

CAVELIER

ABOGADOS

EDIFICIO SISKI

CARRERA 4 No. 72 - 35

BOGOTÁ 8, COLOMBIA

WEB SITE: www.caveller.com
E-MAIL: caveller@caveller.com

TELEFONO: (57) (1) 347-3611
TELEFAX: (57) (1) 211-8650 (57) (1) 540-0860

Señora Jefe de la
DIVISION DE NUEVAS CREACIONES
Superintendencia de Industria y Comercio
E. S. D.

SUPERINDUSTRIA Y COMERCIO
Radicación : 03090274 00000003 Folios: 2
Fecha (Año): 2005-12-15 17:48:43
Trámite : VII PCI-PATENT 379 FASE NACI 538 PETICION
Dependencia: 2004 DIVISION DE NUEVAS CREACIONES

Trámite :011
Evento :379
Actuación :538

Referencia : Expediente No. 03090274
Asunto : Solicitud de patente para **PRODUCTO ABSORBENTE CON INDISERNIBILIDADES MEJORADAS**
Solicitante : SCA HYGIENE PRODUCTS AB
Fecha de solicitud : 9 de octubre de 2003
Publicada en : La Gaceta No. 553 del 30 de junio de 2005

1. Yo, Emilio FERRERO, identificado como aparece al pie de mi firma, actuando como apoderado en el asunto de la referencia, atentamente, solicito se efectúe el examen de patentabilidad de la solicitud en referencia presentada de acuerdo con el Capítulo II del PCT y según lo establecido en el artículo 44 de la Decisión 486 de la Comisión de la Comunidad Andina. Para tal efecto presento junto con este escrito el recibo por valor de \$ 186.000.00, que corresponde a la tasa fijada según lo dispuesto en la resolución No. 31980 del 24 de diciembre de 2004.

2. Ruego atentamente a la Señora Jefe se sirva ordenar que se anexe este recibo para que se efectúe dicho examen y se continúe con el trámite de la solicitud.

Bogotá, 4 DIC. 2005
Señora Jefe,


EMILIO FERRERO
T.P.A. No. 31.929

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

NIT : 800176089-2

SUPERINTENDENCIA Y COMERCIO
Radicacion : 010982/4 00000003 Folios: 2
Fecha (HH): 2005-12-15 17:40:43
Tramite : 011 PCT-PATENT 379 FASE NULI 536 PETICION
Dependencia: JUEZ DIVISION DE NUEVAS INENCIONES

RECIBO OFICIAL DE CAJA : 05 - 90,759
FECHA : NOVIEMBRE 28 DE 2005

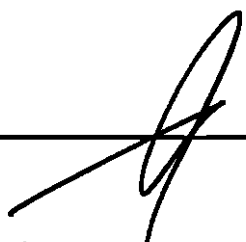
***** CONSIGNACION *****

DEPOSITANTE	TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PGO	Vr. PAGO
CAVELIER ABOGADOS	CONSIGNACION	BANCO POPULAR	050-00110-6	44802236	28/11/2005	44,089,500.00

***** CONCEPTO *****

CANT. RENTISTICO	CONCEPTO	TOTAL CONCEPTO
1 50005-01-01 SOLICITUDES	114 PTC CAP-11 EXAMEN DE PATENTIBILID	186,000.00
	TOTAL :	186,000.00

SON: CIENTO OCHENTA Y SEIS MIL PESOS

RESPONSABLE :  _____
RECIBO DE CAJA APLICADO AL EXPEDIENTE No. _____

Cdb 11256-841-028-9

**SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
DIVISIÓN DE NUEVAS CREACIONES
SOLICITUD VIA PCT**

2020

Bogotá, D.C., 17 de noviembre de 2006

Doctor
EMILIO FERRERO
Apoderado

Oficio No. 13614

ASUNTO	Radicación	03-90274
	Trámite	002
	Evento	001
	Actuación	430
	Folios	017

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

- Para el presente estudio se tuvo en cuenta el capítulo descriptivo que se encuentra en los folios 65 a 90, los dibujos que se encuentran en los folios 19 a 29 y el capítulo reivindicatorio que se encuentra en los folios 91 a 94 que comprende quince (15) reivindicaciones.
- Se considerará la prioridad reivindicada sobre la solicitud de Suecia No. 0101294-7 del 11 de abril de 2001.

2. Objeto de la invención

- La invención propuesta se relaciona con un producto absorbente con aletas.

En la reivindicación independiente 1 se define un producto absorbente (101) tal como una toalla sanitaria, un recubrimiento interior de pantaloncito o una almohadilla de incontinencia, cuyo producto tiene dos bordes de extremo transversales (117, 118), dos bordes laterales longitudinales (119, 120), una capa de superficie permeable a los líquidos (102), una capa posterior que impide el paso de líquido (103) y un núcleo absorbente (104) dispuesta entre estas capas (102, 103), el producto tiene aletas laterales (106) dispuesta en los bordes laterales longitudinales (119, 120) sobre ambos lados del núcleo absorbente (104), cuyas aletas laterales (106) son de tal forma y tamaño que, durante el uso del producto, ellas se pueden doblar alrededor de los bordes de la pierna en la porción de entrepierna sobre un par de pantaloncitos, caracterizada por que las aletas laterales (106) exhiben un brillo inferior al 25%.

- Se afirma que muchas usuarias emplean productos sanitarios con aletas laterales para evitar chorroaduras de fluidos corporales pero estas aletas son visibles. En el estado del arte se conocen productos sanitarios con aletas laterales transparentes pero dicha transparencia no es lo mismo que la no visibilidad. Las aletas laterales, aún si ellas son hechas de un material transparente, pueden brillar y de esta manera ser visibles. De esta manera, existe la necesidad de un artículo absorbente mejorado con aletas laterales y discreción mejorada.
- El objeto de la invención definido se catalogó como A61F 13/15, según la Clasificación Internacional de Patentes (IPC⁷).

3. Claridad de la solicitud

El artículo 30 de la Decisión 486 de la Comisión de la Comunidad Andina establece que: "Las reivindicaciones definirán la materia que se desea proteger mediante la patente. Deben ser claras y concisas y estar enteramente sustentadas por la descripción.

Las reivindicaciones podrán ser independientes o dependientes. Una reivindicación será independiente cuando defina la materia que se desea proteger sin referencia a otra reivindicación anterior. Una reivindicación será dependiente cuando defina la materia que se desea proteger refiriéndose a una reivindicación anterior. Una reivindicación que se refiera a dos o más reivindicaciones anteriores se considerará una reivindicación dependiente múltiple".

- En la reivindicación independiente 1 se caracteriza un producto absorbente porque 'las aletas laterales exhiben un brillo inferior al 25%' lo cual corresponde a una propiedad física que puede ser intrínseco del material empleado para hacer las aletas laterales. No obstante, esta es una forma inadecuada de definir un producto porque está intentando caracterizar mediante una propiedad física como lo es el brillo, propiedad inherente a un material más que a un producto. Otra dificultad es que no es posible siquiera definir el alcance de la invención pues estaría intentando proteger cualquier producto absorbente cuyas aletas laterales posean un brillo inferior al 25% cosa que no es admisible.

Es conocido en el ámbito de patentes que los productos sean caracterizados por los elementos contenidos y/o estructura tangible, por su configuración, por su disposición, por su forma, por su composición, naturaleza química, etc. Además, una reivindicación independiente debe ser lo suficientemente completa como para permitir identificar las características novedosas de la invención. Por lo tanto, se recomienda que el señor solicitante modifique la parte caracterizante de forma que se incluyan los elementos técnicos, la estructura, etc., que corresponda al aporte que se propone con la solicitud.

- En la reivindicación dependiente 2 se presenta el mismo problema de claridad discutido en la reivindicación 1 y por ello se recomienda tener en cuenta las observaciones del punto anterior.
- En conclusión, las reivindicaciones 1 y 2 no cumplirían con el requisito de claridad de acuerdo con el artículo 30 de la Decisión 486.

4. Determinación del estado de la técnica

El artículo 16 de la Decisión 486 de la Comisión establece: "El estado de la técnica comprenderá todo lo que haya sido accesible al público por una descripción escrita u oral, utilización, comercialización o cualquier otro medio antes de la fecha de presentación de la solicitud de patente o, en su caso, de la prioridad reconocida.

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

- Se realizó el estudio de los documentos concernientes a la búsqueda preliminar Internacional y se consideró el 11 de abril de 2001 como fecha para el análisis del estado de la técnica.
- De acuerdo con lo establecido en el artículo 16 se determinó el estado de la técnica y se encontraron los siguientes antecedentes:

No.	Documento No.	Título	Fecha de Publicación
1	EP1078619	"ABSORBENT ARTICLE HAVING SIDE FLAPS, AND PROCESS FOR MANUFACTURING THE SAME"	28 de febrero de 2001
2	US4463045	"MACROSCOPICALLY EXPANDED THREE-DIMENSIONAL PLASTIC WEB EXHIBITING NON-GLOSSY VISIBLE SURFACE AND CLOTH-LIKE TACTILE IMPRESSION"	31 de julio de 1984

5. Evaluación de los requisitos de patentabilidad

El artículo 14 de la Decisión 486 de la Comisión de la Comunidad Andina establece: "Los Países Miembros otorgarán patentes para las invenciones, sean de producto o de procedimiento, en todos los campos de la tecnología, siempre que sean nuevas, tengan nivel inventivo y sean susceptibles de aplicación industrial."

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

Evaluación del Nivel Inventivo:

El artículo 18 de la Decisión 486 de la Comisión de la Comunidad Andina establece: "Se considerará que una invención tiene nivel inventivo, si para una persona del oficio normalmente versada en la materia técnica correspondiente, esa invención no hubiese resultado obvia ni se hubiese derivado de manera evidente del estado de la técnica."

Respecto al estado de la técnica:

- En el Documento **EP1078619** (llamado de aquí en adelante D1) se divulga la existencia de un artículo de absorción que incluye un cuerpo con una hoja permeable superior, una hoja de respaldo y una capa absorbente entre dichas capas; y unos miembros de alas sobre los dos lados del cuerpo absorbente.

Una característica técnica que se desea resaltar en D1 es que se revela la alternativa de que los miembros de ala sean elaborados de una película polimérica transparente (Columna 10, líneas 44 – 46).

- En el Documento **US4463045** (llamado de aquí en adelante D2) se divulga la existencia de una película plástica tridimensionalmente expandida que exhibe una superficie visible no brillante y con impresión fibrosa al tacto. Esta película plástica presenta un patrón microscópico en la superficie el cual no es perceptible por el ojo humano y que elimina la reflexión especular de la luz incidente.

En D2 se enseña que dicha película puede ser empleada para prendas y estructuras fibrosas que estén en contacto con la piel del usuario, también como nuevos productos donde impresión visual y táctil es deseada, entre los cuales se mencionan los pañales desechables, las toallas sanitarias, etc.

Respecto a la solicitud en estudio:

- El técnico de nivel medio versado en la materia puede ser un ingeniero químico que labore en la industria de absorbentes y atiende a planes de mejoramiento continuo normalmente planteados en las empresas.
- De acuerdo con las reivindicaciones de la solicitud en estudio, se entiende que el principio técnico sobre el cual se fundamenta la propuesta consiste en productos absorbentes que incluyen aletas laterales transparentes con brillo muy bajo (menor al 25%). No obstante, si un técnico de nivel medio versado en la materia tuviera acceso a D1 se motivaría a desarrollar artículos absorbentes desechables con aletas laterales que pueden ser transparentes.

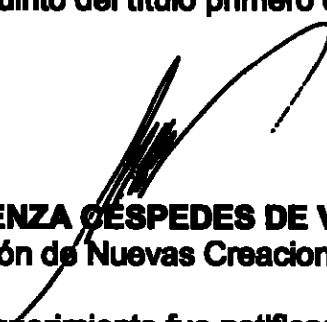
La diferencia entre D1 y la propuesta es que en dicha anterioridad no se habla nada sobre el deseo de eliminar el brillo de las aletas transparentes. No obstante, en D2 sí se divulga un material polimérico en forma de película que puede emplearse en artículos absorbentes desechables y que tiene un nivel de brillo muy bajo dado que dicha película busca ese propósito visual mediante la formación de un patrón de superficie microscópico imperceptible al ojo humano. Así, un técnico de nivel medio que se base en D1, analice las diversas opciones de películas elaboradas de materiales poliméricos del arte previo y tenga en cuenta la posibilidad de seleccionar películas como las de D2, podría verse motivado a desarrollar artículos absorbentes equivalentes a los de la solicitud en estudio, que tengan aletas laterales transparentes y de poco brillo que resulten en una baja percepción visual de las aletas durante su uso. Por lo tanto, no es posible afirmar que con la propuesta se genere un efecto sorprendente que evidencie un salto tecnológico respecto a lo conocido, por el contrario, el producto propuesto parece ser un mejoramiento que forma parte de la línea normal de avance de la tecnología adelantado por un técnico de nivel medio versado en la materia.

- Por lo anteriormente expuesto, la invención definida por las reivindicaciones 1 a 15 de la solicitud podría verse afectada en su nivel inventivo ya que se deriva de manera evidente del estado de la técnica y puede ser obvia para un técnico de nivel medio versado en la materia. Por tanto, no cumpliría con las disposiciones del artículo 18 de la Decisión 486 de la Comisión de la Comunidad Andina.
- En conclusión, los requisitos de patentabilidad de la presente solicitud se encuentran afectados así:

No.	Documento	Reivindicaciones Afectadas	Requisito que afecta
1.	EP1078619	1 – 15	Nivel Inventivo
2.	US4463045		

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 No. 10 de 2001.


ALIX CARMENZA CÉSPEDES DE VERGEL
 Jefe de División de Nuevas Creaciones

24 NOV. 2006

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

CONCEPTO TECNICO No. 1790	EXAMINADOR TECNICO Código No. 202042
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Europäisches Patentamt
European Patent Office
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(11) EP 1 078 619 A2

(12) EUR PEAN PATENT APPLICATION

(43) Date of publication:
28.02.2001, Bulletin 2001/08

(51) Int Cl.7: A61F 13/476

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(72) Inventor: Suekane, Makoto, c/o Technical Center
Mitoyo-gun, Kagawa-ken 760-1602 (JP)

(74) Representative: Enakat, Michael Antony Frank
Saunders & Dolleymore,
8, Rickmaneworth Road
Watford, Hertfordshire WD18 0JU (GB)

(30) Priority: 27.08.1999 JP 24127999

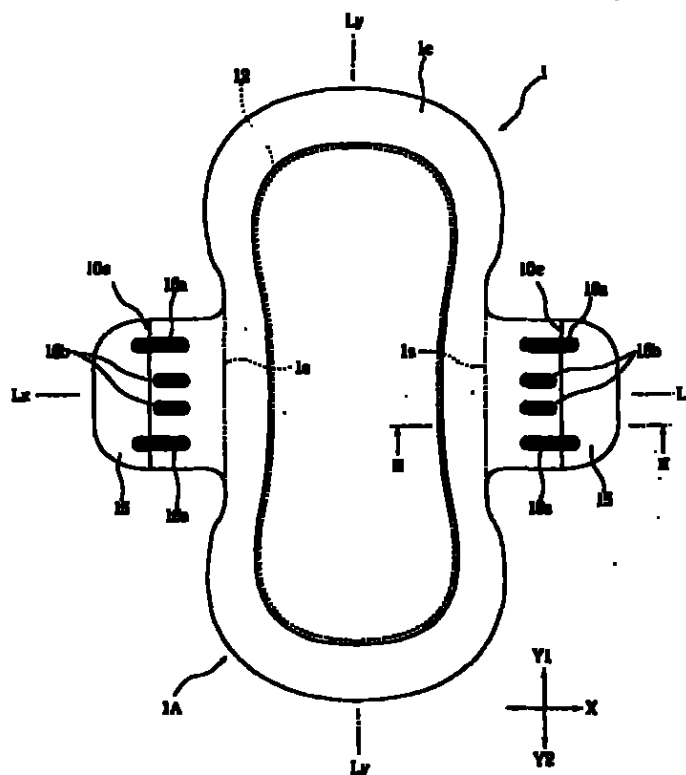
(71) Applicant: UNI-CHARM CORPORATION
Kawanoe-shi Ehime-ken (JP)

(54) Absorbent article having side flaps, and process for manufacturing the same

(57) There is disclosed an absorptive article including: a body including a liquid-permeable top sheet, a back sheet and an absorbent layer sandwiched between the top sheet and the back sheet; and wing mem-

bers disposed on two side portions of the body and extending outwards in the widthwise direction from the body. The wing members are joined to the two side portions of the body while being sandwiched between the top sheet and the back sheet.

Fig. 1



ABSORPTIVE ARTICLE HAVING WING MEMBERS, AND PROCESS FOR MANUFACTURING THE SAME

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an absorptive article such as a sanitary napkin, a panty liner or a towel pad. More particularly, the invention relates to an absorptive article having wings to be folded back, when worn, to the lower side of the crotch portion of an undergarment, and to a process for manufacturing the absorptive article.

2. Related Art

In recent years, various types of absorptive articles such as sanitary napkins, panty liners or towel pads have been used for absorbing the discharges such as menses or urine. Most of these absorptive articles are provided with wings on the two longitudinally extending side portions. When the absorptive article is worn, the wings are folded back to the lower side of the crotch portion of the undergarment to prevent the undergarment edge portions from being blocked with the discharges. In general, these wings are provided with adhesive means for attaching them to the undergarment. The absorptive article can be easily worn with this structure if its wings are attached and released to the lower side of the crotch portion of the undergarment.

These wings are generally formed by pasting the members constructing the body of the absorptive article integrally, that is, the joint assembly of a back sheet and a top sheet sidepiece of the body of the absorptive article.

When the joint assembly of the back sheet and the top sheet is used to form the wings, however, the absorptive article has to be manufactured such that a laminate is formed by sandwiching an absorbent layer between a back sheet material and a top sheet material, and this laminate is released cut to form an elongated or later-gone body portion and wings. Therefore, the width size of the back sheet material and the top sheet material for use have to be much larger to form the wings by cutting. Moreover, the unnecessary waste portions to be cut out while having the body portion and the wings are considerably wide even in the top sheet material and the back sheet material.

In some absorptive articles of the prior art, on the other hand, the wing members are formed separately from the members forming the body so that they may be given a function different from that of the top sheet. In Japanese Unexamined Patent Publication (Kokai) No. Heisei 6-47073, for example, there is disclosed a sanitary napkin in which the wing members and the side barriers (or the absorbent leakage preventing walls) are made of a common member. This napkin can be manufactured by releasing one step of the manufacturing process because the members to be sufficiently attached separately of each other are made of the common member.

In Japanese Unexamined Patent Publication (Kokai) No. Heisei 9-531029, on the other hand, there is disclosed an absorptive article in which the wing members are easily folded downward along the edge portions of the crotch portion of an undergarment. These wing members are provided with means of different extensibility to lower the stress which will arise at the folding time.

However, the structure, in which the wing members are made of a member different from that constructing the body, has a defect that the wing members easily come out from the

body. In the aforementioned example, moreover, the wing members are joined to the surface of the top sheet or back sheet of the absorptive article so that there is a limit to the adjustment of the joint strength between the wing members and the body. Since the wing members are usually exposed to the surface of the absorptive article, moreover, their wet portions are highly possibly caught, when the absorptive article is worn, to harm the body.

On the other hand, the wing members are demanded to have functions such as an easy foldability along the edge portions of the undergarment or an air-permeability. If the wing members and the side barriers are made of the common member as in the former example, for example, the wing members are hard to fold downward along the edge portions of the crotch portion of the undergarment. Moreover, the side barriers are usually made of an impermeable material, and the wing members have an air-permeability lowered to reduce the leakage of the undergarment stuff if they are made of the same material. In the latter case, on the contrary, the wing members having the differently extensible means could be made of an air-permeable material and are easily folded downward along the edge portions of the crotch portion of the undergarment. In the presence of the differently extensible means, however, the foldable areas of the wing members are so widened that the wing members are hard to fold on the predetermined lines in the manufacturing process. As a result, it is difficult to realize the production efficiency.

SUMMARY OF THE INVENTION

An object of this invention is to provide an absorptive article having wing members joined reliably.

Another object of the invention is to provide an absorptive article having wing members which can be easily folded downward along edge portions of a crotch portion of an undergarment, and a process for manufacturing the absorptive article.

Still another object of the invention is to provide an absorptive article having wing members of excellent air-permeability, and a process for manufacturing the absorptive article.

A further object of the invention is to provide a process for manufacturing an absorptive article which can minimize the trimming loss of the materials in the least while having an excellent production efficiency.

According to the invention, there is provided an absorptive article comprising a body including a liquid-permeable top sheet, a back sheet and an absorbent layer sandwiched between the top sheet and the back sheet; and wing members disposed on two side portions of the body and extending outwardly in the widthwise direction from the body, wherein the wing members are joined to the two side portions of the body while being sandwiched between the top sheet and the back sheet.

In the invention, the wing members are sandwiched between the top sheet and the back sheet so that they can be reliably joined to the body while being prevented from coming out when the absorptive article is worn. In the invention, the wing members are made of a material different from those of the top sheet and the back sheet so that they can be given various functions.

Preferably, both the width size of joint regions between the top sheet and the wing members and the width size of joint regions between the back sheet and the wing members are at least 5 mm.

Preferably, at an intermediate region, to which the wing members are attached, of the body, the top sheet has a larger

width size than that of the back sheet so that the joint regions between the top sheet and the wing members have a larger width size than that of the joint regions between the back sheet and the wing members.

Preferably, the wing members have a moisture permeability of no less than 10,000 g/m² according to JIS-S-0205. In this case, it is preferred that the width size of the joint regions between the top sheet and the wing members is at least 10 mm; that when the area of the joint regions between the top sheet and the wing members is assumed to be 1 (or 100 %), the substantial joint area in the joint regions between the top sheet and the wing members by an adhesive is at most 0.2 (or 20%) and that the top sheet and the wing members are partially welded and joined. More preferably, a plurality of welded and joined portions are arranged in the widthwise direction and provided at intervals in the longitudinal direction such that at least one welded and joined portion extends from the joint regions between the top sheet and the wing members to regions of only the wing members.

Preferably, the rigidity value of napkins, in which the wing members, the top sheet and the back sheet are joined together, according to the method is larger by at least 20 mm than that of a joint portion, in which the top sheet and the back sheet are joined to each other without sandwiching the wing members, according to the same method. In this case, the rigidity value of the wing members according to the same method is preferably 30 to 150 mm in the MD and 30 to 100 mm in the CD.

Preferably, the wing members have an extensibility in the widthwise direction so that the stretching force of the wing members as a whole for a strain of 10% is at least 5 gf when the wing members are uniformly extended in the widthwise direction all over the area of the longitudinal direction.

Preferably, the wing members have an extensibility in the widthwise direction so that the strain when extended to the limits in the widthwise direction is within a range of 10 to 40%.

Preferably, the wing members have a tensile strength of at least 20N according to the JIS-S-7105.

According to the invention, there is also provided a process for manufacturing an absorptive article including a body including a liquid-permeable top sheet, a back sheet and an absorbent layer sandwiched between the top sheet and the back sheet; and wing members disposed on two side portions of the body and extending outwardly in the widthwise direction from the body, comprising:

- (a) a step of joining wing member materials to two sides of a back sheet material;
 - (b) a step of placing an absorbent layer on the back sheet material before or after the step (a);
 - (c) a step of sandwiching the absorbent layer between a top sheet material and the back sheet material by feeding the top sheet material over the absorbent layer;
 - (d) a step of joining the top sheet material and the back sheet material on the outer side of the absorbent layer; and
 - (e) a step of cutting off unnecessary portions of the back sheet material, the top sheet material and the wing member materials, to manufacture an absorptive article in which the body and the wing members are joined.
- According to this manufacturing process, the unnecessary portions to be disposed during the manufacture, that is, the so-called "trimming loss" is reduced, and the wing members can be simply attached to the body so that the process is efficient in the productivity.
- At the step (e), the wing member materials are preferably joined to the upper face of the back sheet material, and at

the step (e), the wing member materials are preferably sandwiched and joined between the back sheet material and the top sheet material.

At the step (e), the back sheet material and the top sheet material are preferably joined by an adhesive.

The process preferably further comprises: between the step (d) and the step (e), the step of welding and joining the top sheet material and the wing member materials.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view showing an absorptive article in accordance with one embodiment of the invention and taken from a liquid receiving side;

FIG. 2 is a bottom plan view, as taken from the back side, of the absorptive article shown in FIG. 1;

FIG. 3 is a partial section taken along line III-III of FIG. 1;

FIG. 4 is a plan view showing the state in which the absorptive article shown in FIG. 1 is mounted on an undergarment;

FIG. 5 is a top plan view showing another embodiment of the wing members;

FIG. 6 is a top plan view showing still another embodiment of the wing members;

FIG. 7 is a process chart for explaining the state in which a back sheet material and a wing member material are fed;

FIG. 8 is a process chart for explaining the state in which an absorbent layer and a top sheet material are fed;

FIG. 9 is a first process chart for explaining a sanitary napkin;

FIG. 10 is a side view of the mounting apparatus of the JIS-S-0205 Standard;

FIG. 11 is a perspective view of the scale used in the JIS-L-1000 Standard;

FIG. 12 is a side view of the measuring apparatus of the JIS-L-7105 Standard; and

FIG. 13 is a plan view of the measuring apparatus of the JIS-L-7105 Standard.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 is a top plan view showing an absorptive article in accordance with one embodiment of the invention and taken from a liquid receiving side. FIG. 2 is a bottom plan view, as taken from the back side, of the absorptive article shown in FIG. 1; FIG. 3 is a partial section taken along line III-III of FIG. 1; and FIG. 4 is a plan view showing the state in which the absorptive article shown in FIG. 1 is mounted on an undergarment. Here, a longitudinal direction of the absorptive article is taken in a Y-direction, and a widthwise direction generally perpendicular to the Y-direction is taken in a X-direction.

In the embodiment shown in FIG. 1, the absorptive article of the invention is comprised by a sanitary napkin 1. This sanitary napkin 1 is made generally symmetric with respect to a center line L_y extending in the Y-direction. The sanitary napkin 1 is constructed, as also seen from the partial sectional view of FIG. 3, to include a body 1A having a liquid-permeable top sheet 10 disposed toward the liquid receiving side, a liquid-impermeable back sheet 11 disposed toward the outer side and an absorbent layer 12 sandwiched between the top sheet 10 and the back sheet 11; and wing members 15 disposed on the two longitudinally extending side portions of the body 1A. Moreover, the top sheet 10 and

the back sheet 11 are joined in each other around the sheet-like layer 12 by a hot-melt adhesive thereby to form a peripheral joint portion 14.

As shown in FIG. 2, adhesive 19 are applied to the back of the body 1A of the sanitary napkin 1, and adhesives 19 are applied to the back of the wing members 15. The sanitary napkin 1 is attached, when worn, to a menses portion 20 of an underwear 20, as shown in FIG. 4. At this time, the adhesive 19 on the back of the body 1A are attached on the inner face of the crotch portion 21 of the underwear 20. Thus, the wing members 15 extending outward of the body 1A in the X-direction are folded together with the extension of the top sheet 10 along the edge portions 31 of the underwear 20 so that the wing members 15 are attached on the underwear 20 by the adhesives 19. By thus providing the wing members 15, it is possible to prevent the underwear edge portions from being lifted and the sanitary napkin 1 from going out of position.

As shown in FIG. 3, the wing members 15 are sandwiched and joined at their side portions between the top sheet 10 and the back sheet 11 by an adhesive such as a hot-melt adhesive. The sandwiching width of the joint regions, that is, both the joint width 22 in the X-direction between the back sheet 11 and the wing member 15 and the joint width 23 in the Y-direction between the top sheet 10 and the wing member 15 are preferably at least 5 mm or more so that the wing member 15 may not easily leave the body 1A.

In order to enhance the joint strength (or the tearing strength) between the wing member 15 and the body 1A, the top sheet 10 is provided to extend longer outward in the X-direction than the back sheet 11. More specifically, in the intermediate region of the body 1A including a center line La (shown and to be attached with the wing members 15, the size of the top sheet 10 in the X-direction is preferably made no longer than the size of the back sheet 11 in the X-direction. That is, the joint width 22 in the X-direction between the top sheet 10 and the wing member 15 may be larger, as shown in FIG. 3, than the joint width 23 in the Y-direction between the back sheet 11 and the wing member 15.

Here, the joint strength (or the tearing strength) between the body 1A and the wing member 15 can also be enhanced by extending the back sheet 11 longer outward in the X-direction than the top sheet 10. When the back sheet 11 is made liquid-impermeable, however, the moisture permeability of the wings drop if the back sheet 11 is extended outward in the X-direction. For this reason, the joint strength between the body 1A and the wing member 15 is preferably enhanced by making the extending width size of the top sheet 10 in the X-direction longer than that of the back sheet 11 and making the joint width between the top sheet 10 and the wing member 15 no longer.

The joint strength (or the tearing strength) between the wing member 15 and the top sheet 10 is preferably 1,000 g/70° or more.

[Measurement 1]

The tearing strength between the wing member 15 and the top sheet 10 was measured in the following manner. A joint assembly, as shown in FIG. 1, of the top sheet 10 and the wing member 15 was manufactured. This assembly is provided with neither the back sheet 11 nor the absorbent layer 12.

One clamp was used to hold the wider outer portion of one wing member 15 than the aforementioned joint width 22, i.e., that portion of the wing member 15, which is not

joined to the top sheet 10 but exposed of itself, and the other clamp was used to hold the leading end, as located on the upper side (or the Y1 side), as seen in FIG. 1, of the top sheet 10. When the clamp holding the leading end of the top sheet 10 was pulled in the Y2-direction with the clamp holding the wing member 15 being fixed, the measured value (g) was the load which was applied between the two clamps at the instant when a tear occurred at the joint portion between the top sheet 10 and the wing member 15. In this case, the moving velocity of the other clamp in the Y2-direction relative to the one clamp was 100 mm/min.

In the test piece measured, on the other hand, the joint width 22 in the X-direction between the top sheet 10 and the wing member 15 was uniform in the Y-direction. In the joint region of the joint width 22, on the other hand, the hot-melt adhesive was applied intermittently and in a uniform distribution between the top sheet 10 and the wing member 15. If the total area of the joint region of the joint width 22 is set to 1 (or 100%), the applied area (or the substantial joint area) of the hot-melt adhesive in the joint region was 0.5 (or 50%).

Here, an estimated result of the measurement which was made on the tearing strength for the individual test pieces having different sizes in the joint width 22:

Joint Width	Tearing Strength
5 mm	200 g
10 mm	300 g
15 mm	1,000 g
20 mm	1,500 g

From these results, it is preferable that the joint width 22 between the top sheet 10 and the wing member 15 is 15 mm or more. In the joint assembly of the body 1A and the wing member 15, however, the tearing strength can be compensated by the joint between the back sheet 11 and the wing member 15. Therefore, the joint width 22 between the top sheet 10 and the wing member 15 is preferably 10 mm or more. More preferably, the joint width 22 is 15 mm or more.

Next, the wing members 15 are preferably made of an air-permeable sheet so that the underwear may not become tightly bound and stuffy in its inside when worn. The moisture permeability of the wing members 15 according to the JIS-S-6208 is preferably 30,000 g/m²·24 h or more.

[JIS-S-6208]

Definition

Moisture permeability is an amount of water vapor which passes through an area of a membrane test piece in a boundary layer when one side of the boundary is kept in relative humidity of 90% and another side is kept dry by a moisture absorbent during 24 hr under 25° C. or 40° C. The measured volume for these test pieces are converted and converted to represent 1 in g per m square (g/m²).

Measuring apparatus

The measuring apparatus comprising parts designated by numerals 1 to 6 described below is prepared and shown in a side view in FIG. 12. Moisture impregnated media of arbitrary thickness is placed in a prepared. A horizontal ceiling was made of 80% paraffin wax with melting point 50-52° C. and 20% polyethylene with low polymerization degree is prepared.

1. Ring	2. Ring
3. Ring	4. Ring
5. Ring	6. Ring
7. Ring	8. Ring
9. Ring	10. Ring
11. Ring	12. Ring
13. Ring	14. Ring
15. Ring	16. Ring
17. Ring	18. Ring
19. Ring	20. Ring
21. Ring	22. Ring
23. Ring	24. Ring
25. Ring	26. Ring
27. Ring	28. Ring
29. Ring	30. Ring
31. Ring	32. Ring
33. Ring	34. Ring
35. Ring	36. Ring
37. Ring	38. Ring
39. Ring	40. Ring
41. Ring	42. Ring
43. Ring	44. Ring
45. Ring	46. Ring
47. Ring	48. Ring
49. Ring	50. Ring
51. Ring	52. Ring
53. Ring	54. Ring
55. Ring	56. Ring
57. Ring	58. Ring
59. Ring	60. Ring
61. Ring	62. Ring
63. Ring	64. Ring
65. Ring	66. Ring
67. Ring	68. Ring
69. Ring	70. Ring
71. Ring	72. Ring
73. Ring	74. Ring
75. Ring	76. Ring
77. Ring	78. Ring
79. Ring	80. Ring
81. Ring	82. Ring
83. Ring	84. Ring
85. Ring	86. Ring
87. Ring	88. Ring
89. Ring	90. Ring
91. Ring	92. Ring
93. Ring	94. Ring
95. Ring	96. Ring
97. Ring	98. Ring
99. Ring	100. Ring

Measurement

1. The ring is cleaned and kept at about 30-40° C.

2. The moisture absorbent is placed in the ring to make its surface substantially horizontal in the ring, and both are placed in the cap. The cap is then put on the cap table which is held in a horizontal position.

3. The test piece is put on the cap with automatic configuration such that the surface of the moisture absorbent is arranged about 3 mm lower than the bottom surface of the test piece.

4. The guide is put on a groove of the cap table.

5. The ring is inserted along the hole of the guide to make for the test piece to clearly contact the top edge of the cap. The weight is then put on the ring.

6. The guide is pulled up without moving the ring.

7. The melting was is passed along the contacting portion for substantially closed packing and contact.

8. After solidification of the wax, the weight and the cap table are removed.

9. The whole apparatus is stored in a desiccator over and stabilized in the test temperature.

10. After melting for over 10 hours, the weight of the whole apparatus is measured in a state of equilibrium.

11. The whole apparatus is again stored in the oven for several hours and removed.

12. The melting and measuring steps are repeated in 24, 48 or 96 hour intervals until two successive results of an increase of the weight per unit area measured within a range of error of less than 5% occurs.

On the other hand, the moisture permeability of the top sheet 10 is also preferably 10,000 g/m²·24 h. If the hot-melt adhesive is applied to the whole surface of the joint region of the joint width 22 between the top sheet 10 and the wing member 15, however, the moisture permeability drops in the region where the wing member 15 and the top sheet 10 overlap. Therefore, it is preferable to adjust the adhesive applied area (i.e., the substantial joint area) in the joint region of the joint width 22. However, this adhesive applied area also influences the joint strength (or the tearing strength) between the body 1A and the wing member 15.

[Measurement 2]

Then, the sample described in the foregoing Measurement 1, i.e., the joint assembly of the top sheet 10 and the wing member 15 was used for measurement of the moisture permeability and its relation to the tearing strength in the joint region of the joint width 22, where the joint width 22 was set at 15 mm (i.e., the lower limit of the preferable range obtained by the Measurement 1) while the adhesive applied area (i.e., the substantial joint area) was varied.

Here, the calculating method of the ratio of the adhesive applied area to the area of the joint region is equal to that described in the Measurement 1. On the other hand, the measurement per se of the tearing strength is also identical to that of the Measurement 1.

The measurement results are as follows (with the moisture permeability being expressed by the unit of g/m²·24 h).

Adhesive Area Ratio	Moisture Permeability	Tearing Strength
0%	10,000	200 g
10%	9,000	300 g
20%	8,000	1,000 g
30%	7,000	1,500 g
40%	6,000	1,500 g

From these results, it can be said that the moisture permeability shows a preferable value for the adhesive applied area ratio of 20% or less. In such a case, however, when the tearing strength is lowered, it is preferable that the wing member 15 and the top sheet 10 are further joined by a welding joint (e.g., the heat-sealing, high-frequency sealing or ultrasonic welding method) to enhance the joint strength.

In the embodiment shown in FIG. 1, a plurality of hot-melt portions 16a and 16b extending in the X-direction are provided at intervals in the longitudinal direction so as to enhance the tearing strength without lowering the moisture permeability as much in the shape of the joint width 22. At this time, it is preferable that at least one of the hot-melt portions (e.g., the hot-melt portion 16a in FIG. 1) extends so far over the range of the joint width 22 as the region where the wing member 15 appears of itself. With these hot-melt portions 16a and 16b (not provided), it is possible to improve the moisture permeability within the region of the joint width 22 and to hold the tearing strength between the top sheet 10 and the wing member 15 at a level of at least 1,500 g or more.

With the hot-melt portions thus extending to the region where the wing member 15 appears of itself, there is obtained another effect to prevent the two longitudinally extending edge portions of the top sheet 10 (as indicated by 10a) from being pulled from the wing member 15. When the hot-melt adhesive for joining the top sheet 10 and the wing member 15 is applied to the area within the joint width 22, more specifically, the edge portions 10a of the top sheet 10 may which to a manufacturing apparatus to transfer the manufacturing waste if the adhesive is applied to the edge portions 10a of the top sheet 10. In an ordinary case, therefore, it is necessary to form a region having a considerable width from the edge portions 10a, to which an adhesive is applied. In this case, the edge portions 10a of the top sheet 10 are in prevented from floating from the wing member 15 if the aforementioned hot-melt portions 16a and 16b are formed.

On the other hand, it is preferable for the sanitary napkin 1 to be easily folded at its wing portions along the edge portions 31 of the underwear 20. If the rigidity value (as measured by the napkin method of the JIS L1096) in the region where the wing members 15, the top sheet 10 and the back sheet 11 are joined, that is, the region of the joint width 21 in FIG. 3 is larger by 20 mm or more than that of the joint portion between the top sheet 10 and the back sheet 11, that is, the peripheral joint portion 14, the wings are easily folded along boundary lines (as located at the rear end portions of the wing members 15) between the body 1A and the wing member 15.

Clampless method

[JIS L 1096]

Method A: 45-degree cantilever method

Five pieces of specimen of 2 cm width 15 cm are cut out in the machine direction (MD) and the cantilever direction (CD), respectively. The specimen is placed on a horizontal table having a smooth surface and a 45-degree slope at one

and thereof while aligning the center side of the specimen on a back line of a scale as shown in FIG. 11. Then, the specimen is then slowly tilted around the scale in an opposite manner. When one end of the specimen comes into contact at the center stand with the scale, the position of the other end of the specimen is read by the scale. Inherent resistance is expressed by the negative length (mm) of the specimen. The respective five pieces of specimens are tested at both the front surface side and back surface side to obtain average values in MD and CD, respectively (in integral number).

In order to bend the wing member 15 more easily along the boundary line 14, it is preferable to set the rigidity value of the peripheral joint portion 14 between the top sheet 10 and the back sheet 11 to be substantially 30 to 80 mm by the cantilever method of the JIS K 15004 and the rigidity value of the portion (where the top sheet 10, the back sheet 11, and the wing member 15 are laminated) close to the boundary line 14 on the side of the wing member 15 to 50 to 120 mm.

If the rigidity value of the portion close to the boundary line is on the side of the wing member 15 is smaller than the aforementioned lower limit (of 50 mm), the wing is hardly folded at the portion of the boundary line 14 but is easily folded at the portion on the wider side than the boundary line 14. As a result, there arises a disadvantage that the wing member 15 is folded in the region where the deformation-resisting adhesive 13 is applied, so that the folded portions of the wing member 15 shift to each other due to the fact that the wing member 15 is left in the folded state but cannot be returned to the flat shape. Here, if the rigidity value exceeds the aforementioned upper limit (of 120 mm), the volume of the adhesive capable may lead a physical diameter.

Here, the rigidity value of the wing member 15 is preferably 50 to 120 mm in MD (Machine Direction) and 50 to 100 mm in CD (Cross Direction). These values reduce the role on the side and improve the wearing feel. In this case, moreover, the portion (where the top sheet 10, the backsheet 11 and the wing member 15 are laminated) close to the boundary line 14 on the side of the wing member 15 takes a preferable rigidity value, too.

With the width in the X-direction being 30 mm, on the other hand, the wing member 15 is preferable to extend within a range of 5 to 20 mm in the same direction. Specifically, the wing member 15 is preferable to have such an extensibility that the width when extended to the width when left may be within a range of 10 to 40%. In the longitudinal direction, however, the wing member 15 is preferable to have an extensibility. When the wing member 15 is to be folded downward and retained on the match portion 20 of the underwear 20 upon wearing of the sanitary napkin 1, the wing member 15 can be easily retained thereon if they have an extensibility in the X-direction to some extent. In order to allow the wing member 15 to be folded easily on the match portion 20, the stretching force of the surface of the wing member 15 for the strain of 10% is preferably 5 gf or more when they are extended uniformly in the widthwise direction all over the longitudinal axis.

The wing member 15 may have an extensibility not only in the widthwise but also extensibility in a necessary portion. For example, FIG. 8 shows a wing member 15A in which an extensible region 15a is provided only on the side of the boundary line 14. On the other hand, FIG. 6 shows a wing member 15B in which two extensible regions 15b and 15c are provided on the side of the boundary line 14 and on the side of the match portion 20.

Here, in order to make the wing member 15 extensible either entirely or partially (e.g., at the region 15a or at the regions 15b and 15c), the surface of the wing member 15 can

be formed by adhering sections and open-holed nonwoven fabric, or the region 15a or the regions 15b and 15c of the wing member 15 can be formed by adhering sections and open-holed nonwoven fabric partially.

On the other hand, the wing member 15 is preferable to have a tensile extensibility of 20% or more according to the JIS K 7105.

Total extensibility
(JIS K 7105)

Measuring apparatus

A measuring apparatus with an integrating sphere is arranged in a configuration as shown in a side view in FIG. 12. A plan view of the integrating sphere is shown in FIG. 13. The total area of the entrance, the opening for detection and the opening for light entrance are all less than 40% of total inner surface. A standard white plate is prepared with a surface of reflective material such as magnesium oxide, barium sulfate and aluminum oxide. The inner surface of the integrating sphere is coated with the same material as the standard reflection plate. A light beam is arranged by the spherical geometry to be parallel in order not to fracture any ray which is diffused over 3 degrees from the axis of the fiber. The axis of fiber is arranged to match a line extending between the centers of the entrance and the opening for the light beam.

Measuring method

1. Three pieces of the wing member with a size which can cover the entrance are prepared.

2. The standard white plate is not used and the fiber is introduced without the test pieces and the value of detector is read as T1.

3. Then the test piece is set and the value for the material is read as T2.

4. The measurement is repeated for three test pieces respectively.

5. The transmittance T is obtained as the average of T2/T1 (percentage). The light ray is not used for this purpose.

The wing member 15 can stand on the outer side of the underwear 20 at the match portion of the underwear 20, as shown in FIG. 4. With the high top extensibility of the wing member 15, therefore, the color of the underwear 20 is seen through the wing member 15 so that the worn sanitary napkin is hardly recognized. When the wing member 15 are made of a nonwoven fabric, for example, the nonwoven fabric is preferably made of an unstretched material such as polypropylene. Alternatively, the nonwoven fabric 15 may be made of a transparent fabric.

The wing member 15 can be made of a nonwoven fabric or a film, for example. Preferred is a thermal bonded nonwoven fabric of polypropylene. When produced in a combination of a spun-bonded nonwoven fabric, a melt-blown nonwoven fabric and a spun-bonded nonwoven fabric.

The top sheet 10 can be made of hydrophilic fibers subjected to a hydrophilic treatment, hydrophilic fibers or the like, such as poly-bonded, absorbent, open-bonded or open-bond nonwoven fabric. Alternatively, the top sheet 10 may be formed by laying a cushion layer of bulky nonwoven fabric over the above-described nonwoven fabric.

The back sheet 11 is made of a nonwoven fabric but is preferable of a nonwoven fabric of polypropylene. Alternatively, the back sheet 11 may be made of a nonwoven fabric and a waterproof film sandwiched between the nonwoven fabric and the absorbent layer 12.

The absorbent layer 12 is made of an absorbent material, as exemplified by a sheet web of hydrophilic fibers such as those of rayon, cotton or the like; polyurethane foam or a sponge of polyurethane foam; and a highly water-absorbent polymer. Alternatively, the absorbent material is prepared by sandwiching the polyurethane foam or the solution of the poly-

urethane poly and the highly water-absorbent polymer with an absorbent sheet such as those.

Next, a process for manufacturing the sanitary napkin 1 shown in FIG. 1 will be described with reference to FIGS. 7 to 9.

First of all, wing member materials 15C of a rectangular shape are joined to the two side portions of a heat-shrinked back sheet material 11A being continuously fed, as shown in FIG. 7. These wing member materials 15C are cut every from a heat-shrinked material and are fed at intervals in the MD so that they are bonded to the back sheet material 11A by a hot-melt adhesive.

Next, as shown in FIG. 8, the absorbent layer 12 are continuously fed, each of which is placed on the back sheet material 11A and between the wing member materials 15C and 15C. At this time, the back sheet material 11A and the absorbent layer 12 are joined by a hot-melt adhesive or the like. Alternatively, the wing member materials 15C may be adhered and joined to the back sheet material 11A after the absorbent layer 12 was fed onto the back sheet material 11A.

After this, a top sheet material 10A is continuously fed so that the absorbent layer 12 is sandwiched between the back sheet material 11A and the top sheet material 10A. At this time, the top sheet material 10A and the back sheet material 11A are joined to each other at the periphery of the absorbent layer 12 by a hot-melt adhesive which has been applied in advance to the back sheet material 11A. Also, the top sheet material 10A and the wing member materials 15C are adhered to each other by a hot-melt adhesive.

By a second roll 41, therefore, the peripheral portion of the absorbent layer 12 is sandwiched between the back sheet material 11A and the top sheet material 10A. As this time, the top sheet material 10A and the back sheet material 11A are joined at the periphery of the absorbent layer 12 to form the peripheral joint portion 14. Simultaneously with this, the heat-shrinked portion 16 and 16b are formed at the joint portion between the top sheet material 10A and the wing member materials 15C.

By a second roll 42, therefore, the unnecessary portions are removed (by a trimming or trim-cutting method). The sanitary napkin 1 thus cut is folded at its wing member 15 around the back sheet or top sheet side. At this time, the folding step can be simply advanced if the wing member 15 are made easily foldable along the boundary line 14, as described hereinafter. Although not shown, moreover, the sanitary napkin 1 is folded in three or four and one individually packaged.

By the process thus far described, the wing members can be attached simply and reliably to the body 1A. According to this manufacturing method of the invention, on the other hand, the portions to be disposed are less (with little time-saving loss) than those of the case of the prior art in which the top sheet material is extended externally of the widthwise direction to form the wings, that is, in which the top sheet material is extended to have a width exceeding the wings and the unnecessary portions are cut off.

Here, the absorptive article having the wing members of the invention should not be limited to the sanitary napkin thus far described but can be applied to pants liners, urine pads or the like. Moreover, the entire shape of the absorptive article is suitably modified according to its wing purpose. On the other hand, the absorptive article can be provided on its two side portions with nonwoven fabric having protruding longer ends (or side portions), as called on.

In the absorptive article of the invention, as has been described hereinafter, the wing members will not easily come out of the body. Moreover, the wing members can be

reliably joined to the body while retaining the uniform permeability and the air permeability. By adjusting the thickness of the body and the wing members, moreover, the wing members can be easily folded at the side portions of the body. This very folding makes it easy to wear the absorptive article and to hold the same while being manufactured.

According to the process for manufacturing the absorptive article of the invention, on the other hand, the problem to be solved during the manufacturing process can be reduced, and the absorptive article can be easily manufactured, so that the productivity can be enhanced.

Here, "manufacturing" when used in this specification is taken to specify the processes of sheet forming, laminating, steps or components but does not predicate the presence or addition of one or more other features, steps, components or groups thereof.

Although various exemplary embodiments have been shown and described, the invention is not limited to the embodiments shown. Therefore, the scope of the invention is intended to be limited solely by the scope of the claims that follow.

What is claimed is:

1. A process for manufacturing an absorptive article including: a body including a liquid-permeable top sheet, a back sheet and an absorbent layer sandwiched between said top sheet and said back sheet; and separate wing members respectively attached on two side portions of said body and extending externally to a widthwise direction from said body, comprising:

(a) a step of joining wing member materials to two sides of a back sheet material;

(b) a step of placing an absorbent layer on said back sheet material before or after said step (a);

(c) a step of manufacturing said absorbent layer between a top sheet material and said back sheet material by feeding said top sheet material over said absorbent layer;

(d) a step of joining said top sheet material and said back sheet material on the outer side of said absorbent layer; and

(e) a step of cutting off unnecessary portions of said back sheet material, said top sheet material and said wing member materials, to manufacture an absorptive article in which said body and said wing members are joined.

2. The absorptive article manufacturing process as set forth in claim 1,

wherein at said step (e), said wing member materials are underlaid at said step (c), said top sheet material and said back sheet material are joined between said back sheet material and said top sheet material,

3. The absorptive article manufacturing process as set forth in claim 1,

wherein at said step (e), said back sheet material and said top sheet material are joined by an adhesive.

4. The absorptive article manufacturing process as set forth in claim 3, further comprising:

between said step (d) and said step (e), a step of cutting and joining said top sheet material and said wing member materials.

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1
MACROSCOPICALLY EXPANDED
THREE-DIMENSIONAL PLASTIC WEB
EXHIBITING NON-GLASSY VISIBLE SURFACE
AND CLOVE-LIKE RACKLE IMPRESSION

CROSS-REFERENCE TO RELATED
APPLICATION

This application is a continuation-in-part of co-pending application Ser. No. 1,214,771 filed Mar. 2, 1971, now abandoned in the name of the present applicant.

TECHNICAL FIELD

The present invention has relation to resilient plastic webs exhibiting many of the three-dimensional, clove-like properties and characteristics previously obtainable only in known webs.

The present invention has further relation to resilient plastic webs which exhibit a combination of desirable, but previously incompatible attributes of prior art 3D webs and prior art plastic webs in a single structure without deleterious side effects.

The present invention has further relation to macroscopically expanded three-dimensional plastic webs having at least one substantially non-glassy visible surface.

The present invention has further relation to macroscopically expanded three-dimensional plastic webs exhibiting a non-glassy surface and a clove-like or rattle-like surface impression.

The present invention has further relation to the provision of method and apparatus for forming plastic webs exhibiting the aforementioned attributes.

BACKGROUND ART

It has long been known in the deceptible deception technique art that it is extremely desirable to construct deceptive devices, such as deceptible displays, auditory signals, lenticular devices, deceptible visual displays, and the like, presenting a dry surface feel to the user to improve working comfort and to facilitate the development of materials this condition due to prolonged exposure to moisture absorbed within the lenticular. One which prior art relation to the aforementioned problem is disclosed in U.S. Pat. No. 4,091,801 issued to Ralston on Aug. 14, 1977 and hereby incorporated herein by reference. The Ralston patent discloses a particular deceptible device comprising a substantially planar, moisture absorbent layer disposed between a soft topcoat and a moisture-resistant backing sheet. The moisture absorbent layer is preferably composed of integral structure containing a multiplicity of deceptible areas which substantially resist the appearance of a substantially planar, moisture absorbent layer. The moisture absorbent areas of the topcoat contact the viewer's skin in such a manner as to provide a rattle-like surface impression. In a particularly preferred embodiment, the moisture absorbent layer is composed of a substantially hydrophilic material exhibiting wet resistance such that the topcoat tends to remain in substantially three-dimensional character upon removal of pressure applied against the topcoat by the body movement of the viewer. The moisture absorbent areas of the topcoat, which are of substantially the same density as the deceptible areas, tend to inhibit the viewer's skin from moisture contained within the moisture absorbent layer, thereby providing surface dryness and resistance to wetting when the structure is tem-

perally subjected to pressure resulting from the viewer's body movement.

U.S. Pat. No. 3,814,101 issued to Ralston on June 4, 1974, relates to the problem of a wet topcoat in a manner slightly different from the use of hydrophilic materials. Ralston discloses a topcoat of a non-hydrophilic film which is provided with a plurality of vertical ribs which resist the reverse flow of liquid from the deceptible element of the device.

U.S. Pat. No. 3,820,133 issued to Thompson on Dec. 30, 1974, and hereby incorporated herein by reference, suggests a macroscopically expanded three-dimensional topcoat composed of liquid-impermeable material, but provided with spaced capillaries, said capillaries having a base opening in the plane of the topcoat and an open opening remote from the plane of the topcoat, said open opening being in intimate contact with the deceptible post defined in the deceptible deceptible layer.

As utilized herein, the term "macroscopically expanded", when used to describe three-dimensional plastic webs, ribbons and films, refers to webs, ribbons and films which have been caused to expand to the surface of a three-dimensional forming structure so that both surfaces thereof exhibit the three-dimensional pattern of said forming structure, said pattern being readily visible to the naked eye when the perspective distance between the viewer's eye and the plane of the web is at least 12 inches. Such macroscopically expanded webs, ribbons and films are typically caused to expand to the surface of said forming structure by extrusion, i.e., when the forming structure exhibits a pattern composed primarily of male projections, by drawing, i.e., when the forming structure exhibits a pattern composed primarily of female apertures, or by extrusion of a substance into directly onto the surface of a forming structure of other type. By way of contrast, the term "micro", when utilized herein to describe plastic webs, ribbons and films, refers to the overall condition of the web, ribbon or film when viewed by the naked eye on a macroscopic scale. In this context "micro" webs, ribbons and films may include webs, ribbons and films having the male surface character on one or both sides, said surface character not being readily visible to the naked eye when the perspective distance between the viewer's eye and the plane of the web is about 12 inches or greater. Hence plastic webs of the aforementioned type are known in the art.

The topcoat disclosed in the aforementioned Thompson patent allows the free transfer of fluids from the body into the deceptible element of the device without inhibiting the reverse flow of these fluids. This provides a relatively smooth skin surface in contact with the user thus has been previously obtainable. However, applicant has demonstrated that despite the highly effective fluid transfer and fluid retention characteristics exhibited by plastic topcoats of the type generally disclosed in the Thompson patent and their proven compatibility with the viewer's skin, many users find it psychologically undesirable to employ a material which is pervasively plastic in contact with their skin. It is believed that this user reaction is due partly to the highly repellent liquid repellent nature of the viewer's skin, thereby providing surface dryness and resistance to wetting when the structure is tem-

The commonly assigned, co-pending U.S. patent application of Richard J. Ralston and Ralph A. Thompson entitled EXCELLENT PLASTIC WEB ACCOUNTING

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FIBER-LIKE PROPERTIES AND METHOD AND
APPARATUS FOR ITS MANUFACTURE, Ser. No.
2,041,116 filed Nov. 13, 1978, now U.S. Pat. No.
4,343,316 and hereby incorporated herein by reference,
discloses an improved macroscopically expanded three-
dimensional plastic web which characterizes the repellent
nature of liquid repellent, as disclosed in the
Thompson patent, while preserving the desirable fluid
transfer properties of the structure. The macroscopically
expanded three-dimensional plastic web disclosed in
the application of Ralston et al. perfectly exhibits a
fine scale three-dimensional microstructure comprising
a regular continuum of capillary networks, preferably
of randomly branching type, originating in and extending
from one surface of said web and preferably terminating
in the form of apertures in the opposite surface thereof
to promote rapid liquid transport in the direction of
decreasing capillary size. The web's fiber-like appearance
is composed of a continuum of fiber-like elements,
each end of said fiber-like elements being interconnected
to at least one other of said fiber-like elements. In a
particularly preferred embodiment, the interconnected
fiber-like elements are substantially non-aligned
with respect to one another.

A typical capillary network in the Ralston et al. structure comprises an apparent capillary opening formed by a multiplicity of primary fiber-like elements intersecting to one another in the opposite plane of the web. The opening may, if desired, be further subdivided into smaller capillary openings by secondary and tertiary fiber-like elements at planes located below the viewer-containing surface of the web.

Each of the primary fiber-like elements exhibits a substantially uniform U-shaped cross-section along its length. Its cross-section comprises a base portion located in the viewer-containing plane and a primary elevated portion joined to each edge of said primary base portion and extending generally in the direction of the deceptible post-containing surface of the web. The secondary and tertiary fiber-like elements, when arranged, are generally parallel, but subparallel to planes below the viewer-containing surface of the web. Because the plastic web of Ralston et al. is composed of a multiplicity of interconnected fiber-like elements rather than a continuous, regular pattern of liquid repellent, as disclosed in the Thompson patent, its appearance and tactile impression are generally perceived as more fiber-like.

In a particularly preferred embodiment of the Ralston et al. structure, the web's visible surface (i.e., that surface which is generally observable from a perspective which is substantially perpendicular to the plane of the web) is also provided with a fine scale texture comprising a multiplicity of generally parallel V-shaped grooves to create a non-slipper surface appearance in the web. The Ralston et al. application suggests that the ridges and valleys formed in the plastic web by the V-shaped grooves in the forming structure tend to reduce the web's gloss.

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discusses the application of Thompson discloses a macroscopically expanded three-dimensional plastic web provided with a surface finishing treatment. In a particularly preferred embodiment, the web is employed as a floor mat. The surface finishing treatment provides a multiplicity of "ridges" randomly formed on a fine scale surface to "improve the tactile impression of the macroscopic film and to reduce its gloss". The ridges, which impart an irregular and somewhat random to the viewer-containing surface of the mat, are most preferably oriented or subparallel to one another, although it is suggested that other non-random shapes may be used.

A preferred method for manufacturing such a topcoat is disclosed in the commonly assigned, co-pending U.S. patent application of Paul R. Lamb, Eugene R. Ralston and Thomas R. Ralston entitled METHOD AND APPARATUS FOR TEXTURING A THREE-DIMENSIONAL PLASTIC WEB, Ser. No. 003,294, filed May 4, 1979 and based on Mar. 31, 1981 in U.S. Pat. No. 4,320,284, said application and said patent being hereby incorporated herein by reference.

Finally, Lamb et al. disclose a particular plastic forming method for providing a multiplicity of particles aligned to its outermost or web-containing surface. In a particularly preferred embodiment, the plastic material is caused with a mixture of solid particles and spray, which spray may be macroscopically expanded onto said plastic material and thereafter cured. As should be apparent from the foregoing description, the variability in the size and spacing of the particles which form the ridges in the plastic film processed in said plastic forming method is completely random, and will depend upon such factors as the uniformity in the size and shape of the particles employed, the ratio of particles to spray, and the uniformity of the spraying technique.

While the random nature of the particles in the aforementioned application of Ralston et al. and the random nature of the particles in the aforementioned application of Lamb et al. and Thompson have in common, the random nature of the particles in the present invention is macroscopically expanded three-dimensional plastic webs (including random) when compared to textured prior art plastic webs. It is suggested in the present invention to randomly define the relevant colors which must be utilized to cause that macroscopically expanded three-dimensional plastic webs which exhibit a substantially non-glossy visible surface and which will inhibit a substantially non-glossy visible surface when the perspective distance between the viewer's eye and the plane of the web is about twelve inches or greater.

It is another object of the present invention to macroscopically define the relevant colors which must be utilized to cause that macroscopically expanded three-dimensional plastic webs which exhibit a substantially non-glossy visible surface and which will inhibit a substantially non-glossy visible surface when the perspective distance between the viewer's eye and the plane of the web is about twelve inches or greater.

It is still another object of the present invention to provide method and apparatus for producing plastic

web exhibiting the desirable characteristics described herein.

DISCLOSURE OF INVENTION

The present invention provides, in a particularly preferred embodiment, the provision of a nontransparently expanded three-dimensional plastic web having at least one substantially non-planar visible surface. The substantially non-planar visible surface exhibits a regularly spaced, microscopic pattern of surface aberrations which are not discernible when the perpendicular distance between the viewer's eye and the plane of the web is about 12 inches or greater. Both of the surface aberrations in said pattern are free of planar areas which are large enough to handle a hair ball (i.e., 0.004 inch) diameter circle and are so spaced relative to (a) adjacent surface aberrations that the maximum diameter of any circle which can be inscribed on any planar surface intermediate said surface aberrations and said adjacent surface aberrations is less than about four mils. Light incident upon the non-planar visible surface of the web is substantially diffracted into a multiplicity of directions by the abnormally surface aberrations rather than being specularly reflected. Thus the microscopic pattern of surface aberrations responsible for causing the diffuse reflection is not visibly perceptible by the observer under normal conditions, i.e., when the perpendicular distance between the viewer's eye and the plane of the web is about 12 inches or greater; macroscopically expanded three-dimensional plastic webs of the present invention are visibly perceptible to most observers as smooth films or clear films. The surface characteristics employed in the practice of the present invention may comprise protrusions projecting generally outwardly from the surface of said web or depressions projecting generally inwardly from the surface of said web.

Macroscopically expanded three-dimensional plastic webs of the present invention may also be made to exhibit a more etch-like or flake-like texture impression by employing surface aberrations having an average amplitude of at least about 0.2 mils (i.e., 0.0002 inches), as measured from the top of said protrusions or the bottom of said depressions, as the case may be, to the plane in which said surface aberrations lie.

Preferred methods and apparatus for forming said macroscopically expanded three-dimensional plastic webs are also provided.

BRIEF DESCRIPTION OF THE DRAWINGS

While the specification concludes with claims particularly pointing out and distinctly claiming the present invention, it is believed the present invention will be better understood from the following description in which:

FIG. 1 is a plan view photograph of a macroscopically expanded three-dimensional plastic web of the type generally disclosed in the aforementioned patent application of Hsieh et al., said web being shown approximately two times actual size;
FIG. 2 is a photograph generally similar to that of FIG. 1, said web being shown approximately 15 times actual size;
FIG. 3 is a photograph of the web shown in FIGS. 1 and 2 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 4 is a photograph generally similar to that of FIG. 1, said web being shown approximately 15 times actual size;
FIG. 5 is a plan view photograph of a macroscopically expanded three-dimensional plastic web of the type generally disclosed in FIGS. 1-4, but incorporating a pattern of irregularly shaped and irregularly spaced islands of the type disclosed in the aforementioned patent application of Hsieh et al. in its visible surface, said web being shown approximately two times actual size;

FIG. 6 is a photograph generally similar to that of FIG. 4, said web being shown approximately 15 times actual size;
FIG. 7 is a plan view photograph of a macroscopically expanded three-dimensional plastic web of the type generally disclosed in FIGS. 1-4, but incorporating a pattern of irregularly shaped and irregularly spaced islands of the type disclosed in the aforementioned patent application of Hsieh et al. in its visible surface, said web being shown approximately two times actual size;

FIG. 8 is a photograph generally similar to that of FIG. 4, said web being shown approximately 15 times actual size;
FIG. 9 is a photograph of the web generally shown in FIGS. 7 and 8 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 10 is a photograph generally similar to that of FIG. 7, said web being shown approximately 15 times actual size;
FIG. 11 is a photograph generally similar to that of FIG. 7, said web being shown approximately 15 times actual size;

FIG. 12 is a plan view photograph of a preferred embodiment of a macroscopically expanded three-dimensional web of the present invention, said web being shown approximately two times actual size;
FIG. 13 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 14 is a photograph of the web generally shown in FIGS. 12 and 13 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 15 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 16 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 17 is a photograph of the web generally shown in FIGS. 15 and 16 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 18 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 19 is a photograph of the web generally shown in FIGS. 18 and 19 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 20 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 21 is a photograph of the web generally shown in FIGS. 20 and 21 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 22 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 23 is a photograph of the web generally shown in FIGS. 22 and 23 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 24 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 25 is a photograph of the web generally shown in FIGS. 24 and 25 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 26 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 27 is a photograph of the web generally shown in FIGS. 26 and 27 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 28 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 29 is a photograph of the web generally shown in FIGS. 28 and 29 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 30 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 31 is a photograph of the web generally shown in FIGS. 30 and 31 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 32 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 33 is a photograph of the web generally shown in FIGS. 32 and 33 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 34 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 35 is a photograph of the web generally shown in FIGS. 34 and 35 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 36 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 37 is a photograph of the web generally shown in FIGS. 36 and 37 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 38 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 39 is a photograph of the web generally shown in FIGS. 38 and 39 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 40 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 41 is a photograph of the web generally shown in FIGS. 40 and 41 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 42 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 43 is a photograph of the web generally shown in FIGS. 42 and 43 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 44 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 45 is a photograph of the web generally shown in FIGS. 44 and 45 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 46 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 47 is a photograph of the web generally shown in FIGS. 46 and 47 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 48 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 49 is a photograph of the web generally shown in FIGS. 48 and 49 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 50 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 51 is a photograph of the web generally shown in FIGS. 50 and 51 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 52 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 53 is a photograph of the web generally shown in FIGS. 52 and 53 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 54 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 55 is a photograph of the web generally shown in FIGS. 54 and 55 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 56 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 57 is a photograph of the web generally shown in FIGS. 56 and 57 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 58 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 59 is a photograph of the web generally shown in FIGS. 58 and 59 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 60 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 61 is a photograph of the web generally shown in FIGS. 60 and 61 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 62 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 63 is a photograph of the web generally shown in FIGS. 62 and 63 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 64 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 65 is a photograph of the web generally shown in FIGS. 64 and 65 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 66 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 67 is a photograph of the web generally shown in FIGS. 66 and 67 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 68 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 69 is a photograph of the web generally shown in FIGS. 68 and 69 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 70 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 71 is a photograph of the web generally shown in FIGS. 70 and 71 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 72 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 73 is a photograph of the web generally shown in FIGS. 72 and 73 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 74 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 75 is a photograph of the web generally shown in FIGS. 74 and 75 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 76 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 77 is a photograph of the web generally shown in FIGS. 76 and 77 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 78 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 79 is a photograph of the web generally shown in FIGS. 78 and 79 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 80 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 81 is a photograph of the web generally shown in FIGS. 80 and 81 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 82 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 83 is a photograph of the web generally shown in FIGS. 82 and 83 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 84 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 85 is a photograph of the web generally shown in FIGS. 84 and 85 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 86 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 87 is a photograph of the web generally shown in FIGS. 86 and 87 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 88 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 89 is a photograph of the web generally shown in FIGS. 88 and 89 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 90 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 91 is a photograph of the web generally shown in FIGS. 90 and 91 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 92 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 93 is a photograph of the web generally shown in FIGS. 92 and 93 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 94 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 95 is a photograph of the web generally shown in FIGS. 94 and 95 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 96 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 97 is a photograph of the web generally shown in FIGS. 96 and 97 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 98 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 99 is a photograph of the web generally shown in FIGS. 98 and 99 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 100 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 101 is a photograph of the web generally shown in FIGS. 100 and 101 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 102 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 103 is a photograph of the web generally shown in FIGS. 102 and 103 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 104 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 105 is a photograph of the web generally shown in FIGS. 104 and 105 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 106 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 107 is a photograph of the web generally shown in FIGS. 106 and 107 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 108 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 109 is a photograph of the web generally shown in FIGS. 108 and 109 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 110 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 111 is a photograph of the web generally shown in FIGS. 110 and 111 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 112 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 113 is a photograph of the web generally shown in FIGS. 112 and 113 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 114 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 115 is a photograph of the web generally shown in FIGS. 114 and 115 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 116 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 117 is a photograph of the web generally shown in FIGS. 116 and 117 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 118 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 119 is a photograph of the web generally shown in FIGS. 118 and 119 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 120 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 121 is a photograph of the web generally shown in FIGS. 120 and 121 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 122 is a photograph generally similar to that of FIG. 12, said web being shown approximately 15 times actual size;
FIG. 123 is a photograph of the web generally shown in FIGS. 122 and 123 taken at an angle of approximately 35° with respect to the plane of said web, said web being shown approximately two times actual size;

FIG. 24 is a simplified schematic illustration of a preferred method for forming portions of the present invention wherein a reflective web is extended directly onto the surface of a deburring and perforating cylinder having a microscopic pattern of surface aberrations therein and

FIG. 25 is a simplified schematic illustration of a preferred method for forming portions of the present invention wherein a reflective web is extended directly onto the surface of a deburring and perforating cylinder and the opposite surface of said web is thereafter contacted by a cushion roll to impart a microscopic pattern of surface aberrations therein.

DETAILED DESCRIPTION OF THE INVENTION

It is generally known in the art that the appearance attributes of any object are related to the ways in which the object reflects the light that strikes it. The light can be modified greatly according to diffuse and specular reflection and/or diffraction and interference. The light can also be modified spectrally (by color). As is pointed out, beginning at page 26, of a prior art reference entitled "The Mechanics of Appearance" by Richard T. Hunter, John Wiley & Sons, New York, 1975, said text being hereby incorporated herein by reference, three major things can happen to light when it encounters an object: (1) specular reflection at the site of the object (associated with clarity); (2) scattering within the material (associated with diffuse reflection and sometimes with diffuse transmission); (3) absorption within the material (largely responsible for color); and (4) specular transmission directly through the object, if it is semi or less transparent (associated with clarity).

The present invention is concerned primarily with the first two phenomena, particularly the aspects of specular reflection and diffuse reflection. As utilized herein, specular reflection is considered to cover within a broad range of light is reflected from a surface such that the angle of reflection is equal to the angle of incidence, and the component of its direction which is parallel to the plane of said surface remains unchanged. Diffuse reflection, on the other hand, comprises any reflection which is non-specular. An example of a surface exhibiting only specular reflection would be a perfect mirror. It will therefore be appreciated that nearly any real surface will exhibit both specular and diffuse reflection. The aforementioned references of Hunter point out, beginning at page 26, that it is specular reflection which is responsible for the visible glossy appearance of a surface. With normal commercial materials, the specularly reflected light is not changed in color. Accordingly, the highlights of the object being observed appear white, the color of the light source.

Conversely, if the surface of the object is specularly reflecting diffuse reflection with respect to an incident beam of light, the surface tends to appear more matt. In general, the more diffuse the reflection from an opaque surface, the more matt will be the appearance. However, it has been observed that there does not appear to be any clearly defined point at which a surface ceases being perceived as glossy and suddenly appears to be matt. In fact, there seems to be a gradual transition in perception from glossy to matt with various stages in between typically being described with words like "satin".

It is also generally known in the art that the amount of light reflected or transmitted by an object can vary as

the direction of view is changed. Curves showing changes of amount of reflectance or transmittance with changes of angle of view are usually called goniophotometric curves. Such curves identify the properties of specimens responsible for gloss, haze, luster, and other photometric attributes. Recently, a goniophotometric curve is produced by fixing the light source at a specific angle and measuring the light reflected at different angles of view. A goniophotometric curve is typically plotted on a two-dimensional X-Y coordinate system by designating the reflectance factor as the Y-axis and the angle of reflection as the X-axis. The reflectance factor curve is typically plotted logarithmically. If, for example, such a curve showing the amount of light reflected in various directions with the specimen illuminated at an angle of 45° is plotted, a surface which is high in specular reflection will exhibit a very high peak value at an angle of -45° (i.e., the point at which the angle of incidence with the web and the angle of reflection from the web are equal) and a relatively low value on the curve then formed, while a surface which is very matt will generally exhibit little evidence of a peak and a rather large area under the curve. It will of course be recognized by those skilled in the art that if the reflectance factor curve were plotted linearly rather than logarithmically, then the matt area under such curve would be smaller. For example, a logarithmically plotted goniophotometric curve for a perfect mirror would be a relatively vertical spike at -45°, while the curve for a perfectly matt surface would be a substantially horizontal line extending generally parallel to the X-axis at a lower amplitude than said vertical spike.

According to the teachings of Hunter, a variety of established methods of gloss measurement have been developed over the years due to the necessity of measuring different aspects of reflection in order to duplicate, as far as possible, the different visual gloss qualities perceived which are not possible with the human eye. A more complete description of these generally accepted methods may be found in the aforementioned references of Hunter, beginning at page 71.

Hunter apparently recognizes the relatively limited abilities of instruments typically employed when compared to the human eye. He suggests, at page 76, that the human eye has a higher resolving power than do most reflectance measuring instruments. According to Hunter, the normal human eye can see two lines as being separate when they are only 0.01" apart, while photometric measurements of reflectance are typically limited to resolvable field angles about 100 times as large. Furthermore, the equipment for the test involves far more complex measurements of high gloss is very expensive when dealing with quantitative instrument measurements because an instrument cannot differentiate between a low reflectance value due to poor image reflecting quality of the specimen and a low reflectance value caused by surface curvature that has directed the specularly reflected light away improperly. The eye, however, can readily distinguish between these effects, since specular reflections change, but does not change, the visual images reflected in its surface.

Accordingly, attempts to quantify gloss utilizing prior art measuring techniques and to intelligently correlate such quantitative measurements with a human observer's visual perception have not been completely successful. This is believed due to the fact that such prior art techniques take into consideration only one of the effects which must be met to provide a surface

which is perceived by the human eye as substantially uniform.

It has, in making the present invention to provide, been determined that the ability of a surface to exhibit specular diffuse reflection is a necessary condition to achieve visually perceived gloss. However, the ability of a surface to exhibit diffuse reflection is not, in and of itself, a sufficient criteria to create the visual perception of a wet surface. A second criteria which must also be met is that the diffusing pattern must be sufficiently fine that it is nondetectable to the naked eye of the observer under normal circumstances. If the pattern is detectable by the naked eye, then the surface will be visually perceived as a locally glossy surface with discontinuities on it.

Experiments with macroscopically expanded three-dimensional plastic webs of the type disclosed in the aforementioned patent application of Riedel et al. and Sturmann has demonstrated that gloss is visually perceived when the pattern of surface discontinuities is sufficiently fine to reflect the incident light at (1) when the pattern of surface discontinuities is detectable to the naked eye. Conversely, experiments in reducing the present invention to practice has demonstrated that when the pattern of surface discontinuities causes the surface to exhibit primarily diffuse rather than specular reflection and the pattern of surface discontinuities is of a scale fine enough that it is not detectable to the naked eye under normal test conditions, then the surface is visually perceived as being wet.

Macroscopic embodiments of macroscopically expanded three-dimensional plastic webs of the type disclosed in the aforementioned patent application of Riedel et al. and Sturmann are disclosed in FIGS. 1-4 and 5-8, respectively, while macroscopic embodiments of macroscopically expanded three-dimensional plastic webs of the present invention are disclosed in FIGS. 9 through 16.

FIGS. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 are all plan view photographs taken with the incident light striking at an angle of approximately 30° with the plane of the webs. Thus, for the plan view photographs disclosed above the angle formed between the camera lens and the incident light is approximately 70°. As pointed out earlier herein, maximum specular reflection would normally occur when the angle of light collection is equal to the angle of light incidence. Accordingly, FIGS. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 and 14 are photographs taken when the camera lens has been repositioned to make the camera coincide with the angle of collection of the incident light to illustrate the condition existing at the point of maximum specular reflection. The incident light angle for these photographs was 30° with respect to the plane of the web, and the angle of collection, i.e., the angle at which the camera was positioned, was -30° with respect to the plane of the web.

The webs disclosed in FIGS. 1-14 all exhibit a similar macroscopically expanded three-dimensional pattern. The flexing direction utilized was generally either to the right or to the left as indicated in FIGS. 1-14 and was composed of a stack of flattened, rounded humps, each having a multiplicity of irregularly shaped protrusions superimposed thereon. The maximum dimension of said protrusions varied approximately 25 mils (i.e., 0.025 inches). Each hump exhibited a thickness of approximately 20 mils (i.e., 0.020 inches). Five web humps were superimposed with their protrusions shaped optically in vertical alignment to provide a flexing structure exhibiting a multiplicity of protrusions shaped optically as having closely oriented substantially perpendicular to the plane of plastic webs produced thereon. The humps were oriented to one another to form an integral structure generally in accordance with the teachings of the aforementioned patent application of Riedel et al.

The apparatus features of the flexing structure utilized to produce the macroscopically expanded three-dimensional plastic webs 20 disclosed in FIGS. 1 and 2 to lead some perspective to the flexing of the three-dimensional pattern, and about 11 times actual size in FIGS. 2 and 4 to clarify the glass phenomenon. Due to the limitations inherent in photographic techniques, the glass phenomenon perceived by the human eye when examining the actual samples is not readily apparent from an examination of the photographic views at the lower scale magnification.

While the highly enlarged plan view photograph of FIG. 3 shows only incident glass highlights 21 on the web's visible surface 22, the photograph of FIG. 4, which includes with the angle of collection of the incident light exhibits a substantially continuous glass highlight on the web's visible surface. In this regard it should be noted that only those portions of FIG. 4 located intermediate view lines 10-14 and 15-17 are in proper focus due to the angular orientation of the web 20 with respect to the camera. It is this specularly reflected light which is visually perceived as gloss by the observer when the web 20 is subjected to normal use.

The flexing structure utilized to produce the macroscopically expanded three-dimensional plastic web 20 disclosed in FIGS. 5-8 was trained with an open gap between the webs with the angle of collection of the aforementioned patent application of Sturmann and Loeck et al. In particular, a witness comprised of 70 percent No. 400 Grit and 30 percent No. 220 Grit was added with a provided space to a mils of approximately 24 (approximately) and sprayed on a greater rate the apparent surface of the macroscopically shaped flexing structure. Once deposited on the surface of the flexing structure the witness of grit and epoxy were heated generally in accordance with the teachings of the aforementioned patent application of Loeck et al. to secure the grit permanently in place.

As can be seen in FIG. 5, the visible surface 21 of web 20 is provided with a multiplicity of irregularly shaped and irregularly spaced ridges, e.g., ridges 23, 24, 25. As with the web 20 shown in FIGS. 1-4, the plan view photograph of FIG. 6 shows only incident glass highlights 21 on the web's visible surface 22, while the photograph of FIG. 7, which includes with the angle of collection of the incident light, exhibits much more extensive glass highlights on the web's visible surface. Nevertheless, there is generally less visually perceived gloss under normal use conditions with webs of the type disclosed in FIGS. 5-8 than with webs of the type disclosed in FIGS. 1-4 due to the presence of the ridges, e.g., ridges 23, 24, 25. As with FIG. 4, only those portions of FIG. 7 located intermediate view lines 10-14 and 15-17 are in proper focus due to the angular orientation of the web 20 with respect to the camera. The web 20 shown in FIGS. 9-12 is a preferred embodiment of the present invention produced utilizing a

two-sided flexing process of the type generally disclosed in FIG. 17. The apparatus features of the flexing structure utilized to produce the macroscopically expanded three-dimensional plastic web 20 disclosed in FIGS. 9-12 are provided with a macroscopic pattern of regularly spaced surface discontinuities generally similar to surface discontinuities 100 disclosed in FIG. 20. The discontinuities, which comprised protrusions projecting generally outwardly from the surface of the web, were oriented in one direction, as measured in a plane oriented perpendicular to their lengths, i.e., a plane parallel to the surface of said web. They had an overall cross-sectional diameter of approximately four mils (i.e., 0.004 inches) and were arranged in a hexagonally close packed pattern with a four mil (i.e., 0.004 inch) center-to-center spacing between adjacent surface discontinuities. The average amplitude of the surface discontinuities was approximately 0.3 mils (i.e., 0.0003 inches). The surface discontinuities were provided in the upstream portion of the flexing structure after the previously shaped portions had been provided therein by a secondary protruding treatment of the type generally disclosed in the aforementioned patent application of Riedel et al.

The amplitude of the surface discontinuities referred to throughout the present specification and claims is preferably measured using a high powered microscope which enables the operator to measure distance perpendicular to the plane of the sample in a direction of focus. In particular, this method employs a top lighted microscope with a reflected flexing wheel. While the degree of magnification is typically adjustable on these units, a magnification of 400x has been found to provide a good compromise between depth of focus and viewing area.

Samples of the web to be measured are preferably prepared by making a rectangular section approximately 1 inch by 11 inches from the web. These samples are then mounted on individual microscope slides using double-sided tape with their visible surface generally oriented. The visible surface of each sample is preferably directed with a black felt tip marker. These units of the present invention may be completely transparent, completely opaque, or anywhere between these two extremes, the felt applied by the felt tip marker permits some amplitude measurement regardless of the degree of transparency or opacity of the particular web being measured. Deviating in the aforementioned manner with a felt tip marker provides improved contrast between the apparent surface of the discontinuity and the plane of collection of the observation to be measured. Due to the tendency of the felt to run from the apparent surface of the discontinuity, the apparent surface will generally appear somewhat lighter under the microscope, while the plane of collection, which is generally perpendicular to a valley, will appear generally darker in color. A modified Bausch & Lomb 3000 Series felt tip marker, such as is available from Bausch Corporation of Rochester, N.Y., may be employed for the aforementioned purpose.

Once the web sample has been prepared, the following procedure is preferably carried out:

1. Place the prepared sample on the microscope with the visible surface of the sample oriented toward the lens.
2. Focus on the top of a particular surface discontinuity and then on the plane of collection adjacent said discontinuity to thereby distinguish between to be used in determining focus. As mentioned earlier herein, the

apparent surface of the discontinuity will generally appear somewhat lighter in color, while the plane of collection adjacent the discontinuity will appear generally darker in color.

3. Adjust the focus of the microscope until it is above the plane of the apparent surface of the particular surface discontinuity to be measured.
4. Turn the focus wheel in one direction only until the apparent surface of the particular surface discontinuity just comes into focus. They standing at this point and record the reading from the focus wheel.
5. Continue turning in the same direction until the plane of collection adjacent said discontinuity just comes into focus. They turning the focus wheel and again record the reading from the focus wheel.
6. The difference between these two readings on the focus wheel represents the amplitude of the particular surface discontinuity from its plane of collection. Since the focus wheel is calibrated the distance of travel can usually be converted into mils.

The aforementioned procedure can also be used to determine whether the surface discontinuities comprise a depression rather than a protrusion, the readings generally being taken first in the plane of collection and then at the point of maximum amplitude.

When using the aforementioned measurement method, it is preferred that the flexing be accomplished by turning the focus wheel in one direction only. This eliminates any end play in the focus wheel mechanism which could be significant when measured to the values being measured. It should also be noted that the leading edge of the focus field is preferably used when the measured distance desired is measured in order to minimize the effect of a finite, i.e., greater than zero, depth of field. This is accomplished by stopping and recording the reading on the focus wheel when the surface is in question just comes into focus, rather than at the point corresponding to the middle of the focus field or the point at which the trailing edge is about to go out of focus. When this is done for both the first and the second readings, the effect of a finite depth of field is substantially eliminated from the amplitude measurement.

While nearly any microscope with top light capability, magnification power of 400x (or greater) and a calibrated focusing wheel may be utilized to produce the above measurements, particularly good results have been obtained utilizing an Instron Model 21 universal testing microscope set at 400x. This particular instrument is manufactured by Instron, Inc. and is distributed in the U.S.A. by the Instron Corporation of Waltham, Mass. It should be noted that the unit may also be employed with a television camera and video monitor for video viewing.

To ensure that the amplitude determination made utilizing the foregoing technique is representative for the entire surface of the web sample, each of the 1 inch by 11 inch web samples is preferably measured in at least 16 individual locations oriented at random. The average amplitude for any given sample is computed by calculating the arithmetic average of all measurements taken from a given web sample. Thus, the average amplitude reported throughout the present specification and claims represent the arithmetic average for the sample, as determined by the foregoing technique.

As can be seen in FIG. 13, the visible surface 21 of the web 20 formed on the upstream standard roller handle is provided with a multiplicity of regularly shaped and

two-sided flexing process of the type generally disclosed in FIG. 17. The apparatus features of the flexing structure utilized to produce the macroscopically expanded three-dimensional plastic web 20 disclosed in FIGS. 9-12 are provided with a macroscopic pattern of regularly spaced surface discontinuities generally similar to surface discontinuities 100 disclosed in FIG. 20. The discontinuities, which comprised protrusions projecting generally outwardly from the surface of the web, were oriented in one direction, as measured in a plane oriented perpendicular to their lengths, i.e., a plane parallel to the surface of said web. They had an overall cross-sectional diameter of approximately four mils (i.e., 0.004 inches) and were arranged in a hexagonally close packed pattern with a four mil (i.e., 0.004 inch) center-to-center spacing between adjacent surface discontinuities. The average amplitude of the surface discontinuities was approximately 0.3 mils (i.e., 0.0003 inches). The surface discontinuities were provided in the upstream portion of the flexing structure after the previously shaped portions had been provided therein by a secondary protruding treatment of the type generally disclosed in the aforementioned patent application of Riedel et al.

The amplitude of the surface discontinuities referred to throughout the present specification and claims is preferably measured using a high powered microscope which enables the operator to measure distance perpendicular to the plane of the sample in a direction of focus. In particular, this method employs a top lighted microscope with a reflected flexing wheel. While the degree of magnification is typically adjustable on these units, a magnification of 400x has been found to provide a good compromise between depth of focus and viewing area.

Samples of the web to be measured are preferably prepared by making a rectangular section approximately 1 inch by 11 inches from the web. These samples are then mounted on individual microscope slides using double-sided tape with their visible surface generally oriented. The visible surface of each sample is preferably directed with a black felt tip marker. These units of the present invention may be completely transparent, completely opaque, or anywhere between these two extremes, the felt applied by the felt tip marker permits some amplitude measurement regardless of the degree of transparency or opacity of the particular web being measured. Deviating in the aforementioned manner with a felt tip marker provides improved contrast between the apparent surface of the discontinuity and the plane of collection of the observation to be measured. Due to the tendency of the felt to run from the apparent surface of the discontinuity, the apparent surface will generally appear somewhat lighter under the microscope, while the plane of collection, which is generally perpendicular to a valley, will appear generally darker in color. A modified Bausch & Lomb 3000 Series felt tip marker, such as is available from Bausch Corporation of Rochester, N.Y., may be employed for the aforementioned purpose.

Once the web sample has been prepared, the following procedure is preferably carried out:

1. Place the prepared sample on the microscope with the visible surface of the sample oriented toward the lens.
2. Focus on the top of a particular surface discontinuity and then on the plane of collection adjacent said discontinuity to thereby distinguish between to be used in determining focus. As mentioned earlier herein, the

1. A nonreciprocally dependent three-dimensional plastic web having at least one visible surface which appears substantially non-glossy when exposed to light, substantially all of said visible surface exhibiting a regularly spaced, anisotropic pattern of discrete surface elevations, each of said surface elevations having its amplitude oriented perpendicular to the surface in which said surface elevations originate, each of said surface elevations having a maximum dimension of less than about 0 mils, as measured in a plane oriented substantially perpendicular to its amplitude, whereby said surface elevations are not discernible to the unaided naked eye when the perpendicular distance between the viewer's eye and the plane of said web is at least about 12 inches, each of said surface elevations also being free of planar areas which are large enough to handle a 4 mil diameter die and so spaced relative to all adjacent surface elevations that the maximum diameter of any die which can be handled on any planar surface intermediate said surface elevations and said adjacent surface elevations on any portion of said visible surface is less than about 4 mils, whereby any light incident upon any portion of said visible surface is diffused into a multiplicity of directions by said surface elevations so that said visible surface appears substantially non-glossy.

2. The web of claim 1, wherein at least a portion of said surface elevations comprise protuberances projecting generally outwardly from the surface of said web.

3. The web of claim 1, wherein at least a portion of said surface elevations comprise depressions projecting generally inwardly from the surface of said web.

4. The web of claim 3, wherein said surface elevations correspond to the boundaries of a woven mesh support structure which directly contains the visible surface of said plastic web during production thereof.

5. The web of claim 4, wherein said woven mesh support structure which directly contains the visible surface of said web is composed of filaments having a diameter between about one and about two mils and a mesh count between about 100 filaments per linear inch by 100 filaments per linear inch and about 400 filaments per linear inch by 400 filaments per linear inch.

6. The web of claim 3 or claim 4, wherein said surface elevations have an average amplitude of at least about 0.2 mils.

7. The web of claim 3 or claim 4, wherein said surface elevations have an average amplitude of at least about 0.3 mils.

8. The web of claim 4, wherein the amplitude of each of said surface elevations, as measured perpendicular to the surface in which said surface elevations originate, is within the range of about ± 20 percent of the average value of the amplitude for all adjacent surface elevations.

9. The web of claim 4, wherein the amplitude of each of said surface elevations, as measured perpendicular to the surface in which said surface elevations originate, is within the range of about ± 10 percent of the average value of the amplitude for all adjacent surface elevations.

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