be appreciated that the various features described herein may be used singly or in any combination

thereof. Thus, the present invention is not limited to only the embodiments specifically described herein. While the foregoing description and drawings represent a preferred embodiment of the present invention, it will be understood that various additions, modifications, and substitutions may be made therein without departing from the spirit and scope of the present invention as defined in the accompanying claims. In particular, it will be clear to those skilled in the art that the present invention may be embodied in other specific forms, structures, and arrangements, and with other elements, and components, without departing from the spirit or essential characteristics thereof. One skilled in the art will appreciate that the invention may be used with many modifications of structure, arrangement, and components and otherwise, used in the practice of the invention, which are particularly adapted to specific environments and operative requirements without departing from the principles of the present invention. The presently disclosed embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims, and not limited to the foregoing description.

We claim:

1. A fabric laminate comprising at least a first fabric, a second fabric and a heat sensitive adhesive layer, the adhesive layer pre-laminated on the first fabric in the form of a film tacked on the first fabric by application of pressure and temperature less than that required for lamination followed by placement of the adhesive layer between opposed surfaces of the first and second fabrics for adhesively securing said first and second fabrics together along their opposed surfaces in a lamination step by positioning the second fabric on the pre-laminated first fabric and applying sufficient pressure and temperature.

2. The fabric laminate of claim 1 further including a woven moldable stretch fabric suitable for bubble molding a cup by application of sufficient heat and pressure to an identified area of the fabric laminate.

3. The fabric laminate of claim 2 wherein the woven stretch fabric material isa synthetic fabric.

4. The fabric laminate of claim 1 further including at least one cup.

5. The fabric laminate of claim 1 further having a plurality of edges wherein at least one edge from the plurality of edges has a laminated finish following a die-cutting operation, wherein furthermore, the laminated finish does not require additional finishing with the aid of sewing.

6. The fabric laminate of claim 5 wherein the at least one edge having a laminated finish is treated with a hot surface following the die-cutting operation to smooth out fraying fibers created by the die-cutting operation.

7. The fabric laminate of claim 1 further including a plurality of openings wherein at least one opening from the plurality of openings is suitable for placing therein at least one member of the set consisting of a human arm, a human shoulder, a human torso, a human thigh, a human neck, and a human leg.

8. The fabric laminate of claim 1 wherein the adhesive layer is a film having a thickness of less than or equal to about 20 mil.

9. The fabric laminate of claim 8 wherein the thickness of the adhesive layer is between about 0.5 mil and about 20 mil.

10. The fabric laminate of claim 9 wherein the thickness of the adhesive layer is between about 0.5 mil and about 2.0 mil.

11. The fabric laminate of claim 10 wherein the thickness of the adhesive layer is between about 1.0 mil and about 1.5 mil.

12. The fabric laminate of claim 8 wherein the thickness of the adhesive layer is about 4.0 mil.

13. The fabric laminate of claim 8 wherein the thickness of the adhesive layer is about 6.0 mil.

14. The fabric laminate of claim 1 wherein the adhesive layer comprises ether-based polyurethane.

15. The fabric laminate of claim 14 wherein the adhesive layer comprises at least 50% ether-based polyurethane.

16. The fabric laminate of claim 15 wherein the adhesive layer comprises at least 90% ether-based polyurethane.

17. The fabric laminate of claim 16 wherein the adhesive layer comprises at least 99% ether-based polyurethane.

18. The fabric laminate of claim 1 wherein the adhesive layer comprises heated ester-based polyurethane.

19. The fabric laminate of claim 18 wherein the adhesive layer comprises at least 50% ester-based polyurethane.

20. The fabric laminate of claim 19 wherein the adhesive layer comprises at least 90% ester-based polyurethane.

21. The fabric laminate of claim 20 wherein the adhesive layer comprises at least 99% ester-based polyurethane.

22. The fabric laminate of claim 1 wherein the adhesive layer has a hydrolytic stability of at least 240 days.

23. The fabric laminate of claim 1 wherein the adhesive layer has a hydrolytic stability of at least 1000 days.

24. The fabric laminate of claim 1 wherein the adhesive layer has a hydrolytic stability of at least 5000 days.

25. The fabric laminate of claim 1 further including at least one insert held between the prelaminated first fabric and the second fabric by sandwiching the at least one insert between the first fabric and the second fabric followed by lamination of the first fabric to the second fabric.

26. The fabric laminate of claim 25 wherein the at least one insert is a wire shaped to provide support to at least one breast of a wearer of a garment.

27. A brassiere for providing support to at least one breast of a wearer, the brassier comprising:

at least two layers that are laminated together by an adhesive layer between them by application of heat and pressure;

a third layer of woven, stretch fabric placed in an area suitable for bubble molding such that the third layer, having an adhesive layer prelaminated thereon, is sandwiched between the at least two layers;

at least one cup formed by a bubble molding process such that the at least two layers and the third layer in the area suitable for bubble molding are shaped into a cup having a desired size by the application of pressure via a bubble molding setup; and

at least one unsewn edge finished by lamination only whereby eliminating look and feel of a sewn finish.

28. The brassiere of claim 27 further having at least one strap cushioned by laminating a woven, stretch fabric between the at least two layers in an area suitable for forming a strap.

29. The brassiere of claim 27 wherein the adhesive layer is applied to one of the at least two layers in a prelaminating

step at a temperature and pressure to make the adhesive layer tacky without melting followed by contacting another layer of the at least two layers to the prelaminated layer and laminating at sufficient temperature and pressure to melt the adhesive into the fibers of the at least two layers.

30. The brassiere of claim 27 further including at least one wire in association with the at least one cup.

31. The brassiere of claim 27 wherein the at least one cup provides hanger appeal by substantially returning its shape without requiring a filler or support material.

32. The brassiere of claim 27 wherein the adhesive layer has a thickness of less than or equal to about 20 mil.

33. The brassiere of claim 32 wherein the thickness of the adhesive layer is between about 0.5 mil and about 2.0 mil.

34. The brassiere of claim 33 wherein the thickness of the adhesive layer is between about 1.0 mil and about 1.5 mil.

35. The fabric laminate of claim 27 wherein the adhesive layer comprises ether-based polyurethane.

36. The brassiere of claim 35 wherein the adhesive layer comprises at least 50% ether-based polyurethane.

37. The brassiere of claim 35 wherein the adhesive layer comprises at least 90% ether-based polyurethane.

38. The brassiere of claim 36 wherein the adhesive layer comprises at least 99% ether-based polyurethane.

39. The brassiere of claim 27 wherein the adhesive layer comprises treated ester-based polyurethane.

40. The brassiere of claim 39 wherein the adhesive layer comprises at least 50% ester-based polyurethane.

41. The brassiere of claim 39 wherein the adhesive layer comprises at least 90% ester-based polyurethane.

42. The brassiere of claim 39 wherein the adhesive layer comprises at least 99% ester-based polyurethane.

43. The brassiere of claim 27 wherein the adhesive layer has a hydrolytic stability of at least 740 days.

44. The brassiere of claim 27 wherein the adhesive layer has a hydrolytic stability of at least 1000 days.

45. The brassiere of claim 27 wherein the adhesive layer has a hydrolytic stability of at least 5000 days.

46. The brassiere of claim 27 wherein the cup size is at least A and at the most D.

47. The brassiere of claim 46 further being part of a matched set of undergarments including at least one pair of panties.

48. An insert for providing support to a brassiere by providing support and defining to at least two cups placed in the brassiere, the insert comprising:

a bottom layer that is initially prelaminated with an adhesive layer by contacting them at a temperature and pressure that is not sufficient to completely melt the adhesive;

a set of precisely placed wire inserts to define the separation between the cups in a brassiere;

a top layer, made from a stretch resistant fabric, placed on the prelaminated side of the bottom layer so as to sandwich the wire inserts between the top and the bottom layers following lamination of the top and bottom layers by application of a pressure and temperature sufficient to melt the adhesive for a prescribed cycle time; and

a shape formed by diecutting the laminated top and bottom layers to yield the insert having two appropriately spaced apart wires.

49. A method of manufacturing a laminated garment, the method comprising the steps of:

determining a melt temperature of an adhesive layer;

selecting a tacking temperature below the melt temperature;

placing the adhesive layer on a first fabric layer;

applying a tacking pressure and the tacking temperature to the adhesive layer and the first fabric layer to generate a first prelaminated fabric layer;

placing the first prelaminated fabric layer against a second fabric layer in a defined area such that the adhesive layer is between the first fabric layer and the second fabric layer to form a sandwich in the defined area;

applying a lamination pressure for a pressure cycle time to the sandwich;

applying a lamination temperature for a temperature cycle time to the sandwich such that the lamination temperature is not less than the melt temperature of the adhesive layer; and

shaping the laminated garment.

50. A method for manufacturing a laminated garment of claim 49 further including the step of diecutting the laminated sandwich to shape the laminated garment.

51. A method for manufacturing a laminated garment of claim 50 further including the step of finishing the edges following the step of diecutting with a hot surface to contain fraying fibers generated by the diecutting step.

52. A method for manufacturing a laminated garment of claim 49 wherein the pressure cycle time and the temperature cycle time are synchronized.

53. A method for manufacturing a laminated garment of claim 49 wherein the pressure cycle time and the temperature cycle time are not synchronized.

54. A method for manufacturing a laminated garment of claim 49 further including the step of selecting a hydrolysis resistant adhesive for the adhesive layer such that the adhesive has a hydrolysis stability of at least 740 days.

55. A method for manufacturing a laminated garment of claim 49 further including the step of selecting a hydrolysis resistant adhesive for the adhesive layer such that the adhesive has a hydrolysis stability of at least 1000 days.

56. A method for manufacturing a laminated garment of claim 49 further including the step of selecting a hydrolysis resistant adhesive for the adhesive layer such that the adhesive has a hydrolysis stability of at least 5000 days.

57. A method for manufacturing a laminated garment of claim 49 further including the step of selecting an ether-based polyurethane adhesive for the adhesive layer such that the adhesive comprises at least 50% ether-based polyurethane.

58. A method for manufacturing a laminated garment of claim 49 further including the step of selecting an ether-based polyurethane adhesive for the adhesive layer such that the adhesive comprises at least 90% ether-based polyurethane.

59. A method for manufacturing a laminated garment of claim 49 further including the step of selecting an ether-based polyurethane adhesive for the adhesive layer such that the adhesive comprises at least 99% ether-based polyurethane.

60. A method for manufacturing a laminated garment of claim 49 further including the step of selecting a treated ester-based polyurethane adhesive exhibiting substantially higher resistance water damage than untreated ester-based polyurethane.

61. A method for manufacturing a laminated garment of claim 49 wherein the first fabric layer and the second fabric layer have an additional fabric layer between them outside of the defined area.

62. A method for manufacturing a laminated garment of claim 49 wherein the additional fabric layer is prelaminated with the adhesive layer.

63. A method of molding a cup in a laminated garment, the method comprising the steps of:

placing a woven moldable stretch fabric between a prelaminated first fabric, the prelaminated first fabric having tacked on a first fabric a layer of adhesive, and a second fabric to create a pre-bubble mold assembly;

laminating the pre-bubble mold assembly by applying sufficient pressure and temperature for a cycle time;

placing the laminated pre-bubble mold assembly in a bubble molding assembly between padded holding first and second plates; and

applying heat in a bin connected to the first plate via a first hole; and applying heat and pressure via a plunger pressed through an opening aligned with a second hole in the second plate that is aligned with the first hole.

64. The method of molding a cup in a laminated garment of claim 63 further comprising the step of selecting a plunger shape corresponding to a desired size and shape for the cup.

65. The method of molding a cup in a laminated garment of claim 63 wherein the plunger creates a cup size less than a D size.

66. The method of molding a cup in a laminated garment of claim 63 wherein the plunger creates a cup size of at least an A size.

67. The method of molding a cup in a laminated garment of claim 63 further comprising shaping, prior to bubble molding, the woven moldable stretch fabric to have an embossed trim just inside a bustline corresponding to the cup.

68. The method of molding a cup in a laminated garment of claim 63 further comprising shaping, prior to bubble molding, the woven moldable stretch fabric with an ornamentally shaped die.

69. The method of molding a cup in a laminated garment of claim 68 wherein the die is scalloped.

70. The method of molding a cup in a laminated garment of claim 63 further comprising shaping, prior to bubble molding, the woven moldable stretch fabric to form a slot.

71. The method of molding a cup in a laminated garment of claim 70 further comprising shaping, prior to bubble molding, the woven moldable stretch fabric slot to receive a wire insert adjacent to the woven moldable stretch fabric.

72. The method of molding a cup in a laminated garment of claim 71 wherein the woven moldable stretch fabric is a spacer fabric shaped to adjacently receive a center-front gutter channelling.

73. The method of molding a cup in a laminated garment of claim 71 wherein the woven moldable stretch fabric is a spacer fabric shaped to adjacently receive a channelling.

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(54) TWO-PLY SUPPORT GARMENT AND METHOD OF MAKING SAME

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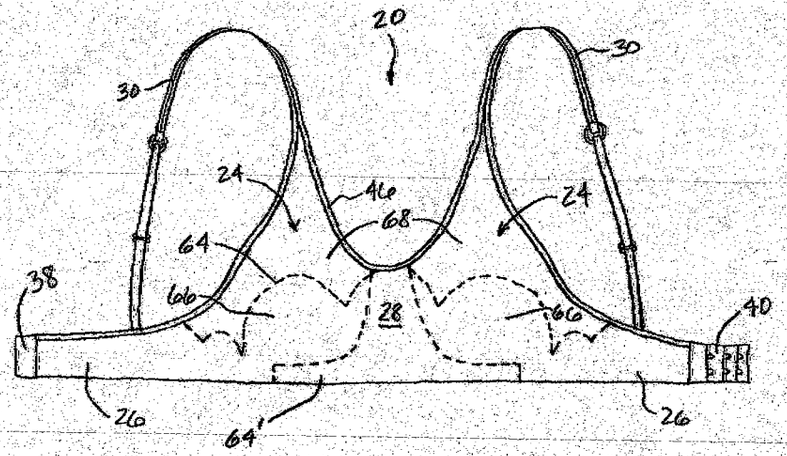
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(57) ABSTRACT

A two-ply support garment such as a brassiere, panty, or the like, is made by positioning a piece of heat-bondable polymer film between two fabric plies of a two-ply fabric blank in one or more selected areas that will become portions of the garment, heating the film to bond the plies to the opposite faces of the film in the one or more selected areas, and fashioning a two-ply garment from the blank. A brassiere embodiment includes the film in partial regions of the cups, in a central panel between the cups, and in side panels of the brassiere.



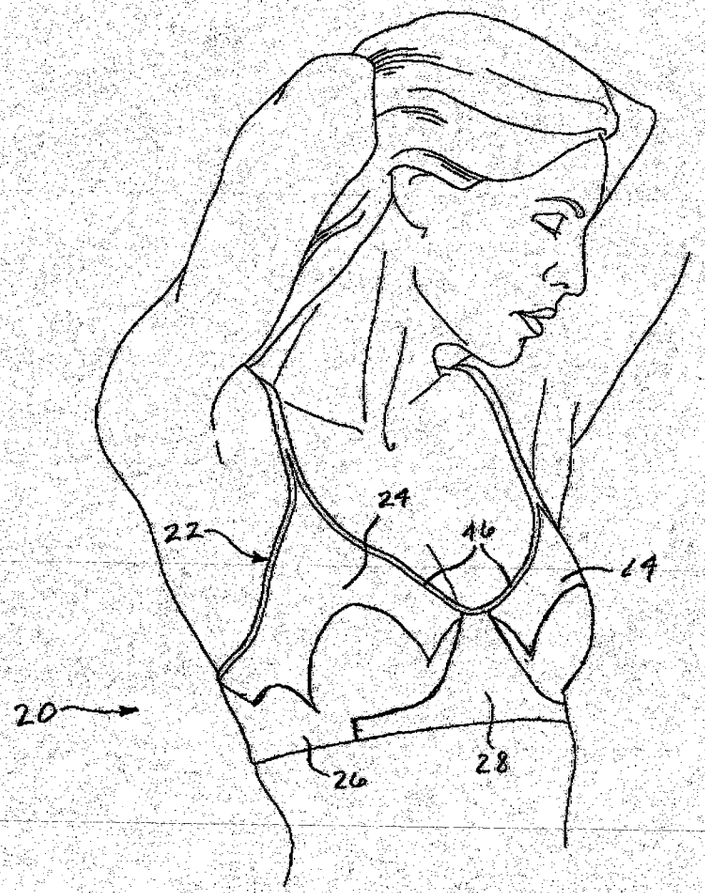


FIG. 1.

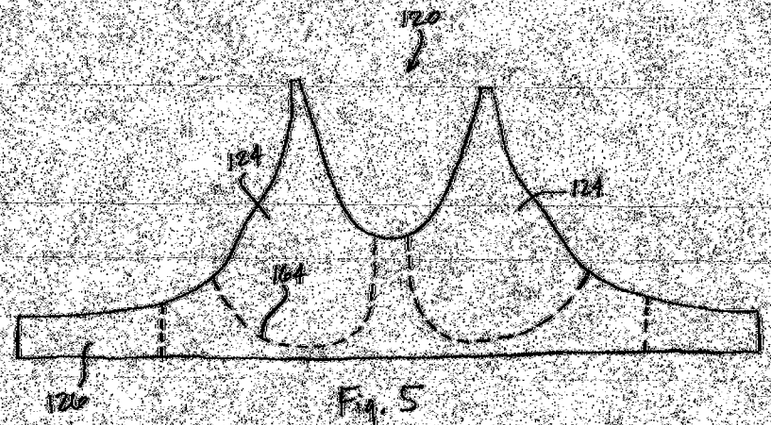


Fig. 5

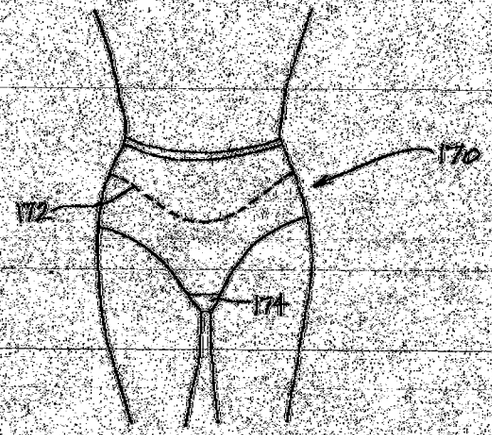


Fig. 6

TWO-PLY SUPPORT GARMENT AND METHOD OF MAKING SAME

FIELD OF THE INVENTION

[0001] The present invention relates to support garments such as brassieres, body-shaping panties and briefs, and the like.

BACKGROUND OF THE INVENTION

[0002] Designers of support garments are in a never-ending quest for increased levels of support and shaping while improving the comfort to the wearer and reducing the cost of manufacturing. These factors tend to be mutually exclusive to some extent. With conventional brassieres, for example, greater support and shaping have generally been achieved only at the expense of reduced comfort, particularly in the case of underwire brassieres. It has also been necessary in general to use the cut-and-sew process to make brassieres providing substantial support, as exemplified for instance by U.S. Pat. No. 4,372,322 issued to Stern et al. A brassiere made in this manner may consist of more than a dozen separate fabric pieces individually cut out and sewn together. One advantage of the cut-and-sew method is that different areas of the brassiere can be given different properties, since the various fabric pieces can be of different knits, different yarns, etc. It may be advantageous, for example, to make some portions of the brassiere resiliently stretchable to hug the wearer's body, while other portions are relatively unstretchable for greater stability. The cut-and-sew method, however, entails a great number of cutting and sewing operations, and therefore is relatively costly. The resulting seams in the brassiere can also be uncomfortable and are often visible under close-fitting clothing.

[0003] Accordingly, methods of fashioning garments from circularly knit fabrics have been developed in an effort to improve the speed and efficiency of production and to reduce the number of unsightly and uncomfortable seams. For example, commonly assigned U.S. Pat. Nos. 5,493,791 and 5,392,636 disclose methods for making non-underwire brassieres from circularly knit tubular blanks. The brassieres are made from single-ply tubular blanks that have a turned welt at one end to form a torso-encircling portion of the brassiere. A series of courses for defining cups and front and rear shoulder straps are integrally knit to the turned welt. The brassiere requires sewing only for joining the front and rear shoulder straps to each other. The circular knitting process greatly reduces the amount of human labor required to fashion a brassiere, thereby reducing the cost of manufacturing significantly, and the brassiere has a greatly improved appearance under close-fitting clothing.

[0004] The potential drawback of the seamless circular knit process is that a garment made in this fashion may not provide as much support and shaping as a conventional cut-and-sew garment, unless deliberate steps are undertaken to improve the support and shaping. For instance, the '636 patent discloses modifying the knit structure along outer edges of the cups nearest the wearer's arms to form panels having a greater resistance to coursewise stretching than the remainder of the fabric blank. The relatively unstretchable panels provide increased lift and support.

[0005] As another example, commonly assigned U.S. Pat. No. 6,287,168 issued Sep. 11, 2001 describes a circularly knit brassiere made as a two-ply structure by knitting a single-ply fabric tube and folding it to form a two-ply tube from which the brassiere is cut. The knit construction in the central panel between the cups is modified so that it is substantially less stretchable than the remainder of the brassiere, thereby providing greater stability to the cups. The brassiere even in non-underwire form provides a reasonably good level of support, while being considerably more comfortable than a traditional underwire, and the manufacturing process is significantly less costly than a conventional cut-and-sew process. However, women who are accustomed to the reassuring feeling of underwires pressing against the body beneath the breasts may perceive the absence of that feeling as a lack of support. What would be desirable is a substantially seamless non-underwire brassiere giving the wearer a feeling similar to that of an underwire brassiere. Additionally, it would be desirable to be able to easily tailor the support and resistance to stretch of different areas of a brassiere or other support garment without having to use the costly cut-and-sew process.

SUMMARY OF THE INVENTION

[0006] The present invention represents a further development in the technology of support garments as described above. In accordance with the present invention, a two-ply support garment with differential stretch and support is made by positioning a heat-bondable polymer film between two fabric plies in one or more selected areas that will become portions of the garment, heating the film to cause the film to bond to the plies in the one or more selected areas, and fashioning a two-ply garment from the resulting fabric blank. The film bonded between the plies increases the resistance to stretching of the fabric and thus provides increased support and/or shaping properties to the area(s) of the garment in which it is located. The invention thus provides a relatively easy and inexpensive way to precisely tailor the support and shaping of various regions of a support garment while avoiding the time-consuming and costly cut-and-sew process. Furthermore, although the preferred heat-bondable film is substantially transparent, the film when bonded between the fabric plies increases the opacity of the fabric, providing enhanced modesty in those areas in which the film is located. The film can also be colored, if desired, to reduce the transparency of the film and thereby provide further enhanced modesty.

[0007] In preferred embodiments of the invention, heat-bondable films of different resistance to stretching can be used in various regions of a garment to provide different degrees of support and/or shaping in those regions. The different resistance to stretching can be accomplished by varying the thickness and/or material properties of the film. In particular, the modulus of the film can be different in different regions of the garment.

[0008] A preferred film comprises an elastically stretchable polyurethane film. The film can be made to have a relatively low resistance to stretching for providing resilient support in certain regions of a garment, such as in lower regions of the cups of a brassiere. The film can be made to have a relatively high resistance to stretching to substantially prevent stretching in other regions of the garment, such as in the central region between the cups of a brassiere.

[0009] In a preferred embodiment of the invention, a fabric blank for making a brassiere is formed by circularly

knitting a fabric tube and folding the fabric (either in tube form or after slitting the tube lengthwise to form a flat blank) to form the two-ply blank. The heat-bondable film preferably is positioned to extend over bottom portions of the cups, while the fabric plies in the remainder of the cups are not bonded together. The bottom portions of the cups are thereby made substantially less stretchable than the other portions, thus enhancing the support where it is needed. If enhanced modesty is desired, the heat-bondable film in the bottom portions of the cups can be extended up to cover the nipples. The heat-bondable film can also be provided in other areas, such as in the central panel between the cups. Preferably, the film in the central panel has a greater resistance to stretching than the film used in the cups. The heat-bondable film can also be provided in the portions of the brassiere that extend below the cups and from the outer edges of the cups around the wearer's back if it is desired to reduce the stretch in these areas. Preferably, each type of heat-bondable film to be included in the garment is cut to the desired size and shape and is then positioned between the plies and heat and pressure are applied to the plies to bond the plies together. The invention thereby makes it easy to tailor the support of various regions of a garment in a precise manner.

[0010] A two-ply body-shaping panty in accordance with the invention can be provided with shaping panels having a relatively higher resistance to stretching than the rest of the panty, by positioning appropriately configured pieces of heat-bondable film between the plies of a two-ply fabric blank and heating the film to bond the film to the plies. The blank is then used to fashion a panty. Other types of support garments can also be made according to the principles of the present invention.

[0011] The heat-bondable film can be heated by various techniques. For instance, the garment with the film disposed between the plies can be placed in a heated press and pressed between the heated press members. Alternatively, the film can be ultrasonically heated to bond it to the fabric plies.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The above and other objects, features, and advantages of the invention will become more apparent from the following description of certain preferred embodiments thereof, when taken in conjunction with the accompanying drawings in which:

[0013] FIG. 1 is a perspective view of a person wearing a brassiere in accordance with one embodiment of the present invention;

[0014] FIG. 2 is a plan view of the brassiere of FIG. 1;

[0015] FIG. 3A is a plan view of a heat-bondable film prior to being cut along the indicated dashed line;

[0016] FIG. 3B is a plan view of another heat-bondable film prior to being cut along the indicated dashed line;

[0017] FIG. 4 is a plan view of a single-ply knit fabric blank with the cut heat-bondable film overlaid thereon;

[0018] FIG. 5 is a plan view of a body-covering portion of a brassiere in accordance with another alternative embodiment of the invention; and

[0019] FIG. 6 shows one embodiment of a panty in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0020] The present invention now will be described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout.

[0021] With reference to FIG. 1, a substantially seamless brassiere in accordance with a preferred embodiment of the invention is broadly designated by reference numeral 20. The brassiere 20 includes a body-covering portion 22 comprising a pair of cups 24, a torso-encircling portion 26, and a central panel 28 extending between the cups. The brassiere also includes a pair of shoulder straps 30 attached to the body-covering portion 22.

[0022] The cups 24 and torso-encircling portion 26 can be knit from various types of face yarns, depending on the desired properties of the fabric, and the face yarns can be of various deniers, the selection of the face yarns and the knit depending primarily on the desired characteristics of the fabric such as the hand, appearance, texture, etc. The cups 24 and torso-encircling portion 26 preferably also incorporate elastomeric yarns such as spandex (bare and/or covered) or the like so as to impart resiliency to the fabric. A central panel 28 extends between the cups 24.

[0023] The brassiere 20 has the torso-encircling portion 26 formed in two halves comprising one lateral panel each attached to one of the cups 24. The free end of one of the halves of the torso-encircling portion has fastener members 36, such as hooks, attached to it, and the free end of the other half of the torso-encircling portion has cooperative fastener members 40, such as eyes, attached to it for engagement with the opposite fastener members 38 so that the brassiere can be secured about the wearer's torso.

[0024] The brassiere 20 has a two-ply construction. More particularly, the cups 24, torso-encircling portion 26, and central panel 28 are all formed from a single continuous piece of fabric that is folded upon itself to define an inner ply that faces the wearer's body and an outer ply that faces outward. The fold line of the fabric forms the bottom edge of the brassiere. The two plies are affixed to each other along the upper peripheral edges of the cups and torso-encircling portion, preferably by sewing elastic banding 46 along these edges.

[0025] Thus far, the construction of the brassiere is substantially the same as that described in commonly owned U.S. Pat. No. 6,287,168, which is incorporated herein by reference. The present invention differs from the prior brassiere in that a heat-bondable film is disposed between the plies in one or more selected areas for achieving certain effects that cannot as readily or effectively be achieved by knit construction alone. With reference to FIGS. 2-6, a brassiere and process for making same in accordance with the invention are now described. The brassiere 20, as noted above, is made as a two-ply construction from a single-ply fabric blank 50 shown in FIG. 4 in plan view. The blank is

folded about a fold line 52 so that one ply 54 formed by one half of the blank overlies another ply 56 formed by the other half of the blank.

[0026] Prior to folding the blank, one or more pieces of heat-bondable film are disposed between the plies 54, 56. The heat-bondable film is sized and shaped to correspond to the size and shape of one or more areas in which it is desired to bond the two plies together. Thus, as shown in FIG. 3A, a strip or sheet of heat-bondable film 60 is cut along one or more cut lines 62 to provide a piece of heat-bondable film 64 having the desired size and shape. The film can be cut by die-cutting, with a Gerber system, by hand, etc. The resulting piece of heat-bondable film 64 is placed atop the inner surface of one of the plies such as the ply 56 in FIG. 4.

[0027] A second sheet of heat-bondable film 60' is cut along a cut line to form a second piece of heat-bondable film 64'. This piece of film in the illustrated embodiment is sized and shaped to cover the area of the central panel 28 of the brassiere as well as an area below each cup 24. The film 64' is placed atop the ply 56, as shown, the film 64' also overlies a portion of the first piece of film 64. Alternatively, the film pieces could be cut so that they do not overlap each other, if desired.

[0028] Once the piece or pieces of heat-bondable film are positioned on the blank, the blank is folded about the fold line 52 so that the heat-bondable film 64, 64' is sandwiched between the plies. The blank is then pressed in a heated press or the like to exert pressure on the blank while heating it. The heat-bondable film 64 preferably is a film of a heat-bondable polymer material. A preferred type of heat-bondable film is a polyurethane heat-bondable film having a thickness from about 135μ to 250μ (about 0.005 inch to 0.010 inch). For example, the heat-bondable polyurethane films sold by Framis Italia S.p.A. of Italy under the trademarks TEKFILM TRADILO®, TEKFILM BI TRADILO®, TEKFILM TRADILO® LIGHT, and TEKFILM MIRAGE® can suitably be used in the present invention. The films are resiliently stretchable and have a high recovery so that when stretched and then released, they return to substantially their original unstretched length. The heat-bondable films are bonded to fabric by heating them to a temperature of about 180° C. for about 2 to 5 seconds while maintaining firm contact between the fabric and film. The two-ply fabric with the film disposed between the plies preferably is heated in a hot press. Alternatively, an ultrasonic unit can be used to heat the film and bond it to the plies.

[0029] When the two plies of the brassiere are bonded together with the heat-bondable film, two particularly notable effects are achieved. First, the areas bonded to the film have a resistance to stretching that depends on the properties of the film. Thus, the bonded areas can be given a substantially greater resistance to stretching than the fabric alone so as to provide greater support and shaping in those areas of the garment. Moreover, different regions of the garment can be given different degrees of resistance to stretching. Thus, for example, the heat-bondable film 64 can have a lower resistance to stretching than the film 64'. Another advantage of the invention is that garments having different support characteristics can be produced starting with identical fabric blanks, simply by using films with different properties.

[0030] The other notable effect imparted by inclusion of the heat-bondable film is an increase in the opacity of the two-ply fabric, even though the preferred films as described above are substantially transparent. Thus, garments can be given enhanced opacity in selected areas by bonding the plies together with heat-bondable film in those areas.

[0031] The drawings illustrate one possible configuration of bonded areas in a brassiere. The heat-bondable film 64 is positioned and configured to bond the plies together throughout the torso-encircling portion 26 and central panel 28 of the brassiere. The film 64 is also positioned to bond the plies together in lower portions 66 of the cups 24, while the upper portions 68 of the cups are left unbonded. The lower portions 66 of the cups are therefore more resistant to stretching than the upper portions 68, resulting in enhanced support for the breasts where it is needed. If desired, the heat-bondable film 64 can extend up the cups so as to cover the nipples for enhanced modesty, by virtue of the increased opacity imparted by the film.

[0032] The heat-bondable film 64' is configured and positioned to cover the area of the central panel 28 and marginal regions below each cup 24. The film 64' preferably has a very high resistance to stretching so that the brassiere in the region covered by the film 64' is substantially non-stretchable. This gives enhanced stability to the cups 24 so that they cannot move apart from each other to any significant extent. The film 64' can be made relatively less stretchable than the film 64 by making the film 64' of the same material but thicker, and/or by making the film 64' of a different material from that of the film 64.

[0033] The invention of course is not limited to any particular configuration and placement of the heat-bondable film or films, and various configurations and placements can be used for achieving different effects depending on the needs and desires of the manufacturer. For instance, a single piece of heat-bondable film can be positioned between the plies if only a single contiguous region is to be enhanced in support and/or opacity. Alternatively, multiple pieces of film can be spaced apart from each other if two or more non-contiguous regions are to be enhanced. In some region(s) of the garment, the film may comprise more than one layer of heat-bondable film stacked together. Thus, when the present specification and claims speak of bonding the fabric plies to the opposite faces of "the film", it is to be understood that "the film" can be a single layer of film or multiple layers of film.

[0034] FIG. 5 shows an alternative embodiment of a two-ply brassiere fabric blank 120 in accordance with the invention. The blank 120 includes cups 124, torso-encircling portion 126, and central panel 128 similar to the previously described brassiere 20. The blank 120 is for making a non-underwire brassiere having functional attributes of an underwire brassiere. To this end, the blank includes one or more pieces of heat-bondable film 164 that extend(s) below the cups 124. The film 164 is substantially non-stretchable. An upper edge of the film 164 follows a generally U-shaped course along the lower edge of each cup, i.e., in the shape that a conventional underwire would typically have. The film 164 gives the wearer a feeling of stability and support similar to an underwire, by pressing inward on the body beneath the breasts.

[0035] It is also possible to incorporate other features into the brassieres described above. For instance, the fabric blank can be knit with different knit constructions in different

regions of the blank for achieving various aesthetic and/or functional effects. As an example, the central panel **28**, **128** can be knit to have a greater resistance to stretching than the other portions of the blank to provide enhanced stability to the cups. Other knit-in support and/or shaping features can be included.

[0036] As noted previously, the invention is not limited to brassieres. The invention can also be applied to other types of support garments such as girdles, body suits, panties, and the like. For instance, FIG. 6 shows a body-shaping panty **130** in accordance with the invention. The panty **130** is a two-ply construction. An abdominal control panel **172** is provided for flattening the abdomen. The control panel **172** is formed by bonding a heat-bondable film between the two plies. The film preferably has a sufficient resistance to stretching to give the control panel **172** a substantially greater resistance to stretching than the rest of the torso-encircling part of the panty. The control panel **172** can extend around the wearer's back so that it fully encircles the torso, if desired.

[0037] Instead of or in addition to the abdominal control panel **172**, the panty can include panels for shaping and/or slimming other parts of the body such as the buttocks, hips, etc. As another alternative, it is possible to include the heat-bondable film in the entire torso-encircling part of the panty, except for the crotch **174**, to provide an all-over slimming panty.

[0038] Many modifications and other embodiments of the invention will come to mind to one skilled in the art to which this invention pertains having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the invention is not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

What is claimed is:

1. A method for making a garment, comprising:

overlaying a fabric ply upon another fabric ply to form a two-ply blank;

positioning at least one piece of heat-bondable polymer film between the two plies of the blank in at least one selected area thereof at which enhanced body support is desired, the heat-bondable film having a resistance to stretching greater than that of the fabric alone;

heating the blank to bond the plies to the heat-bondable film in the at least one selected area; and

fashioning a two-ply garment from the blank, whereby the garment in the at least one selected area has a greater resistance to stretching than the fabric alone.

2. The method of claim 1, wherein the heat-bondable film is cut to have a size and shape corresponding to that of the at least one selected area in which greater resistance to stretching is desired, and the cut heat-bondable film is then positioned between the plies and heated to bond the plies together.

3. The method of claim 1, wherein the step of fashioning a garment comprises fashioning a brassiere, and wherein the heat-bondable film is sized and positioned to bond the plies thereto in lower regions of cups of the brassiere while the plies in upper regions of the cups are left unbonded.

4. The method of claim 1, wherein the step of fashioning a garment comprises fashioning a brassiere, and wherein the heat-bondable film covers a region below each cup of the brassiere with an upper edge of the film following a generally U-shaped arc below the cup, the heat-bondable film being substantially non-stretchable so as to stabilize the cups in the manner of underwires.

5. The method of claim 1, wherein a first piece of heat-bondable film having a first resistance to stretching is positioned in a first region between the plies and a second piece of heat-bondable film having a second resistance different from the first resistance is positioned in a second region between the plies.

6. The method of claim 5, wherein the first and second pieces of heat-bondable film are of different thickness.

7. The method of claim 5, wherein the first and second pieces of heat-bondable film are of different modulus.

8. A garment, comprising:

a two-ply fabric body configured to encircle a part of a person's body;

wherein the two plies of the fabric body are bonded to a heat-bondable polymer film positioned between the plies and heated to bond the plies to opposite faces of the film, the heat-bondable film having a greater resistance to stretching than the fabric alone, the heat-bondable film being cut to a desired shape and size prior to being positioned between the plies, whereby the at least one selected area in which the plies are bonded to the film comprises a precisely defined region of the fabric body having an enhanced resistance to stretching.

9. The garment of claim 8, wherein the heat-bondable film comprises a single layer of heat-bondable film.

10. The garment of claim 8, wherein the garment comprises a brassiere and the at least one selected area comprises a partial region of each cup of the brassiere.

11. The garment of claim 10, wherein the partial region of each cup comprises a lower region of the cup.

12. The garment of claim 8, wherein the garment comprises a brassiere and the at least one selected area comprises a central panel between cups of the brassiere.

13. The garment of claim 12, wherein the heat-bondable film in the central panel is substantially non-stretchable.

14. The garment of claim 8, wherein the garment comprises a brassiere and the heat-bondable film covers a region below each cup with an upper edge of the film following a generally U-shaped arc below the cup, the heat-bondable film being substantially non-stretchable so as to stabilize the cups in the manner of underwires.

15. The garment of claim 8, wherein the garment comprises a brassiere and the fabric body comprises a single-ply fabric folded about a lower edge of the brassiere to form the two plies.

16. The garment of claim 15, wherein upper edges of the two plies are joined together by elastic banding sewn therealong.

17. The garment of claim 8, wherein the heat-bondable film comprises polyurethane.

18. The garment of claim 8, wherein a first region of the garment includes a heat-bondable film having a first resistance to stretching, and a second region of the garment includes a heat-bondable film having a second resistance to stretching different from the first resistance to stretching, whereby the first and second regions have different degrees of resistance to stretching.

19. The garment of claim 8, wherein the garment comprises a lower-body undergarment.

20. The garment of claim 19, wherein the garment comprises a panty.

21. A garment, comprising:

a generally non-opaque fabric body having two plies connected to each other along edges of the fabric body;

wherein a partial region of the fabric body has a greater opacity than other portions of the fabric body for enhanced modesty, said part having greater opacity being provided by bonding the two plies together with a heat-bondable polymer film disposed therebetween.

22. The garment of claim 21, wherein the heat-bondable film is substantially transparent.

23. The garment of claim 21, wherein the garment comprises a brassiere and said part having greater opacity covers a partial region of each cup of the brassiere.

24. The garment of claim 23, wherein said part having greater opacity is configured and positioned to cover the nipples of a person wearing the brassiere.

* * * * *

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Fig. 1

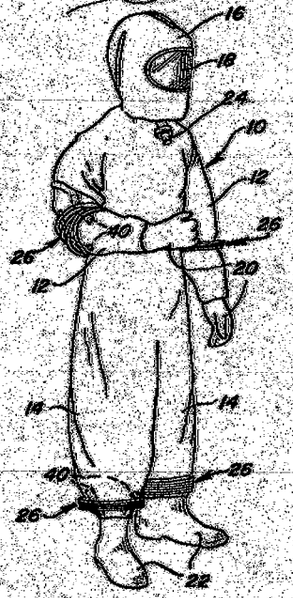


Fig. 2

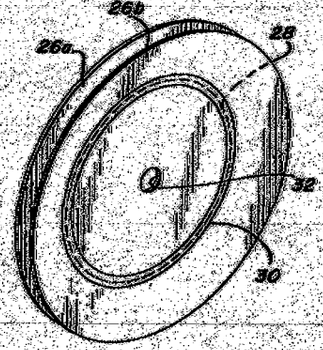


Fig. 3a



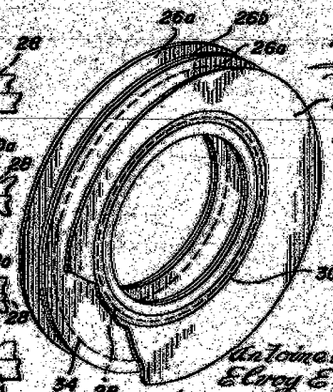
Fig. 3b



Fig. 3c



Fig. 3



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Fig. 4

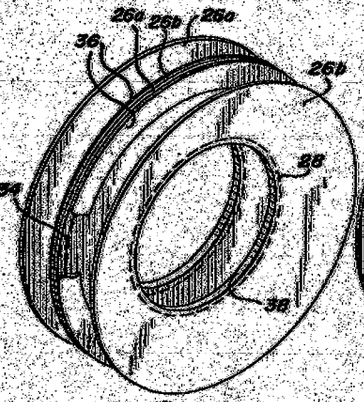


Fig. 5

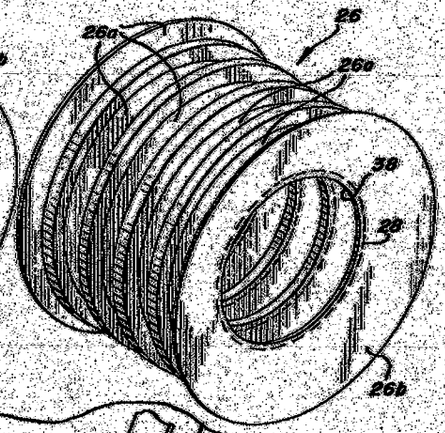
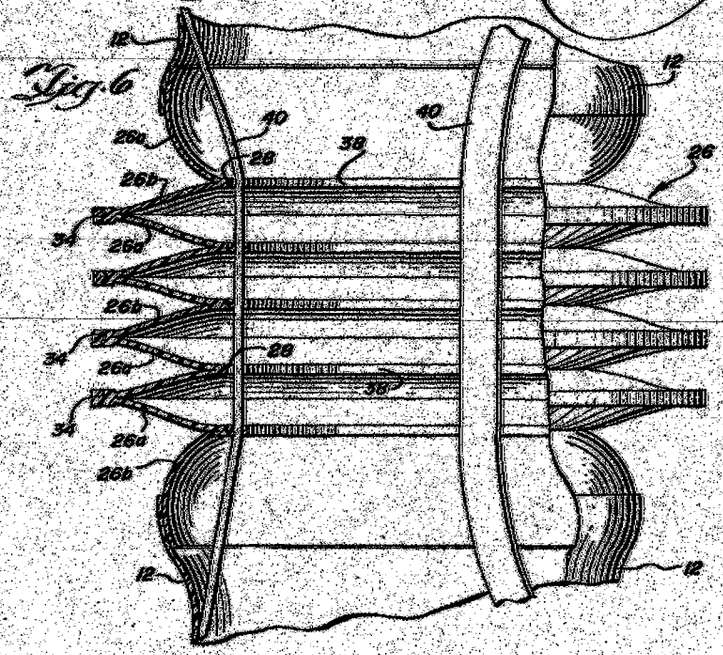


Fig. 6



SAFETY GARMENT JOINT AND METHOD OF MAKING SAME

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to a gas and liquid impervious safety garment, and more particularly to a pleated expansible portion of the garment which surrounds a portion of a person's body, such as an arm or leg.

It is of considerable importance in many manufacturing facilities, or the like, to provide emergency equipment which is used in the event of a valve failure, pipeline break, or similar occurrence, which permits the escape of dangerous and sometimes deadly gases and/or liquids. The need for emergency protective garments for workmen is particularly present in chemical plants, refineries, or the like. Important items of emergency equipment are safety garments worn by men skilled in meeting such emergencies to protect their bodies while working in a dangerous environment. One garment used extensively at the present time is a safety suit which completely encloses a person's body and is fabricated of gas and liquid impervious material, usually a plastic material or impregnated fabric. Safety gloves and boots may be hermetically sealed to the sleeves and trouser legs of the suit, a window may be provided in a helmet portion of the suit; and built-in oxygen or ventilation systems may be employed.

Since such emergencies may arise at any time, it is desirous to provide a safety suit which is adjustable in size because the suit may be required to fit any number of different workmen who might be assigned to the emergency job at any particular time. In the past, such suits normally have been made adjustable by providing sleeves and trouser legs sufficiently long to accommodate the worker of largest size, and providing the suit with adjusting "take up straps" on the inside of the sleeves and trouser legs to gather or blouse the sleeves and legs so that the suit will fit different and smaller sized workmen. Such adjusting straps have several disadvantages. For instance, the gathers or folds formed thereby result in an extremely clumsy garment which may interfere with a person's mobility. Furthermore, adjustment of the take up straps for the sleeves and trouser legs of the garment require time which in many instances would be taken away from the emergency itself.

In addition, adjustment of the straps usually required particularly skilled assistance for the workman to insure that the "take up" was enough but not excessive, because once adjusted the appendage covering could not be relaxed to expand beyond the set limits without aid of another person.

An object, therefore, of the present invention is to provide a new and improved gas and liquid impervious safety garment, and more particularly, an improved pleated expansible portion of such a garment which itself is gas and liquid impervious, which is self-adjusting, and which provides a neat streamlined accordion type portion of the suit which does not interfere with the movement of one wearing the garment.

Another object is to provide a safety garment with an improved take-up and expansion portion that automatically extends and retracts responsive to stress placed upon the portion by the movements of the workman wearing the garment.

A further object is to provide a method of fabricating a bellows-like, pleated expansible portion of a gas and liquid impervious safety garment, of the character described.

In the embodiment of the invention shown herein, the expansible portion of the safety garment is of the accordion type with alternating inner and outer seams spaced in a direction generally perpendicular to the adjoining portions of the garment, such as a sleeve or trouser leg. The method comprises the steps of providing a plurality of pairs of generally disc shaped flat sections of relatively thin plastic material and generally of a uniform size. The two sections of each pair are placed in juxtaposition and joined by sewing a first continuous circular line of stitching about a central aperture locating position spaced inwardly of the periphery of the two sections. The two sections of each pair thereof then are heat sealed together along the first line of stitching, with the seal extending slightly outwardly from the stitching toward the periphery of the sections, to form the inner seams of the accordion portion of the suit. The pairs of joined and sealed sections then are placed in juxtaposition and adjacent sections of adjacent pairs thereof are joined by sewing a second continuous line of stitching spaced outwardly of the first line, and a heat seal is formed along the second line of stitching to form the outer seams of the accordion portion of the suit. A generally central aperture then is cut out of the joined and sealed pairs of sections of flat plastic material, and the accordion suit portion formed thereby is joined in the garment, as in the sleeves or the trouser legs thereof, by hermetically sealed seams or joints. One or more elastic bands then are secured to the adjacent portions of the sleeves or trouser legs of the garment, on the inside thereof, spanning the pleated expansible portion through the central aperture thereof, to draw the accordion sections together but to permit the sections to expand or self adjust to fit different sized persons. All seams sewn are armoured with impervious material so as to present no avenue for ingress of liquid or gas to the interior of the suit.

In the preferred embodiment of the invention, the outer seams of the accordion expansible portion described in the preceding paragraph is reinforced or armoured during the heat sealing operation thereof. This is done by positioning a reinforcing strip of thin plastic material over the outside of each of the joined sections and overlying the outer lines of stitching. The strips and the joined sections then are heat sealed together over the outer lines of stitching to provide a gas and liquid impervious seam. The heat sealing preferably should extend slightly outwardly beyond both the inner and outer lines of stitching so that there are not threads exposed on the outside of the garment, to insure a hermetic seal.

Other objects, features and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a safety garment embodying expansible portions in the sleeves and trouser legs thereof, made in accordance with the concepts of the present invention;

FIG. 2 is a perspective view of a pair of flat sections of the relatively thin plastic material sewn together to illustrate one of the first steps in fabricating the expansible garment portions;

FIG. 3 is a perspective view, partially cut away, showing two pairs of sections, as shown in FIG. 2, sewn together to illustrate a subsequent step in fabricating the expansible portions;

FIGS. 3a through 3c are schematic views illustrating the sequence of steps shown in FIGS. 2 and 3;

FIG. 4 is a perspective view, partially cut away, illustrating a further step in fabricating the expansible portions, wherein the outer seams thereof are reinforced or armoured for subsequent heat sealing;

FIG. 5 is a perspective view of a completed expansible portion of the safety garment, embodying five pairs of plastic sections, before the expansible portion is joined in the garment; and

FIG. 6 is a partial section of the expansible portion shown in FIG. 5 joined in either a sleeve or trouser leg of the safety garment, and illustrating a pair of the gathering elastic bands spanning the inside of the expansible portion.

DETAILED DESCRIPTION OF THE INVENTION

The invention is shown herein as embodied in a gas and liquid impervious safety garment, generally designated 10 in FIG. 1, which, in most instances, completely covers a person's body and includes sleeve portions 12, trouser portions 14, and a helmet portion 16 with a window 18 hermetically sealed in the front thereof. Safety gloves 20 and boots 22 preferably are hermetically sealed on the ends of the sleeves and trouser legs, respectively. An outlet conduit 24 may be provided below the helmet 16 for connection to breathing and/or ventilating systems.

The invention disclosed herein is directed particularly to providing bellows-like, pleated expansible portions, generally designated 26 in FIG. 1, joined in the safety garment, for instance in the sleeves 12 and/or trouser legs 14. The expansible portions 26, as will be shown hereinafter, are of the accordion type, having alternating inner and outer seams spaced in a direction generally perpendicular to the adjoining portions of the garment such as the sleeves and the trouser legs. It should be pointed out that the expansible portions 26 are shown herein to be circular or tubular in shape for use in sleeves or trouser legs of the safety garment. However, the principles of the invention are equally applicable to semi-circular expansible portions, or other shapes applicable to other portions of the safety garment.

The invention relates both to a product comprising the expansible sections 26, as well as a method of fabricating the expansible portions. The fabrication method will be described in detail below. The structure of the expansible sections will be readily apparent in every detail from the following explanation of the method of fabrication.

Initially, it should be pointed out that the expansible portions 26 are fabricated by starting out with a plurality of preferably disc shaped flat sections of relatively thin plastic or impregnated fabric material of a generally uniform size, the material being capable of adherance by heat sealing to provide gas and liquid impervious seams for the accordion type expansible portions of the garment, and to permit a completed expansible garment portion to be hermetically sealed in a sleeve or trousers leg, for instance, of the safety garment.

Referring to FIG. 2, a pair of the aforesaid flat sections of plastic material, sections 26a and 26b, are placed in juxtaposition and joined together by sewing a first continuous circular line of stitching 28 about a central aperture locating position (to be described hereinafter), and spaced inwardly of the periphery of the pairs of sections. At least one of the sections, 26b shown in FIG. 2, may be provided with a circular impression 30 which serves as a guide for sewing the line of stitching 28. In addition, air passages 32 should be formed in the flat sections 26a, 26b, within the bounds of the circular line of stitching 28, before or after joining the two sections to provide means to relieve vacuum between the sections and between adjacent pairs of sections during subsequent fabricating steps, as will be readily apparent hereinafter.

After joining the two sections 26a, 26b by sewing the circular line of stitching 28, the two sections are heat sealed together along the line stitching, with the heat seal extending outwardly at least slightly beyond the stitching, preferably generally in the area shown by the aforesaid impression 30 (FIG. 2). Actually, the same heating machine could be utilized to form the guiding impression 30 as well as provide the heat seal.

At this point, it should be pointed out that a plurality of pairs of sections 26a, 26b are sewn together and heat sealed as described above and then the pairs of joined and sealed sections are themselves joined in juxtaposition, as described below, to form the bellows or accordion type expansible section 26.

More particularly, as shown in FIG. 3, two pairs of joined and sealed sections 26a, 26b are placed in juxtaposition and adjacent sections (i.e., section 26a of one pair and section 26b of the other pair) of the two adjacent pairs thereof are joined by sewing a second circular continuous line of stitching 34 spaced outwardly from the first line of stitching 28.

The sequence of fabricating steps described up to this point are shown in FIGS. 3a through 3c. FIG. 3a shows a pair of sections 26a, 26b sewn together by a line of stitching 28. FIG. 3b shows the joined pair of sections heat sealed together along the line of stitching 28 and extending outwardly therefrom, as designated by the impressions 30a which usually are left by the sealing iron. FIG. 3c shows the next step of sewing adjacent sections of adjacent pairs thereof together by the line of stitching 34. The second or outer line of stitching 34 preferably is maintained generally equidistant from the first or inner line of stitching 28.

After sewing the two adjacent pairs of sections 26a, 26b together along stitching line 34, a reinforced or armoured heat seal is provided over the stitching line. Referring to FIG. 4, this is accomplished by positioning reinforcing strips 36 over the line of stitching 34 on the outside face of each of the joined sections 26a, 26b about the periphery thereof and overlying the stitching line 34, as best seen in FIG. 4. The strips 36 and the sections 26a, 26b sandwiched therebetween then are heat sealed together over the stitching line 34 with the seal extending at least slightly outwardly from the stitching toward the periphery of the sections to provide a gas and liquid impervious seam. Any excess portions of the strips 36, or the outer periphery of the sections 26a, 26b sandwiched and sealed therebetween, then is trimmed off to provide a neat outer periphery for the outer seams of the expansible portion 26 (see FIG. 5).

A central aperture 38 then is cut out of the joined and sealed sections 26a, 26b through which a body portion such as an arm or leg will extend when the expansible portion is joined in the safety garment.

It should be pointed out that the above description of the fabrication method of this invention is directed to the assembly and fabrication of only two pairs of sections 26a, 26b. This is done for illustration and brevity purposes only. However, the same structure and fabrication procedures may be performed in fabricating expansible portions comprising more than two of such pairs of such sections, for instance five sections as shown in FIGS. 1, 5 and 6.

FIG. 5 shows a completely fabricated expansible portioned 26 embodying the concepts of the present invention prior to joining the expansible portion in a safety garment. FIG. 6 shows the expansible portion 26 shown of FIG. 5 hermetically sealed in a portion of the safety garment, for instance sleeve 12. Section 26a of the top pair (as viewed in FIG. 6) of joined and sealed sections, and section 26b of the lower pair thereof are hermetically sealed to adjacent portions of the sleeve 12, as by heat sealing or the like. FIG. 6 shows that by heat sealing and armouring the seams between adjacent sections and adjacent pairs thereof, in the manner described above, there is no stitching exposed on the exterior of the suit, and a gas and liquid impervious expansible portion of the suit is provided.

Referring to FIGS. 1 and 6, a plurality of elastic bands 40 are secured to the inside of the garment (for instance the sleeve 12 shown in FIG. 6) on opposite sides of the expansible portion 26 and spanning the expansible portion on the inside thereof through the apertures 38 in the sections to normally urge the expansible portion to a contracted condition. Appropriately, the expansible portion 26 may be expanded against the biasing of the elastic bands 40 for self adjustment to fit different sized individuals. It thus is readily apparent that the expansible portions 26 of the present invention, and the garment within which they are built-in, protect a workman while conforming to the workman's size so as to provide maximum mobility commensurate with the total protection against ambient liquid and gas environment.

The foregoing detailed description has been given for clearness of understanding only and no unnecessary limitations should be understood therefrom as some modifications will be obvious to those skilled in the art.

We claim:

1. A method of fabricating a bellows-like, pleated expansible portion of a gas and liquid impervious safety garment, comprising the steps of:

providing a plurality of pairs of flat sections of relatively thin flexible material and generally of a uniform shape;

placing the two sections of each pair thereof in juxtaposition;

joining the two sections of each pair thereof by sewing a first continuous line of stitching about a central aperture locating position and spaced inwardly of the periphery of said sections;

heat sealing the two sections of each pair thereof together along said first line of stitching;

placing at least two pairs of said joined and sealed sections in juxtaposition;

joining adjacent sections of adjacent pairs thereof by sewing a second continuous line of stitching spaced outwardly of said first line of stitching;

heat sealing the adjacent sections of adjacent pairs thereof together along said second line of stitching; and

joining said joined and sealed pairs of sections in said garment.

2. The method of claim 1 including the step of forming a body portion receiving aperture through said joined and sealed flat sections inside of said first line of stitching after sewing said first line of stitching and before joining said pairs of joined and sealed sections in said garment.

3. The method of claim 2 including the step of securing at least one elastic strap to the inside of said garment on opposite sides of said expansible portion, the strap extending through said aperture and normally biasing the expansible portion to a contracted condition.

4. The method of claim 1 including the step of forming an air passage in each of said flat sections within the bounds of said first line of stitching before joining said pairs of said sections together to provide means to relieve vacuum between adjacent sections.

5. The method of claim 1 wherein said second line of stitching is sewn generally equidistant from said first line of stitching.

6. The method of claim 1 wherein said step of heat sealing along said second line of stitching is performed by positioning a reinforcing strip of thin flexible material over said second line of stitching on the outside of each of said joined sections, and heat sealing the strips and the sections together over said second line of stitching to provide a gas and liquid impervious seam.

7. The method of claim 6 wherein said strips are positioned so as to extend outwardly of said second line of stitching, and including the step of trimming off any excess of said strips and/or said sections which extends outwardly beyond the heat seal over said second line of stitching.

8. The method of claim 1 including the step of providing an elongated guiding impressing on the outside of at least one section of each pair thereof to guide the sewing of said first line of stitching.

9. The method of claim 1 including the step of trimming off any excess of said sections which extends outwardly beyond the heat seal over said second line of stitching.

10. The method of claim 1 wherein said heat seals over said first and second lines of stitching extend at least slightly outwardly beyond the stitching toward the periphery of the sections to insure gas and liquid impervious seams.

11. A method of fabricating a pleated expansible portion of a gas and liquid impervious safety garment, said portion being of the accordion type with alternating inner and outer seams spaced in a direction generally perpendicular to adjoining portions of the garment, comprising the steps of:

providing a plurality of pairs of flat sections of relatively thin flexible material having at least one surface of plastic material;

joining the two sections of each pair thereof by sewing a first line of stitching and heat sealing the two plastic surfaces of such sections of each pair along said first line of stitching to form said inner seams;

joining adjacent sections of adjacently positioned pairs thereof by sewing second lines of stitching spaced from said first lines of stitching and heat sealing along said second line of stitching to form said outer seams; and

joining said joined and sealed pairs of sections in said garment by a gas and liquid impervious seam.

12. The method of claim 11 including the step of trimming off any excess of said sections which extends outwardly beyond the heat seal over said second lines of stitching.

13. The method of claim 11 wherein said step of heat sealing along said second line of stitching is performed by positioning a reinforcing strip of thin plastic material over said second line of stitching on the outside of each of said joined sections, and heating sealing the strips and the sections together over said second line of stitching to provide a gas and liquid impervious seam.

14. The method of claim 13 wherein said strips are positioned so as to extend outwardly of said second line of stitching, and including the step of trimming off any excess of said strips and/or said sections which extends outwardly beyond the heat seal over said second line of stitching.

15. The method of claim 11 including the step of securing at least one elastic strap to the inside of said garment on opposite sides of said expansible portion to urge the expansible portion to a contracted condition.

16. In a gas and liquid impervious safety garment, a pleated expansible portion of the accordion type with alternating inner and outer seams spaced in a direction generally perpendicular to adjoining portions of the garment, said inner and outer seams comprising a line of stitching between adjacent pleated sections, and a heat seal over said lines of stitching and extending at least slightly outwardly therefrom toward the outside of the garment to insure that the seams are hermetically sealed.

17. The safety garment of claim 16 wherein at least the outside seams of said expansible portion are reinforced by strips of plastic-like material positioned over each side of said stitching and heat sealed thereof.

18. The safety garment of claim 16 including at least one elastic strap secured to the inside of the garment spanning said expansible portion to urge the expansible portion to a contracted condition.

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