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DIRECCIÓN DE

Procedimiento acelerado de exámenes de patente (pph)

1	NÚMERO DE SOLICITUD ANTE LA SIC	14 058633
2	OFICINA DE PRIMERA PRESENTACIÓN (OPP)	ESTADOS UNIDOS
3	NÚMERO(S) DE SOLICITUD O PUBLICACIÓN DE LA(S) SOLICITUD(ES) (OPP):	1.13/238,826 2. 3.
4	☐ REPRESENTANTE LEGAL ☐ APODERADO	
APELLIDOS RAISBECK		NOMBRES J. IAN
		IDENTIFICACIÓN C.C. 79.376.996 T.P. 135.799
DIRECCIÓN CALLE 90 NO. 19-41, OFC. 602		No. TELÉFONO 6011100
CIUDAD BOGOTA D.C.		CORREO ELECTRÓNICO notificaciones.patentes@roclaw.co
País COLOMBIA		No. RADICACIÓN O PROTOCOLO DE PODER GENERAL
5	CONDICIONES PARA ACCEDER A ESTE PROCESO:	
5.1.	DATOS DE PRIORIDAD ☒ SI ☐ NO	
(33) PAÍS DE ORIGEN 1.ESTADOS UNIDOS DE AMERICA		CÓDIGO PAÍS US
		(31) NÚMERO 13/238,826
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5.2.	DATOS SOLICITUD INTERNACIONAL PCT ☒ SI ☐ NO	
Solicitud Internacional No. PCT/IB2012/054042		Fecha 08/08/2012
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El solicitante presenta una copia de la(s) reivindicación(es) patentable(s) u otorgable(s) de la solicitud de la Oficina de Primera Presentación que profirió el examen de patentabilidad, junto con una traducción al castellano. ☒ SI ☐ NO		
REQUISITOS PARA EL RECONOCIMIENTO DE LOS RESULTADOS DE EXÁMENES DE PATENTABILIDAD EFECTUADOS A SOLICITUDES EXTRANJERAS		
Para que la Superintendencia de Industria y Comercio pueda reconocer los resultados de exámenes de patentabilidad producidos por otras Oficinas de Propiedad Industrial se debe cumplir con las siguientes condiciones:		
(a) Al momento de solicitar el examen de patentabilidad, si el solicitante pide que se reconozcan exámenes de patentabilidad de otras oficinas extranjeras, deberá aportar junto con el pago de la tasa correspondiente, los siguientes anexos:		
(i) Copia de las resoluciones, fallos o decisiones que han sido relevantes para la determinación de la patentabilidad de la(s) solicitud(es) en la Oficina que haya proferido el examen de patentabilidad que contienen reivindicaciones patentables u otorgables que son la base de la petición, y si es del caso, su traducción al castellano. ☒ SI ☐ NO		
(ii) Copia de todas las reivindicaciones determinadas como patentables u otorgables en la Oficina que profirió el examen de patentabilidad y, si es del caso, su traducción al castellano. ☒ SI ☐ NO		
(iii) Copia de los antecedentes, información o documentos citados por el examinador de la Oficina de Primera Presentación del examen de patentabilidad, en las resoluciones, fallos o decisiones correspondientes, incluyendo la literatura no patente. Los documentos de patente deberán presentarse siempre y cuando no estén disponibles para la Superintendencia de Industria y Comercio mediante el simple acceso a bases de datos gratuitas. ☒ SI ☐ NO		
(iv) Una tabla de correspondencias de las reivindicaciones que han sido determinadas como patentables u otorgables en la solicitud de la Oficina que haya proferido el examen de patentabilidad.		
7	FIRMA DEL SOLICITANTE, DEL APODERADO O DEL REPRESENTANTE LEGAL Junto a cada firma, indicar el nombre del firmante y su calidad (si tal calidad no es obvia al leer el petitorio)	
J. IAN RAISBECK		

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6	TABLA DE CORRESPONDENCIA DE REIVINDICACIONES		
	Reivindicaciones en la solicitud en Colombia	Reivindicaciones otorgables en la solicitud internacional	Explicación sobre la suficiente correspondencia ó Comentarios que explican la correspondencia
	Las Reivindicaciones 1 a 20, modificadas el 30 de septiembre de 2014.	Las Reivindicaciones 1 a 20 de la Patente US 8,524,374.	Las Reivindicaciones 1 a 20 modificadas el 30 de septiembre de 2014 corresponden enteramente a las Reivindicaciones 1 a 20 otorgadas por la Oficina de Marcas y Patentes de los Estados Unidos de América, dentro del trámite de la solicitud de patente US 13/238,826, cuya prioridad se invoca en la presente solicitud. Reivindicaciones que corresponden en su totalidad a las otorgadas por dicha entidad en la patente US 8,524,374. Observación: Únicamente se ha retirado en las Reivindicaciones traducidas el término “aproximadamente”, el cual no es aceptado por ese Despacho por razones de claridad.

In the United States Patent and Trademark Office

Applicant:	Thomas Gerard Shannon	Docket No.:	64765836US01
Application No.:	13/238,826	T.C./A.U.:	1788
Confirmation No.:	4146	Examiner:	Leszek B. Kiliman
Filed:	09/21/2011	Date:	11/20/2012
For:	TISSUE PRODUCT COMPRISING BAMBOO		

Amendment

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Pursuant to 37 C.F.R. § 1.111 and in response to the Office Action mailed 08/29/2012, the following amendments and remarks are submitted for your consideration.

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 5 of this paper.

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Cancelled).
2. (Cancelled).
3. (Cancelled).
4. (Cancelled).
5. (Cancelled).
6. (Cancelled).
7. (Cancelled).
8. (Cancelled).
9. (Original) A layered through-air dried tissue web, the web comprising a first fibrous layer and a second fibrous layer, the first fibrous layer comprising wood fibers and the second layer comprising bamboo fibers, wherein the first fibrous layer is substantially free of bamboo fibers and wherein the bamboo fibers comprise at least about 10 percent of the total weight of the through-air dried web.
10. (Original) The layered through-air dried tissue web of claim 9 wherein the first fibrous layer consists essentially of hardwood fibers and the second fibrous layer comprises bamboo and softwood fibers, wherein the amount of softwood fiber in the second fibrous layer is less than about 10 percent by weight of the layer.
11. (Original) The layered through-air dried tissue web of claim 9 wherein the first fibrous layer comprises at least about 75 percent hardwood fibers by weight of the first fibrous layer and the

second layer comprises at least about 50 percent bamboo fibers by weight of the second fibrous layer.

12. (Original) The layered through-air dried tissue web of claim 9 wherein the through-air dried web comprises less than about 10 percent softwood fibers by weight of the through-air dried web.
13. (Original) The layered through-air dried tissue web of claim 9 having a Durability Index greater than about 20.
14. (Original) The layered through-air dried tissue web of claim 9 having a Stiffness Index less than about 7.
15. (Original) The layered through-air dried tissue web of claim 9 having a Bulk greater than about 10 cubic centimeters per gram.
16. (Currently Amended) A tissue product comprising a first through-air dried tissue web, the web comprising a first fibrous layer and a second fibrous layer, the first fibrous layer comprising wood fibers and the second layer comprising bamboo fibers, wherein the first fibrous layer is substantially free of bamboo fibers and wherein the bamboo fibers comprise at least about 10 percent of the total weight of the through-air dried web having from about 10 percent to about 75 percent bamboo fibers by weight of the through air dried tissue web, the tissue product having a basis weight from about 10 to about 60 grams per square meter.
17. (Original) The tissue product of claim 16 further comprising a second tissue web plied to the first through-air dried tissue web.
18. (Currently Amended) The tissue product of claim 16 having a Durability Index greater than about 20.
19. (Currently Amended) The ~~multi-ply~~ tissue product of claim 16 having a Stiffness Index less than about 13.

20. (Currently Amended) The ~~multi-ply~~ tissue product of claim 16 having a Bulk greater than about 10 cubic centimeters per gram.
21. (New) The tissue product of claim 16 wherein the web further comprises a third fibrous layer comprising wood fibers and substantially free of bamboo fibers.
22. (New) The tissue product of claim 16 wherein the bamboo fibers comprise from about 20 to about 50 percent of the total weight of the through-air dried web and the web comprises less than about 10 percent softwood fibers by weight of the through-air dried web.
23. (New) The tissue product of claim 16 having a basis weight from about 20 to about 45 grams per square meter and a Bulk from about 10 to about 22 cubic centimeters per gram.
24. (New) The tissue product of claim 16 having a Stiffness Index from about 5 to about 10.
25. (New) The tissue product of claim 16 wherein the web further comprises a third fibrous layer comprising wood fibers and substantially free of bamboo fibers, the web having a basis weight from about 20 to about 45 grams per square meter, a Bulk from about 10 to about 22 cubic centimeters per gram and Stiffness Index from about 5 to about 10.
26. (New) The tissue product of claim 16 wherein the bamboo fibers have an average fiber length from about 1 to about 2 mm.
27. (New) The tissue product of claim 26 wherein the bamboo fiber is derived from a bamboo species selected from the group consisting of *Phyllostachys heterocycla pubescens*, *Phyllostachys nigra variant Henon*, *Phyllostachys vivax* and *Phyllostachys bambusoides*.
28. (New) The tissue product of claim 16 wherein the through-air dried web is uncreped.

REMARKS/ARGUMENTS

Claims 9-28 are presented for the Examiner's consideration. Pursuant to 37 C.F.R. §1.111, reconsideration of the present application in view of the foregoing amendments and the following remarks is respectfully requested.

I. Interview

Applicant thanks the Examiner for the courtesy of a telephonic interview on 8 November 2012, at which time the Hu and Zhao references were discussed in relation to the pending claims.

II. Claim Amendments

Claims 1-8 have been cancelled without prejudice.

New claims 21-28 have been added. Support for the newly added claims may be found, for example, at original claims 2 through 8 and in the specification at page 7, ll. 8-11, page 7, ll. 15-18, page 8, ll. 5-18, page 10, ll. 7-21, page 13, ll. 4-8, and page 8, ll. 21-24.

Claim 16 has been amended to further specify that the web is multi-layered. Support of the amendment may be found in the specification, for example, at page 10, ll. 7-21.

Claims 18-20 have been amended to correct a typographical error in the preamble.

Applicant respectfully submits that the newly added claims and the instant amendments do not constitute new matter.

III. Claim Rejections

Claims 1-20 stand rejected under 35 U.S.C. §102(b) as anticipated by or, in the alternative, under 35 U.S.C. §103(a) as obvious over US 6,797,114 to Hu ("Hu") as further evidenced by the Zhao article ("Zhao").

For a prior art reference to anticipate a claim, the reference must disclose all of the claimed elements as they are arranged in the claim. The requirement that the prior art elements themselves be arranged as in the claim means that claims cannot be "treated ... as mere catalogs of separate parts, in disregard of the part-to-part relationships set forth in the claims and that give the claims their meaning." *Lindemann Maschinenfabrik GMBH v. Am. Hoist & Derrick Co.*, 730 F.2d 1452,

1459 (Fed. Cir. 1984). Thus, “unless a reference discloses within the four corners of the document not only all of the limitations claimed but also all of the limitations *arranged or combined in the same way as recited in the claim*, it cannot be said to prove prior invention of the thing claimed and, thus, cannot anticipate under 35 U.S.C. §102.” *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1371 (Fed. Cir. 2008) (emphasis added).

Here, Hu merely mentions non-wood fibers as one of at least eighteen different possible cellulosic materials, both wood and non-wood, useful in the invention. Hu then goes on to describe a specific layered tissue structure consisting entirely of *wood fibers*, and more specifically a structure comprising from about 50-80% hardwood pulp fiber and 20-50% softwood pulp fiber. Hu at col. 8, l. 64 – col. 9, l. 5. In no instances does Hu describe a layered tissue web comprising bamboo, let alone a multi-layered structure where bamboo is selectively incorporated into one layer in the claimed amounts. Thus, Hu fails to disclose all limitations as they are arranged in the claim and therefore does not anticipate any of the pending claims.

Zhao does not cure Hu’s deficiencies. Unlike the currently claimed layered tissue webs, Zhao teaches a blended fine paper comprising bamboo and hardwood, the objectives of which are to create a low bulk (high density) paper with high stiffness. To achieve a low bulk, high stiffness fine paper, Zhao teaches that bamboo must be refined in order to replace softwood. *See Zhao* at Fig. 2. This is the exact opposite effect observed by the inventor of the presently claimed subject matter. With reference to Table 2, at page 22 of the specification, the inventor has demonstrated that when bamboo is substituted for softwood fibers in a through-air dried web (“TAD” web) bulk increases, stiffness nominally increases and the durability remains substantially unchanged. Conversely, when a web is prepared by pressing (“CWP” web), a method akin the process of preparing fine papers employed by Zhao, bulk and durability decreases dramatically, while stiffness increases significantly. Thus, one skilled in the art following Zhao would have been dissuaded from substituting bamboo for softwood fiber in a tissue because of the deleterious effects on bulk and stiffness.

Application No. 13/238,826
Amendment dated 11/20/2012
Reply to Office Action of 08/29/2012

IV. Conclusion

For the reasons stated above, it is respectfully submitted that all of the presently presented claims are in form for allowance. Please charge any prosecutorial fees which are due to Kimberly-Clark Worldwide, Inc. deposit account number 11-0875. The undersigned may be reached at (920) 721-3616.

Respectfully submitted,

THOMAS GERARD SHANNON

By: /Michael J. Sullivan/

Michael J. Sullivan, Reg. No. 54,479

ELECTRONIC FILING CERTIFICATE

I, Cynthia M. Trudell, hereby certify that this correspondence and all attachments and any fee(s) are being electronically transmitted via the internet to the United States Patent and Trademark Office using the Electronic Filing System (EFS-Web) on 11/20/2012.

By: /Cynthia M. Trudell/

Cynthia M. Trudell

MODIFICACIONES A LAS REIVINDICACIONES:

Este listado de reivindicaciones reemplazará todas las versiones anteriores, y listas, de las reivindicaciones en la solicitud:

Listado de reivindicaciones:

1. (Cancelada).
2. (Cancelada).
3. (Cancelada).
4. (Cancelado).
5. (Cancelada).
6. (Cancelada).
7. (Cancelada).
8. (Cancelada).
9. (Original) Un elemento laminar continuo de papel tisú estratificado secado por aire, el elemento laminar continuo comprende una primera capa fibrosa y una segunda capa fibrosa, la primera capa fibrosa comprende fibras de madera y la segunda capa comprende fibras de bambú, en donde la primera capa fibrosa se encuentra sustancialmente libre de fibras de bambú y en donde las fibras de bambú comprenden por lo menos aproximadamente 10 por ciento del peso total del elemento laminar continuo secado por aire.
10. (Original) El elemento laminar continuo de papel tisú estratificado secado por aire de conformidad con la reivindicación 9, en donde la primera capa fibrosa consiste esencialmente en fibras de madera dura y la segunda capa fibrosa comprende fibras de bambú y de madera blanda, en donde la cantidad de fibra de madera blanda en la segunda capa fibrosa es menor a aproximadamente 10 por ciento en peso de la capa.

11. (Original) El elemento laminar continuo de papel tisú estratificado secado por aire de conformidad con las reivindicaciones 9 o 10, en donde la primera capa fibrosa comprende por lo menos aproximadamente 75 por ciento de fibras de madera dura en peso de la primera capa fibrosa y la segunda capa comprende por lo menos aproximadamente 50 por ciento de fibras de bambú en peso de la segunda capa fibrosa.
12. (Original) El elemento laminar continuo de papel tisú estratificado secado por aire de conformidad con la reivindicación 9, en donde el elemento laminar continuo secado por aire comprende menos de aproximadamente 10 por ciento de fibras de madera blanda en peso del elemento laminar continuo secado por aire.
13. (Original) El elemento laminar continuo de papel tisú estratificado secado por aire de conformidad con la reivindicación 9, que tiene un Índice de durabilidad mayor a aproximadamente 20.
14. (Original) El elemento laminar continuo de papel tisú estratificado secado por aire de conformidad con la reivindicación 9, que tiene un Índice de rigidez menor a aproximadamente 7.
15. (Original) El elemento laminar continuo de papel tisú estratificado secado por aire de conformidad con la reivindicación 9, que tiene un Volumen mayor a aproximadamente 10 centímetros cúbicos por gramo.
16. (Actualmente Modificada) Un producto de papel tisú que comprende un primer elemento laminar continuo secado por aire, que comprende una primera capa fibrosa y una segunda capa fibrosa, la primera capa fibrosa comprende fibras de madera y la segunda capa fibrosa comprende fibras de bambú, en el que la primera capa fibrosa está sustancialmente libre de fibras de bambú y en el que las fibras de bambú comprenden al menos aproximadamente 10 por ciento del peso total del elemento laminar continuo secado por aire, el producto de papel tisú tiene un peso base de aproximadamente 10 a aproximadamente 60 gramos por metro cuadrado.

17. (Original) El producto de papel tisú de conformidad con la reivindicación 16, que además comprende un segundo elemento laminar continuo de papel tisú laminado al primer elemento laminar continuo de papel tisú secado por aire.
18. (Actualmente Modificada) El producto de papel tisú de conformidad con la reivindicación 16 que tiene un índice de durabilidad mayor que aproximadamente 20.
19. (Actualmente Modificada) El producto de papel tisú de conformidad con la reivindicación 16 que tiene un Índice de rigidez menor que aproximadamente 13.
20. (Actualmente Modificada) El producto de papel tisú de conformidad con la reivindicación 16 que tiene un Volumen mayor que aproximadamente 10 centímetros cúbicos por gramo.
21. (Nueva) El producto de papel tisú de conformidad con la reivindicación 16 en el que el elemento laminar continuo además comprende una tercera capa fibrosa que comprende fibras de madera y sustancialmente libre de fibras de bambú.
22. (Nueva) El producto de papel tisú de conformidad con la reivindicación 16 en el que las fibras de bambú comprenden desde aproximadamente 20 hasta aproximadamente 50 por ciento del peso total del elemento laminar continuo secado por aire y el elemento laminar continuo comprende menos que aproximadamente 10 por ciento en peso de fibras de madera blanda del elemento laminar continuo secado por aire.
23. (Nueva) El producto de papel tisú de conformidad con la reivindicación 16 que tiene un peso base desde aproximadamente 20 hasta aproximadamente 45 gramos por metro cuadrado y un Volumen desde aproximadamente 10 hasta aproximadamente 22 centímetros cúbicos por gramo.

24. (Nueva) El producto de papel tisú de conformidad con la reivindicación 16 que tiene un Índice de rigidez desde aproximadamente 5 hasta aproximadamente 10.
25. (Nueva) El producto de papel tisú de conformidad con la reivindicación 16 en el que el elemento laminar continuo comprende además una tercera capa fibrosa que comprende fibras de madera y sustancialmente libre de fibras de bambú. el elemento laminar continuo tiene un peso base desde aproximadamente 20 hasta aproximadamente 45 gramos por metro cuadrado, un Volumen desde aproximadamente 10 hasta aproximadamente 22 centímetros cúbicos por gramo y un Índice de rigidez desde aproximadamente 5 hasta aproximadamente 10.
26. (Nueva) El producto de papel tisú de conformidad con la reivindicación 16 en el que las fibras de bambú tienen una longitud promedio de fibra desde aproximadamente 1 hasta aproximadamente 2 mm.
27. (Nueva) El producto de papel tisú de conformidad con la reivindicación 26 en el que la fibra de bambú se deriva de una especie de bambú seleccionada del grupo que consiste de *Phyllostachys heterocycla pubescens*, *Phyllostachys nigra variant Henon*, *Phyllostachys vivax* y *Phyllostachys bambusoides*.
28. (Nueva) El producto de papel tisú de conformidad con la reivindicación 16 en el que el elemento laminar continuo secado por aire no es crepado.

OBSERVACIONES/ARGUMENTOS

Las reivindicaciones 9-28 se presentan a la consideración del examinador. De conformidad con 37 C.F.R. § 1.111, se solicita respetuosamente la reconsideración de la presente solicitud, a la vista de las enmiendas anteriores y los siguientes observaciones.

I. Entrevista

El Solicitante agradece al Examinador la cortesía de la entrevista telefónica el 8 de noviembre de 2012, momento en el cual se discutieron las referencias Hu y Zhao en relación con las reivindicaciones pendientes.

II. Reivindicaciones Modificadas

Las reivindicaciones 1- 8 han sido canceladas sin prejuicios.

Se han añadido las reivindicaciones nuevas 21 - 28. El soporte para las nuevas reivindicaciones añadidos se puede encontrar, por ejemplo, en las reivindicaciones originales 2 al 8 y en la especificación, en la página 7,11. 8-11, página 7,11. 15-18, página 8,11. 5-18, página 10,11. 7-21. página 13,11. 4-8, y la página 8,11. 21-24.

La reivindicación 16 ha sido modificada para precisar, además, que el elemento laminar continuo es multi-estratificado. El soporte de la modificación se puede encontrar en la especificación, por ejemplo, en la página 10,11. 7-21.

Las reivindicaciones 18-20 se han modificado para corregir un error tipográfico en el preámbulo.

El solicitante presenta respetuosamente que las reivindicaciones recién añadidas y las modificaciones actuales no constituyen materia nueva.

III. Reivindicaciones Rechazadas

Las Reivindicaciones 1-20 son rechazadas en virtud de 35 U.S.C. 102(b) como anticipadas por o, en la alternativa, en virtud de 35 U.S.C. 103(a) como obvias sobre U.S.P. N°. 6.797.114 como se evidencia además en el artículo Zhao. ("Zhao").

Por una referencia del arte previo para anticipar una reclamación, la referencia debe describir todos los elementos reivindicados, como están dispuestos en la reivindicación. El requisito que los elementos del arte previo en sí mismos estén dispuestos como en la reivindicación significa que las reivindicaciones no pueden ser "tratadas... como meros catálogos de partes separadas, en desacuerdo de las relaciones parte a parte establecidas en las reivindicaciones y que le dan a las reivindicaciones su significado". *Lindemann Maschinenfabrik GMBH v. Am. Hoist & Derrick Co.*, 730 F. 2d 1452, 1459 (Fed. Cir. 1984). Por lo tanto, "a menos que una referencia describa dentro de las cuatro esquinas del documento no solamente todas las limitaciones reivindicadas, sino también todas las limitaciones *dispuestas o combinadas en la misma forma que se describe en la reivindicación*, no se puede decir que la invención anterior demuestra lo reivindicado y, por lo tanto, no se puede anticipar a la vista de 35 U.S.C. §102". *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F. 3d 1359, 1371 (Fed. Cir. 2008) (énfasis añadido).

Aquí, Hu se limita a mencionar las fibras que no son de maderera como una de por lo menos dieciocho diferentes posibles materiales celulósicos, tanto en madera y no madera, útiles en la invención. Hu pasa luego a describir una estructura específica de papel tisú estratificado compuesto enteramente de fibras de madera, y más específicamente una estructura que comprende desde aproximadamente 50-80% de fibra de pulpa de madera dura y 20-50% de fibra de pulpa de madera blanda. Hu en la col. 8, 1.64 - col. 9, 1.5. En ningún caso Hu describe un elemento laminar continuo de papel tisú estratificado que comprende bambú, por no hablar de una estructura multi-estratificada en la que el bambú se incorpora selectivamente en una capa en las cantidades reivindicadas. Por lo tanto, Hu no da a conocer todas las limitaciones, como están dispuestas en la reivindicación y, por tanto, no anticipa ninguna de las reivindicaciones pendientes.

Zhao no soluciona las deficiencias de Hu. A diferencia los elementos laminares continuos estratificados de papel tisú actualmente reivindicados, Zhao enseña un papel fino mezclado que comprende bambú y madera dura, cuyos objetivos son crear un papel de bajo volumen (alta densidad) con alta rigidez. Para lograr un menor volumen, papel fino de alta rigidez, Zhao enseña que el bambú debe ser refinado con el fin de sustituir la madera blanda. Ver Zhao en la fig. 2. Este es el efecto opuesto exacto observado por el inventor de la materia reivindicada actualmente. Con referencia a la Tabla 2, en la página 22 de la especificación, el inventor ha demostrado que cuando el bambú se sustituye por fibras de madera blanda el elementos laminar continuo secado por aire (elemento laminar continuo "TAD") aumento el volumen, incrementa nominalmente la rigidez y la durabilidad permanece sustancialmente sin cambios Por el contrario, cuando se prepara un elemento laminar continuo por presión (elemento laminar continuo "CWP"), se emplea un método parecido al proceso de preparación de papeles finos empleados por Zhao, el volumen y la durabilidad disminuyen drásticamente, mientras que la rigidez aumenta significativamente. Por lo tanto, un versado en el arte siguiendo Zhao tendría que haberse disuadido de sustituir bambú por fibra de madera blanda en un papel tisú por los efectos nocivos en volumen y rigidez.

IV. Conclusión

Por las razones expuestas anteriormente, se sostiene respetuosamente que todas las reivindicaciones presentadas actualmente están en forma de admisibilidad. Por favor cargar el cobro de honorarios procesales que se deben a Kimberly-Clark Worldwide, Inc. Cuenta de Depósito número 11-0875. El abajo firmante se puede localizar en (920) 721-3616.

Respetuosamente,

THOMAS SHANNON GERARD

Por: /Michael J. Sullivan/

Michael J. Sullivan, Reg. Nº. 54.479

Solicitud No. 13/238826

Fecha de Modificación 11/20/2012

Respuesta a la Acción de la Oficina del 08/29/2012

CERTIFICADO PRESENTACIÓN ELECTRÓNICA

Yo, Cynthia M. Trudell, por la presente certifico que esta correspondencia y todos los anexos y cualquier tarifa(s) que se transmiten electrónicamente vía la Internet a la Oficina de Patentes y Marcas de los Estados Unidos utilizando el Sistema de Radicación Electrónica (EFS-Web) en 11/20/2012.

Por: /Cynthia M. Trudell/

Cynthia M. Trudell



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SOLICITUD No.	FECHA DE RADICACIÓN	PRIMER INVENTOR NOMBRADO	DOCUMENTO DEL ABOGADO NO.	CONFIRMACIÓN No.
13/238,826	09/21/2011	Thomas Gerard Shannon	64765836US01	4146

23556 7590 08/29/2012

KIMBERLY-CLARK WORLDWIDE, INC.
Tara Pohlkotte
2300 Winchester Rd.
NEENAH, WI 54956

EXAMINADOR

KILIMAN LESZEK B.

UNIDAD DEL ARTE	NUMERO DEL DOCUMENTO
--------------------	-------------------------

1788

FECHA NOTIFICACIÓN	MODO DE PRESENTACIÓN
-----------------------	-------------------------

08/29/2012

PAPEL

**Por favor encuentre más adelante y/o adjunto una comunicación de la
Oficina relativa a esta solicitud o proceso.**

El período de tiempo para la respuesta, si la hay, se encuentra en la comunicación
adjunta.

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Resumen de la Acción de la Oficina	Solicitud No. 13/238,826	Solicitante(s) SHANNON, THOMAS GERARD	
	Examinador LESZEK KILIMAN	Unidad del Arte 1788	

**- LA FECHA DE ENVÍO de esta comunicación aparece en la portada con la dirección de correspondencia _____
Plazo para responder**

UN PERÍODO ESTATUTARIO ACORTADO PARA RESPONDER SE ESTABLECE QUE EXPIRA EN 3 MES (ES) O TREINTA (30) DÍAS, EL QUE SEA MAYOR, DESDE LA FECHA DE ENVÍO DE ESTA COMUNICACIÓN.

- Extensiones de tiempo pueden estar disponibles bajo las disposiciones de 37 CFR 1.136 (a). En ningún caso, sin embargo, se puede presentar una respuesta a tiempo después de SEIS (6) MESES a partir de la fecha de envío de esta comunicación.
- Si NO se especifica el periodo para respuesta anteriormente, el periodo estatutario máximo se aplicará y expirará en SEIS (6) MESES a partir de la fecha de envío de esta comunicación.
- La falta de respuesta dentro de lo establecido o el periodo extendido para responder causará, por ley, que la solicitud se convierta en abandonada (35 U.S.C. § 133). Cualquier respuesta recibida por la Oficina después de tres meses de la fecha de envío de esta comunicación, aunque se presente a tiempo, puede reducir cualquier ajuste en el término obtenido de la patente. Ver 37 CFR 1.704 (b).

Estado

1) ☐ En respuesta a la comunicación(es) presentado el _____.

2a) ☐ Esta acción es **FINAL**. 2b) ☒ Esta acción no es final.

3) ☐ Una elección fue hecha por el solicitante en respuesta a un requisito de restricción establecida durante la entrevista en _____; el requisito de restricción y las elecciones se han incorporado a esta acción.

4) ☐ Puesto que esta solicitud se encuentra en estado de asignación a excepción de las cuestiones formales, el enjuiciamiento sobre el fondo se cierra de acuerdo con la práctica de conformidad con Ex parte Quayle, 1935 CD 11, 453 O.G. 213.

Disposición de las reivindicaciones

5) ☒ Reivindicación(es) **1-20** es/están pendiente en la solicitud.
5a) de la reivindicación(es) anteriores _____ es/están fuera de consideración

6) ☐ Reivindicación(es) _____ es/están permitidas.

7) ☒ Reivindicación(es) **1-20** es/están rechazadas.

8) ☐ Reivindicación(es) es / están objetadas

9) ☐ Reivindicación(es) _____ están sujetas a la restricción y/o requerimiento de elección

Documentos de la Solicitud

10) ☐ La especificación es objetada por el examinador.

11) ☐ El(os) dibujo (s) presentados el _____ es /están: a) aceptado(s) o b) objetado(s) por el examinador.
El solicitante no podrá pedir que una objeción al dibujo (s) se mantenga en suspenso. Ver 37 CFR 1.85 (a).
Se requiere hoja (s) de dibujo de reemplazo que incluyen la corrección del dibujo (s) objetado(s). Ver 37 CFR 1.121 (d).

12) ☐ El juramento o declaración es objetado por el examinador. Nota. La acción de la Oficina adjunta o la forma PTO-152.

Prioridad de conformidad con 35 U.S.C. § 119

13) ☐ Se hace referencia a una reivindicación de prioridad extranjera en virtud de 35 U.S.C. § 119 (a) - (d) o (f).
a) ☐ Todo ☐ Algunos* ☐ Ninguna de:
1. ☐ Copias certificadas de los documentos de prioridad se han recibido.
2. ☐ Copias certificadas de los documentos de prioridad que se hayan recibido en la solicitud N°. _____
3. ☐ Copias de las copias certificadas de los documentos de prioridad que se hayan recibido en esta solicitud en etapa nacional de la Oficina internacional (Regla 17.2 del PCT (a)).
* Ver la acción detallada de la Oficina adjunta de una lista de las copias certificadas no recibidas.

Adjunto (s)

1. ☒ Aviso de las referencias citadas (PTO-892)

2. ☐ Aviso de Revisión dibujo de la patente de Ponente de opinión (PTO-948)

3. ☒ Declaraciones descritas en la información (PTO/SB/08),
Documento No. / fecha de correo 11/16/2011

4. ☐ Resumen de la entrevista (PTO-413),
Documento No. / Fecha de correo _____

5. ☐ Notificación de la solicitud de patente
Informal

6. ☐ Otro: _____

ACCIÓN DETALLADA

Reivindicación Rechazada - 35 U.S.C. § 102

1. La siguiente es una cita de los párrafos apropiados del 35 U.S.C 102 que forman la base para el rechazo de esta sección hecha en esta acción de la oficina:

Una persona tendrá derecho a la patente, a menos

(b) la invención fue patentada o descrita en una publicación impresa en este país o en el extranjero o en el uso público o en venta en este país, más de un año antes de la fecha de solicitud de patente en los Estados Unidos.

2. Las Reivindicaciones 1-20 son rechazadas en virtud de 35 U.S.C. 102(b) como anticipadas por o, en la alternativa, en virtud de 35 U.S.C. 103(a) como obvias sobre U.S.P. Nº. 6.797.114 como se evidencia además en el artículo Zhao.

Ver USPM'114 que muestra que es conocido en el arte el hacer y usar un elemento laminar continuo de papel tisú que comprenden fibras de bambú. La USPM'114 también describe una estructura de un elemento laminar continuo estratificado. Las propiedades de tal elemento laminar continuo serían las mismas que las propiedades del elemento laminar continuo de papel tisú reivindicado. Ver resumen de la invención; la columna 3, renglones 34-55; columna 5, renglones 34-47; columna 8 renglón 62 hasta la columna 9, renglón 16; reivindicaciones.

También, por favor tenga en cuenta que el artículo de Zhao et enseña claramente que las maderas blandas pueden ser reemplazadas por bambú en la producción de papel.

Cualquier pregunta relacionada con esta comunicación o comunicaciones anteriores del examinador se deben dirigir a LESZEK KILIMAN cuyo número de teléfono es (571) 272 - 1.509. El examinador normalmente se puede encontrar en M-T, 6,30-5,00.

Si el intento de localizar al examinador por teléfono no es exitoso, se puede contactar al supervisor del examinador, Alicia Chevalier, en 571-272-1490.

El número de fax de la organización a la que se le asigna esta solicitud o proceso es 571-273-8300.

La información sobre el estado de una solicitud se puede obtener en el sistema de solicitud de patente de Recuperación de Información (PAR). La información de estado para las solicitudes publicadas se puede obtener ya sea en el PAIR privado o en el PAIR Público. La información de estado de las solicitudes no publicadas está disponible sólo a través de PAIR privado. Para obtener más información sobre el sistema PAIR, ver <http://pair-direct.uspto.gov>. Si usted tiene preguntas sobre el acceso al sistema privado PAIR, póngase en contacto con el Centro de Negocios Electrónicos (EBC) en 866-217-9197 (llamada gratuita). Si desea asistencia de un representante de servicio al cliente USPTO o acceso al sistema de información automatizado, llame a 800-786-9199 (EN EE.UU. o Canadá) o 571-272-1000.

Lk

/leszek b kiliman/

Primer Examinador, Unidad de Arte 1788



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1430
Alexandria, Virginia 22313-1430
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/238,826	09/21/2011	Thomas Gerard Shannon	64765836US01	4146
23556 7590 08/29/2012 KIMBERLY-CLARK WORLDWIDE, INC. Tara Pohlkotte 2300 Winchester Rd. NEENAH, WI 54956			EXAMINER KILIMAN, LESZEK B	
			ART UNIT	PAPER NUMBER
			1788	
			MAIL DATE	DELIVERY MODE
			08/29/2012	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 13/238,826	Applicant(s) SHANNON, THOMAS GERARD	
	Examiner LESZEK KILIMAN	Art Unit 1788	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 5) ☒ Claim(s) 1-20 is/are pending in the application.
- 5a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 6) ☐ Claim(s) ____ is/are allowed.
- 7) ☒ Claim(s) 1-20 is/are rejected.
- 8) ☐ Claim(s) ____ is/are objected to.
- 9) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 12) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|--|
| 1) ☒ Notice of References Cited (PTO-892) | 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) ☐ Notice of Informal Patent Application |
| 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>11/16/2011</u> . | 6) ☐ Other: ____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-20 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over USP No. 6797114 as further evidenced by Zhao article.

See USP'114 for showing that it is known in the art to make and use a through-air dried tissue web comprising bamboo fibers. USP'114 also discloses a layered web structures. Properties of such web would be the same as the properties of claimed tissue web. See summary of the invention; column 3, lines 34-55; column 5, lines 34-47; column 8, line 62 through column 9, lines 16; claims.

Also, please note that Zhao et article clearly teaches that softwoods may be replaced with bamboo in paper production.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LESZEK KILIMAN whose telephone number is (571)272-1509. The examiner can normally be reached on M-T, 6.30-5.00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, alicia chevalier can be reached on 571-272-1490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Lk
/leszek b kiliman/
Primary Examiner, Art Unit 1788

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NOTICE OF ALLOWANCE AND FEE(S) DUE

23556 7590 02/04/2013
KIMBERLY-CLARK WORLDWIDE, INC.
Tara Pohlkotte
2300 Winchester Rd.
NEENAH, WI 54956

EXAMINER

KILIMAN, LESZEK B

ART UNIT

PAPER NUMBER

1788

DATE MAILED: 02/04/2013

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/238,826	09/21/2011	Thomas Gerard Shannon	64765836US01	4146
TITLE OF INVENTION: Tissue Product Comprising Bamboo				

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1770	\$300	\$0	\$2070	05/06/2013

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN **THREE MONTHS** FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. **THIS STATUTORY PERIOD CANNOT BE EXTENDED.** SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

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PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

23556 7590 02/04/2013
KIMBERLY-CLARK WORLDWIDE, INC.
Tara Pohlkotte
2300 Winchester Rd.
NEENAH, WI 54956

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/238,826	09/21/2011	Thomas Gerard Shannon	64765836US01	4146

TITLE OF INVENTION: Tissue Product Comprising Bamboo

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1770	\$300	\$0	\$2070	05/06/2013

EXAMINER	ART UNIT	CLASS-SUBCLASS
KILIMAN, LESZEK B	1788	428-534000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a **Customer Number is required.**

2. For printing on the patent front page, list
 (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, 1 _____
 (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 _____
 3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☐ Issue Fee
☐ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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23556 7590 02/04/2013
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Tara Pohlkotte
2300 Winchester Rd.
NEENAH, WI 54956

EXAMINER

KILIMAN, LESZEK B

ART UNIT	PAPER NUMBER
1788	

DATE MAILED: 02/04/2013

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 0 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 0 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No.	Applicant(s)	
	13/238,826	SHANNON, THOMAS GERARD	
	Examiner	Art Unit	
	LESZEK KILIMAN	1788	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from Issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to amendments and remarks filed 11/20/12.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are 9-28. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: ____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date ____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|--|--|
| 1. ☐ Notice of References Cited (PTO-892) | 5. ☐ Examiner's Amendment/Comment |
| 2. ☐ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date ____ | 6. ☒ Examiner's Statement of Reasons for Allowance |
| 3. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 7. ☐ Other ____. |
| 4. ☐ Interview Summary (PTO-413),
Paper No./Mail Date ____. | |

/leszek b kiliman/
Primary Examiner, Art Unit 1788

REASONS FOR ALLOWANCE

The following is an examiner's statement of reasons for allowance: The instant invention claims a layered through-air dried tissue web comprising a specific structure and composition. The closest prior art references that relate to the claimed invention are USP No.'s 6797114, 6821387 and Zho et article. The closest prior art teaches that it is known in the art to make and use layered tissue webs. However, the prior does not teach or fairly suggest the instant invention wherein a specific structure and composition of multilayered web is claimed .

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LESZEK KILIMAN whose telephone number is (571)272-1509. The examiner can normally be reached on M-T, 6.30-5.00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, alicia chevalier can be reached on 571-272-1490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Lk
/leszek b kiliman/
Primary Examiner, Art Unit 1788



OFICINA DE PATENTES Y MARCAS DE LOS ESTADOS UNIDOS

DEPARTAMENTO DE COMERCIO DE LOS ESTADOS UNIDOS
Oficina de Patentes y Marcas de los Estados Unidos
Dirección: COMISIONADO PARA PATENTES
P.O. Box 1450
Alexandria Virginia 22313-1450
www.uspto.gov

AVISO DE CONCESIÓN Y DERECHO(S) DEBIDO(S)

23556 7590 02/04/2013

KIMBERLY-CLARK WORLDWINE, INC
Tara Pohlkotte
2300 Winchester Rd.
NEENAH, WI 54956

EXAMINADOR

KILIMAN, LESZEK B.

UNIDAD DEL
ARTE
1788

NUMERO DEL
DOCUMENTO

FECHA DE CORREO: 02/04/2013

SOLICITUD No.	FECHA DE RADICACION	PRIMER INVENTOR NOMBRADO	DOCUMENTO DEL ABOGADO NO.	CONFIRMACION No.
13/238,826	09/21/2011	Thomas Gerard Shannon	64765836US01	4146

TÍTULO DE LA INVENCION: Producto de papel tisú que comprende Bambú

TIPO DE SOLICITUD	PEQUEÑA ENTIDAD	DERECHOS DE EMISION DEBIDOS	DERECHOS DE PUBLICACION DEBIDOS	DERECHOS DE EMISION PAGADOS PREVIAMENTE	TOTAL DERECHO(S) DEBIDOS	FECHA DEBIDA
No provisional	NO	\$1770	\$300	\$0	\$2070	05/06/2013

LA SOLICITUD IDENTIFICADA ANTERIORMENTE HA SIDO EXAMINADA Y SE PERMITE PARA SU EMISIÓN COMO PATENTE. EL ENJUICIAMIENTO DE LOS MÉRITOS ESTÁ CERRADO. ESTE AVISO DE CONCESIÓN NO ES UNA GARANTIA DE LOS DERECHOS DE PATENTE. ESTA SOLICITUD ESTÁ SUJETA A RETIRO DE EMISIÓN POR INICIATIVA DE LA OFICINA O BAJO LA PETICIÓN DEL SOLICITANTE. VEA 37 CFR 1.313 Y MPEP 1308.

LOS DERECHOS DE EMISIÓN Y LOS DERECHOS DE PUBLICACIÓN (SI SE REQUIERE) SE DEBEN PAGAR EN EL PLAZO DE TRES MESES A PARTIR DE LA FECHA DE CORREO DE ESTA NOTIFICACION O ESTA SOLICITUD SE DARÁ POR ABANDONADA. ESTE PERIODO LEGAL NO PUEDE SER EXTENDIDO. VER 35 U.S.C. 151. EL DERECHO DEBIDO DE EMISIÓN ANTERIORMENTE CITADO NO REFLEJA UN CRÉDITO PARA CUALQUIER PAGO PREVIO DE DERECHOS DE EMISIÓN EN ESTA SOLICITUD. SI UN DERECHO DE EMISIÓN YA HA SIDO PAGADO PREVIAMENTE EN ESTA SOLICITUD (COMO SE MUESTRA ARRIBA), EL RETORNO DE LA PARTE B DE ESTA FORMA SERÁ CONSIDERADA UNA SOLICITUD PARA APLICAR LOS DERECHOS DE EMISION PAGADOS PREVIAMENTE HACIA EL DERECHO DE EMISIÓN AHORA DEBIDO.

CÓMO RESPONDER A ESTE AVISO:

I. Revisar el estado PEQUEÑA ENTIDAD mostrado arriba. Si la entidad pequeña se muestra como sí, verificar su estado actual PEQUEÑA ENTIDAD: A. Si el estado es el mismo, pagar la cuota(s) total debida mostrada arriba. B. Si el estado anterior se va a quitar, active la casilla 5b en la Parte B - Tarifa(s) de transmisión y pague la tasa de publicación (si es necesario) y dos veces el importe de	la tasa de expedición mostrada arriba, o Si la entidad pequeña se muestra como NO: A. Pague el total de los derecho(s) mostrado arriba, o B. Si el solicitante alega el carácter de pequeña entidad anterior, o ahora está reclamando estado de PEQUEÑA ENTIDAD, active la casilla 5a en la Parte B - Tarifa(s) de transmisión y pague la tasa de publicación (si es necesario) y ½ de la tasa de expedición mostrada arriba.
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II. PARTE B - CUOTA(S) DE TRANSMISIÓN, o su equivalente, deben ser completados y devueltos a la Oficina de Patentes y Marcas de los Estados Unidos (USPTO) con su tasa de expedición y tasa de publicación (si es necesario). Si está cargando la cuota(s) a su cuenta de depósito, la sección "4b" de la Parte B - Tarifa(s) de transmisión debe ser completada y una copia adicional del formulario se debe presentar. Si se presenta un equivalente de la Parte B, una solicitud para volver a aplicar una tasa de expedición pagada previamente debe estar claramente hecha, y los retrasos en el procesamiento pueden ocurrir debido a la dificultad en el reconocimiento del documento como un equivalente de la Parte B.

III. Todas las comunicaciones relativas a esta solicitud deben dar el número de solicitud. Por favor, dirija todas las comunicaciones antes de la emisión (al Mail Stop ISSUE FEE a menos que se indique lo contrario).

RECORDATORIO IMPORTANTE: Las patentes de utilidad sobre la emisión de las solicitudes presentadas a partir del 12 de diciembre 1980 pueden requerir el pago de cuotas de mantenimiento. Es responsabilidad del titular de la patente para garantizar el pago puntual de las cuotas de mantenimiento a su vencimiento.

PARTE B - CUOTA(S) DE TRANSMISIÓN

Complete y envíe este formulario, junto con los derechos aplicable(s), al: Mail Stop ISSUE FEE

COMISIONADO PARA PATENTES

P.O.Box 1450

Alexandria Virginia 22313-1450

o por FAX (571)273-2885

INSTRUCCIONES: Este formulario debe ser utilizado para la transmisión de LOS DERECHOS DE EMISION y los DERECHOS DE PUBLICACION (si es necesario). Los Bloques 1 a 5 se deben completar cuando sea apropiado. Toda la correspondencia adicional incluyendo la Patente, pedidos por adelantado y la notificación de los derechos de mantenimiento se enviará por correo a la dirección de correspondencia actual como se indica a menos que se corrija más abajo o se indique lo contrario en el bloque 1, por (a) que especifica una nueva dirección para la correspondencia; y/o (b) que indica una "DIRECCIÓN DE DERECHO" separada para las notificaciones de derechos de mantenimiento.

DIRECCION DE CORRESPONDENCIA ACTUAL
(Nota: Use el bloque 1 para cualquier cambio de dirección)

23556 7590 02/04/2013

KIMBERLY-CLARK WORLDWIDE, INC.
Tara Pohlkotte
2300 Winchester Rd.
NEENAH, WI 54956

Nota: Un certificado de envío sólo se puede utilizar para los envíos nacionales de los derecho(s) de transmisión. Este certificado no se puede utilizar para cualquier otro documento de acompañamiento. Cada documento adicional, tal como una cesión o un dibujo formal, debe tener su propio certificado de envío o transmisión.

Certificado de envío o transmisión

Por la presente certifico que este Derecho(s) de transmisión está siendo depositado en el Servicio Postal de los Estados Unidos, con franqueo suficiente para el correo de primera clase en un sobre dirigido a la parada de correo de los derechos de emisión dirección anterior o que se transmite al facsímil a la USPTO (571)273-2885, en la fecha indicada más adelante.

Nombre del Depositante
Firma
Fecha

SOLICITUD No.	FECHA DE RADICACION	PRIMER INVENTOR NOMBRADO	DOCUMENTO DEL ABOGADO NO.	CONFIRMACION No.
13/238,826	09/21/2011	Thomas Gerard Shannon	64765836US01	4146

TÍTULO DE LA INVENCION: Producto de papel tisú que comprende Bambú

TIPO DE SOLICITUD	PEQUEÑA ENTIDAD	DERECHOS DE EMISIÓN DEBIDOS	DERECHOS DE PUBLICACIÓN DEBIDOS	DERECHOS DE EMISIÓN PAGADOS PREVIAMENTE	TOTAL DERECHO(S) DEBIDOS	FECHA DEBIDA
No provisional	NO	\$1770	\$300	\$0	\$2070	05/06/2013

EXAMINADOR	UNIDAD DEL ARTE	CLASE-SUBCLASE
KILLIMAN, LESZEK B	1788	428-534000

I. Cambio de dirección de correspondencia o indicación de "Dirección de Derecho" (37 CFR 1.363). ☐ Cambio de dirección de correspondencia (o cambio de forma de dirección de Correspondencia PTO/SB/122) adjunto. ☐ Indicación "Dirección de Derecho" (o Forma de indicación de "Dirección de Derecho" PTO/SB/47; Rev. 03-02 o más reciente) adjunto. Se requiere el uso de un número de cliente.	2. Para la impresión de la primera página de la patente, listar (1) Los nombres de hasta 3 abogados o agentes OR registrados, alternativamente, (2) El nombre de una sola empresa (que tiene como miembro un abogado o agente registrado) y los nombres de hasta 2 abogados de patentes registrados o agentes. Si no hay ningún nombre en la lista, ningún nombre se imprimirá. 1. _____ 2. _____ 3. _____
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3. NOMBRE CESIONARIO Y DATOS DE RESIDENCIA A IMPRIMIR EN LA PATENTE (escriba en letra imprenta o a máquina)
NOTA: A menos que se identifique un cesionario abajo, no aparecerá ningún dato cesionario de la patente. Si el cesionario se identifica a continuación, el documento se ha presentado para su registro como se establece en 37 CFR 3.11. Completar este formulario no es un sustituto para la presentación de una asignación.

(A) NOMBRE DEL CESIONARIO _____

(B) RESIDENCIA: (CIUDAD Y ESTADO O PAÍS) _____

Por favor, marque la categoría o categorías asignadas (no será impresa en la patente) ☐ Individual ☐ corporación u otra entidad del grupo privado ☐ Gobierno

4a. Los siguientes derecho(s) se presentan:

- ☐ Derecho de emisión
- ☐ Derecho de Publicación (No hay descuento Permitido para pequeña entidad)
- ☐ Prepedido - # de Copias _____

4b. Derecho(s) de pago: (Por favor, primero vuelva a aplicar cualquier emisión de pago de derechos mostrado anteriormente)

- ☐ Se adjunta un cheque.
- ☐ Pago con tarjeta de crédito. Se adjunta Formulario PT0-2038.
- ☐ El Director está autorizado por este medio para cargar los derecho(s) requeridos, cualquier deficiencia o créditos de cualquier sobre pago, para depositar a la Cuenta Número _____ (adjunte una copia adicional de este formulario).

5. Cambio en la estado de la Entidad (de carácter que se indica más arriba)

- ☐ a. El Solicitante reclama estatus de entidad pequeña. Ver 37 CFR 1.27
- ☐ b. El Solicitante ya no está reclamando status de pequeña entidad. Ver 37 CFR 1.27 (g) (2)

NOTA: La cuota de emisión y la cota de publicación (si es necesario) no serán aceptadas de cualquier persona distinta del solicitante; un abogado o agente registrado; o el cesionario u otra parte interesada, como se muestra en los registros de la Oficina de Patentes y Marcas de los Estados Unidos.

Firma Autorizada _____

Fecha _____

Nombre mecanografiado o impreso _____ Registro No. _____

Esta colección de información es requerida por 37 CFR 1.311. La información es necesaria para obtener o conservar un beneficio por el público que es para archivar (y por el UPSTO para procesar) una solicitud. La confidencialidad se rige por 35 U.S.C. 122 y 37 CFR 1.14. Se estima que esta colección toma 12 minutos para completarse, incluida la recogida, la preparación y envío del formulario de solicitud completa a la USPTO. El tiempo variará dependiendo de cada caso individual. Cualquier comentario sobre la cantidad de tiempo que necesita para completar este formulario y/o sugerencias para reducir esta carga deben ser enviados a la Jefe de Información de la Oficina de Patentes y Marcas de los Estados Unidos, Departamento de Comercio, P.O. Box 1450, Alexandria, Virginia 22313-1450. NO ENVIAR LOS HONORARIOS O LOS FORMULARIOS A ESTA DIRECCIÓN. ENVIAR A: Comisario de Patentes. P.O. Box 1450 Alexandria, Virginia 22313-1450.

Según la Ley de Reducción de Papeleo de 1995, ninguna persona está obligada a responder a una solicitud de información a menos que muestre un número de control válido de la OMB.



OFICINA DE PATENTES Y MARCAS DE LOS ESTADOS UNIDOS

DEPARTAMENTO DE COMERCIO DE LOS ESTADOS UNIDOS
Oficina de Patentes y Marcas de los Estados Unidos
Dirección: COMISIONADO PARA PATENTES
P.O. Box 1450
Alexandria Virginia 22313-1450
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SOLICITUD No.	FECHA DE RADICACION	PRIMER INVENTOR NOMBRADO	DOCUMENTO DEL ABOGADO NO.	CONFIRMACION No.
13/238,826	09/21/2011	Thomas Gerard Shannon	64765836US01	4146

23556 7590 02/04/2013

KIMBERLY-CLARK WORLDWINE, INC
Tara Pohlkotte
2300 Winchester Rd.
NEENAH, WI 54956

EXAMINADOR

KILIMAN, LESZAK B.

UNIDAD DEL ARTE	NUMERO DEL DOCUMENTO
1788	

FECHA DE CORREO: 02/04/2013

Determinación de Los Términos de la Patente Ajustados En virtud de 35 U.S.C. 154 (b) (Solicitud presentada en o a partir del 29 mayo de 2000)

El Ajuste de los Términos de la Patente a la fecha es de 0 día(s). Si se paga el derecho de publicación en la fecha que es tres meses después de la fecha de envío del presente anuncio y los asuntos relacionados con patentes el Martes antes de la fecha que es 28 semanas (seis meses y medio) después de la fecha de envío de esta notificación, el ajuste de los términos de la patente será de 0 días(s).

Si se presentó una Solicitud de Enjuiciamiento Continuo (CPA) en la solicitud identificada anteriormente, la fecha de presentación que determina el Ajuste del Término de la patente es la fecha de presentación de la más reciente CPA.

El solicitante podrá obtener información más detallada mediante el acceso a la Recuperación de información de la solicitud de patente (PAIR) Sitio Web (<http://pair.uspto.gov>).

Cualquier pregunta relacionada con la extensión del término de la patente o de la determinación de ajuste se deben dirigir a la Oficina de Administración Jurídica de Patentes al (571)-272-7702. Las preguntas relativas a la emisión y el pago de derechos de publicación deben dirigirse al Centro de Servicio al Cliente de la Oficina de Publicación de Patente, al 1-(888)-786-0101 o (571)-272-4200.

PTOL-85 (Rev. 02/11)

Declaración de Ley de Privacidad

La Ley de Privacidad de 1974 (PL 93-579) requiere que se le de cierta información en relación con el envío del formulario adjunto relacionado con una solicitud de patente o patente. En consecuencia, de conformidad con los requisitos de Ley, le informamos que: (1) la autoridad general para la recogida de esta información es 35 U.S.C. 2 (b) (2); (2) el suministro de la información solicitada es voluntaria; y (3) el motivo principal por el cual la información es utilizada por la Oficina de Patentes y Marcas de los Estados Unidos es procesar y/o examinar su presentación relacionada con una solicitud de patente o patente. Si usted no desea suministrar la información solicitada, la Oficina de Patentes y Marcas de los Estados Unidos no podrá procesar y/o examinar su presentación, lo que puede resultar en la terminación del procedimiento o desistimiento de la solicitud o la caducidad de la patente.

La información proporcionada por usted en este formulario estará sujeta a los siguientes usos de rutina:

1. La información en este formulario será tratada de forma confidencial en la medida permitida por Ley de Libertad de información (5 U.S.C. 552) y Ley de Privacidad (5 U.S.C. 552a). Los registros de este sistema de registros se pueden divulgar al Departamento de Justicia para determinar si la divulgación de estos registros es requerida por Ley de Libertad de información.

2. Un registro de este sistema de registros se puede divulgar, como un uso normal, en el transcurso de la presentación de pruebas ante un tribunal, juez o tribunal administrativo, e incluso al abogado contrario en el curso de negociaciones de arreglo.
3. Un registro de este sistema de registros se puede divulgar, como un uso normal, a un miembro del Congreso que presente una solicitud relativa a un individuo, a quien corresponde el registro, cuando la persona haya solicitado la ayuda de los miembros con respecto a la materia cuestión del registro.
4. Un registro de este sistema de registros se puede divulgar, como un uso normal, a un contratista de la Agencia, que tenga necesidad de la información con el fin de realizar un contrato. Se requerirá a los receptores de la información para cumplir con los requisitos de Ley de Privacidad de 1974, según enmendada, de conformidad con 5 U.S.C. 552a (m).
5. Un registro relacionado con la Solicitud internacional presentada en virtud del Tratado de Cooperación de Patentes en este sistema de registros se puede divulgar, como un uso normal, a la Oficina internacional de la Organización Mundial de Propiedad Intelectual, de conformidad con el Tratado de Cooperación de Patentes.
6. Un registro de este sistema de registros se puede divulgar, como un uso normal, a otra agencia federal para propósitos de revisión de Seguridad Nacional (35 U.S.C. 181) y de revisión de conformidad con la Ley de Energía Atómica (42 U.S.C. 218 (c)).

7. Un registro de este sistema de registros se puede divulgar, como un uso normal, al Administrador, a Servicios Generales, o su designado/a, durante una inspección de los registros realizados por la GSA como parte de la responsabilidad de ese organismo de recomendar mejoras en las prácticas y programas de gestión de registros, de conformidad con 44 U.S.C. 2904 y 2906. Dicha divulgación se hará de acuerdo con las regulaciones GSA que rigen la inspección de registros para este propósito, y cualquier otra Directiva relevante (i.e., GSA o Comercio). Esa información no se utiliza para hacer determinaciones acerca de las personas.
8. Un registro de este sistema de registros se puede divulgar, como un uso normal, al público después de la publicación de la solicitud de conformidad con 35 U.S.C. 122 (b) o la emisión de una patente de conformidad con 35 U.S.C. 151. Además, un registro se puede divulgar, sujeto a las limitaciones de 37 CFR 1.14, como un uso normal, al público si el registro se presentó en una solicitud que fue abandonada o en los que el procedimiento se terminó y la solicitud que hace referencia a ya sea una solicitud publicada, una solicitud abierta a la inspección pública o una patente otorgada.
9. Un registro de este sistema de registros se puede divulgar, como un uso normal, a un Estado federal, o agencia local de solicitud de la ley, si la USPTO se da cuenta de una violación o posible violación de Ley o reglamento.

Notificación de admisibilidad	Solicitud No. 13/238,826	Solicitante(s) SHANNON, THOMAS GERARD	
	Examinador LESZEK KILIMAN	Unidad del Arte 1788	

- LA FECHA DE ENVÍO de esta comunicación aparece en la portada con la dirección de correspondencia -----
 Todas las reivindicaciones que son permisibles, EL ENJUICIAMIENTO DE LOS MÉRITOS ES (O PERMANECE) cerrados en esta solicitud. Si no está adjunta (o enviada previamente por correo), una notificación de permisibilidad (PTOL-85) u otra comunicación apropiada será enviada por correo a su debido tiempo. **ESTE AVISO DE PERMISIBILIDAD ES GARANTIA DE DERECHOS DE PATENTE.** Esta solicitud está sujeta a la retirada de la emisión por iniciativa de la Oficina o previa petición del solicitante. Ver 37 CFR 1.313 y MPEP 1308.

1. ☒ Esta comunicación responde a Después de modificación final de 11/20/12.
☐ Declaración fiscal(s)/declaración jurada(s) bajo 37 CFR 1.130 (b) se han presentado en _____.

2. ☐ El solicitante hizo una elección en respuesta a un requisito de restricción establecido durante la entrevista en _____; el requisito de restricción y la elección se han incorporado a esta acción; la restricción _____.

3. ☒ La reivindicación(es) permitida (s) **9-28**. Como resultado de la(s) reivindicación(es) permitida(s), usted puede ser elegible para beneficiarse del programa **Patent Prosecution Highway** en una oficina de propiedad intelectual participante para la solicitud correspondiente. Para obtener más información, por favor ver <http://www.uspto.gov/patents/init events/pph/index.isp> o envíe una consulta a PPHfeedback@uspto.gov.

4. ☐ Se hace reconocimiento a una reivindicación de prioridad extranjera en virtud de 35 U.S.C. § 119 (a) - (d) o (f).
Copias certificadas:
 a) ☐ Todo b) ☐ algunos* c) ☐ Ninguna de las
 1. ☐ Copias certificadas de los documentos de prioridad se han recibido.
 2. ☐ Copias certificadas de los documentos de prioridad que se hayan recibido en la solicitud N°. _____
 3. ☐ Copias de las copias certificadas de los documentos de prioridad que se hayan recibido en esta solicitud en etapa nacional de la Oficina internacional (Regla 17.2 del PCT (a)).
 * Copias certificadas no recibidos: _____.

El solicitante tiene TRES MESES A PARTIR DE LA "FECHA DE ENVÍO" de esta comunicación para presentar una respuesta que cumpla con los requisitos indicados a continuación. La falta de cumplimiento al tiempo resultará en abandono de esta solicitud.
ESTE PERIODO DE TRES MESES NO ES EXTENSIBLE.

5. ☐ DIBUJOS CORREGIDOS (como "hojas de reemplazo") se deben presentar.
☐ Incluyendo los cambios requeridos por la Modificación/comentarios adjuntos del Examinador o en la acción de la Oficina de Documento No. / Fecha de Correo: _____.

Indicios de identificación tales como el número de solicitud (ver 37 CFR 1.84 (c)) se deben escribir en los dibujos, en la parte delantera (no la parte de atrás) de cada hoja. Las hojas de reemplazo(s) se deben etiquetar tal como en el encabezamiento de acuerdo con 37 CFR 1.121 (d).

6. ☐ DEPÓSITO DE y/o información sobre el depósito de MATERIAL BIOLÓGICO se deben presentar. Nota: el comentario adjunto del examinador en cuanto a EL REQUERIMIENTO PARA EL DEPOSITO DE MATERIAL BIOLÓGICO.

Adjunto (s)

1. ☐ Aviso de las referencias citadas (PTO-892)

2. ☐ Declaraciones descritas en la información (PTO/SB/08), Documento No. / fecha de correo _____

3. ☐ Comentarios del Examinador en cuanto a los requerimientos para el depósito de material biológico

4. ☐ Resumen de la entrevista (PTO-413), Documento No. / Fecha de correo _____

5. ☐ Modificación/Comentarios del Examinador

6. ☒ Declaración del Examinador de las razones para la permisibilidad.

7. ☐ Otro _____

/leszek b kiliman/ Examinador Principal, Unidad de Arte 1788	
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RAZONES PARA ADMISIBILIDAD

La siguiente es una declaración del examinador(es) de las razones de admisibilidad: La presente invención reivindica un elemento laminar continuo de papel tisú secado al aire que comprende una estructura y composición específicas. Las referencias del arte anterior más cercano que se relacionan con la invención reivindicada son USP Nos, 6797114, 6821387 y el artículo Zho et. El arte previo más cercano enseña que es conocido en el arte hacer y utilizar elementos laminares continuos de papel tisú estratificado. Sin embargo, la anterior no enseña ni sugiere justamente la presente invención en la que se reivindica la estructura y composición específica de un elemento laminar continuo multi-estratificado.

Cualquier comentario que se considere necesario por el solicitante deberá presentarse a más tardar el pago de la tasa de expedición y, evitar retrasos en el procesamiento. Debe acompañar preferentemente la tasa de expedición. Estas presentaciones deben estar claramente etiquetadas "Comentarios sobre la declaración de razones para permisibilidad".

Cualquier pregunta relacionada con esta comunicación o comunicaciones anteriores del examinador se deben dirigir a LESZEK

KILIMAN cuyo número de teléfono es (571) 272 - 1.509. El examinador normalmente se puede encontrar en M-T, 6,30-5,00.

Si el intento de localizar al examinador por teléfono no es exitoso, se puede contactar al supervisor del examinador, Alicia Chevalier, en 571-272-1490.

El número de fax de la organización a la que se le asigna esta solicitud o proceso es 571-273-8300.

La información sobre el estado de una solicitud se puede obtener en el sistema de solicitud de patente de Recuperación de Información (PAR). La información de estado para las solicitudes publicadas se puede obtener ya sea en el PAIR privado o en el PAIR Público. La información de estado de las solicitudes no publicadas está disponible sólo a través de PAIR privado. Para obtener más información sobre el sistema PAIR, ver <http://pair-direct.uspto.gov>. Si usted tiene preguntas sobre el acceso al sistema

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Lk
/leszek b kiliman/
Primer Examinador, Unidad de Arte 1788



US008524374B2

**(12) United States Patent
Shannon****(10) Patent No.: US 8,524,374 B2
(45) Date of Patent: Sep. 3, 2013****(54) TISSUE PRODUCT COMPRISING BAMBOO****(75) Inventor: Thomas Gerard Shannon**, Neenah, WI (US)**(73) Assignee: Kimberly-Clark Worldwide, Inc.**, Neenah, WI (US)**(*) Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.**(21) Appl. No.: 13/238,826****(22) Filed: Sep. 21, 2011****(65) Prior Publication Data**
US 2013/0071678 A1 Mar. 21, 2013**(51) Int. Cl.**
B32B 23/04 (2006.01)**(52) U.S. Cl.**
USPC 428/532; 428/533; 428/534; 428/535;
428/536**(58) Field of Classification Search**
USPC 428/532, 533, 534, 535, 536
See application file for complete search history.**(56) References Cited**

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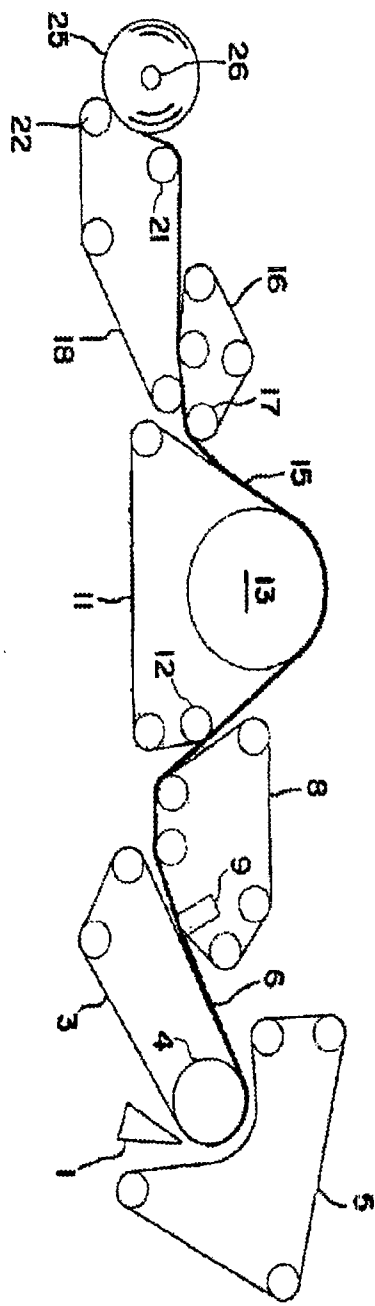
Primary Examiner — Leszek Kiliman

(74) Attorney, Agent, or Firm — Michael J. Sullivan

(57) ABSTRACT

The disclosure provides tissue webs, and products incorporating the same, where the webs comprise wood and bamboo fibers. More specifically the disclosure provides soft and durable through-air dried tissue webs comprising at least about 10 percent bamboo fiber by weight of the web. In the through-air dried tissue webs of the present disclosure, bamboo typically replaces high average fiber length wood fibers, which increases the bulk of the through-air dried web without negatively effecting softness or durability.

20 Claims, 1 Drawing Sheet



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TISSUE PRODUCT COMPRISING BAMBOO

FIELD OF THE INVENTION

This disclosure relates to soft and durable through-air dried tissue webs, and tissue products comprising the same, wherein the tissue webs comprise wood and bamboo fibers. It has been discovered that replacing high average fiber length wood fibers with bamboo fibers in a through-air dried web increases sheet bulk without negatively effecting durability or stiffness.

BACKGROUND

Tissue products, such as facial tissues, paper towels, bath tissues, napkins, and other similar products, are designed to include several important properties. For example, the products should have good bulk, a soft feel, and should have good strength and durability. Unfortunately, however, when steps are taken to increase one property of the product, other characteristics of the product are often adversely affected.

Tissue products are made via one of two primary tissue manufacturing processes: conventional wet press (CWP) and through-air drying (TAD). In CWP, the tissue is formed on a forming fabric from either a suction breast roll or twin wire former and the embryonic web is transferred to a papermaking felt and dewatered by pressing with one or two pressure roll nips against the surface of a large steam heated cylinder called a Yankee dryer. The pressing process also assists in transfer of the sheet to the Yankee dryer surface. An adhesive solution is sprayed on the dryer surface prior to the sheet transfer in order to provide good bonding between the sheet and the dryer surface. The sheet is removed from the Yankee surface by a doctor blade in the creping process. In the TAD process, the sheet is formed on a forming fabric and transferred to one or more other fabrics as it is dewatered to a consistency of 25 percent or higher. After the initial dewatering the sheet is dried while in contact with the fabric by blowing hot air through the fabric until the consistency is 40 percent or higher. In conventional through-air dried processes, the through-air dried web is adhered to a Yankee dryer and creped. A roll may be present at the point of transfer to assist in the transfer of the web from the drying fabric to the Yankee dryer but absent the presence of high pressure used to dewater the web in the CWP process. Alternatively TAD tissue may be prepared without creping where foreshortening of the web occurs with a differential velocity transfer of the wet laid web from the forming fabric to a substantially slower moving, open mesh transfer fabric. Thereafter the web is dried while preventing macroscopic rearrangement of the fibers in the plane of the web. The web is then dried on a fabric in the through-air dryer to a consistency of 90 percent or higher and wound. No Yankee dryer is used in the uncreped through-air dried (UCTAD) process. Through-air dried tissue products are typically associated with higher quality tier tissue products than conventional wet pressed products due to their higher bulk and greater absorption capacity.

To achieve the optimum product properties, tissue products are typically formed, at least in part, from pulps containing wood fibers and often a blend of hardwood and softwood fibers to achieve the desired properties. Typically when attempting to optimize surface softness, as is often the case with tissue products, the papermaker will select the fiber furnish based in part on the coarseness of pulp fibers. Pulps having fibers with low coarseness are desirable because tissue paper made from fibers having a low coarseness can be made softer than similar tissue paper made from fibers having a

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high coarseness. To optimize surface softness even further, premium tissue products usually comprise layered structures where the low coarseness fibers are directed to the outside layer of the tissue sheet with the inner layer of the sheet comprising longer, coarser fibers.

Unfortunately, the need for softness is balanced by the need for durability. Durability in tissue products can be defined in terms of tensile strength, tensile energy absorption (TEA), burst strength and tear strength. Typically tear, burst and TEA will show a positive correlation with tensile strength while tensile strength, and thus durability, and softness are inversely related. Thus the paper maker is continuously challenged with the need to balance the need for softness with a need for durability. Unfortunately, tissue paper durability generally decreases as the average fiber length is reduced. Therefore, simply reducing the pulp average fiber length can result in an undesirable trade-off between product surface softness and product durability.

Besides durability long fibers also play an important role in overall tissue product softness. While surface softness in tissue products is an important attribute, a second element in the overall softness of a tissue sheet is stiffness. Stiffness can be measured from the tensile slope of stress-strain tensile curve. The lower the slope the lower the stiffness and the better overall softness the product will display. Stiffness and tensile strength are positively correlated, however at a given tensile strength shorter fibers will display a greater stiffness than long fibers. While not wishing to be bound by theory, it is believed that this behavior is due to the higher number of hydrogen bonds required to produce a product of a given tensile strength with short fibers than with long fibers. Thus, easily collapsible, low coarseness long fibers, such as those provided by Northern Softwood Kraft (NSWK) fibers typically supply the best combination of durability and softness in tissue products when those fibers are used in combination with hardwood Kraft fibers such as Eucalyptus hardwood Kraft fibers. While Northern Softwood Kraft Fibers have a higher coarseness than Eucalyptus fibers their small cell wall thickness relative to lumen diameter combined with their long length makes them the ideal candidate for optimizing durability and softness in tissue.

Unfortunately, supply of NSWK is under significant pressure both economically and environmentally. As such, prices of NSWK fibers have escalated significantly creating a need to find alternatives to optimize softness and strength in tissue products. Another type of softwood fiber is Southern Softwood Kraft (SSWK) widely used in fluff pulp containing absorbent products such as diapers, feminine care absorbent products and incontinence products. Unfortunately while not under the same supply and environmental pressures as NSWK, fibers from SSWK are too coarse for tissue products and are unsuitable for making soft tissue products. While having long fiber length, the SSWK fibers have too wide a cell wall width and too narrow a lumen diameter and thus create stiffer, harsher feeling products than NSWK.

The tissue papermaker who is able to obtain pulps having a desirable combination of fiber length and coarseness from fiber blends generally regarded as inferior with respect to average fiber properties may reap significant cost savings and/or product improvements. For example, the papermaker may wish to make a tissue paper of superior strength without incurring the usual degradation in softness which accompanies higher strength. Alternatively, the papermaker may wish a higher degree of paper surface bonding to reduce the release of free fibers without suffering the usual decrease in softness which accompanies greater bonding of surface fibers. As such, a need currently exists for a tissue product formed from

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a fiber that will improve durability without negatively affecting other important product properties, such as softness.

Outside of Northern and Southern softwood pulp fibers very few options exist for papermakers when selecting long fibers. Bamboo fibers have been used in paper for many years primarily in India and China. Long and short fiber bamboo species are reported. Bamboo fibers have been used to replace wood fibers in blended, conventional wet pressed tissue products in India and China. Unfortunately commercially available bamboo pulps comprise a mixture of species of bamboos including long and short fibers. Length weighted average fiber lengths are significantly shorter than northern and southern softwood pulp fibers. In addition, the bamboo pulps contain a high portion of primary fines in the form of parenchyma cells. It is well known that the presence of high levels of fines in tissue products create a decrease in surface softness and an increase in stiffness of tissue sheets. Thus, tissue sheets comprising high amounts of bamboo fibers tend to be less soft than those comprising wood fibers. Moreover, given the relatively short fiber length and high level of primary fines, bamboo pulp fibers would not be predicted to provide good durability or softness properties to premium tissue products when specifically replacing wood pulp fibers. Generally, bamboo fibers have coarseness and fines that are too high to replace hardwood fibers and an average fiber length that is too short and cell walls that are too thick to replace softwood fibers.

SUMMARY

It has now been unexpectedly discovered that bamboo fibers, despite having relatively short fiber length, thick cell walls and a narrow lumen may be incorporated into a through-air dried tissue web, and particularly the non-skin contacting layer of a multi layered web, to yield a tissue web having improved bulk without a significant increase in stiffness or decrease in durability. These properties are particularly acute when bamboo fibers are substituted for high average fiber length wood fibers, such as softwood fibers and more specifically Northern Softwood Kraft (NSWK). Accordingly, in certain preferred embodiments, bamboo fibers may replace at least about 50 percent of the NSWK in the web and more preferably at least about 75 percent of the NSWK, such that bamboo fiber comprises at least about 10 percent and more preferably at least about 20 percent by weight of the web. Moreover, it has been discovered that softness levels may be further improved by disposing the bamboo fibers within the fibrous tissue web such that the bamboo fibers are not brought into contact with a user's skin in-use, such as in the middle layer of a three layered structure. Furthermore, it has been discovered that through-air dried webs comprising bamboo fibers have an unexpected increase in bulk. The improved durability and bulk are observed for several species of bamboo, including both tropical and temperate timber bamboo.

Accordingly, the present disclosure provides, in one embodiment, a through-air dried tissue web comprising bamboo fiber, wherein the bamboo fiber comprises at least about 10 percent by weight of the tissue web. If desired, the bamboo pulp fibers may have an average fiber length greater than about 1 mm, such as from about 1.1 to about 2.5 mm and more preferably from about 1.2 to about 2 mm.

In another embodiment, the present disclosure provides a through-air dried tissue web comprising bamboo fiber wherein the bamboo fiber has replaced a significant portion of the long fiber, particularly NSWK fiber such that the amount of NSWK fiber in the web is less than about 20 percent of the

total web such as from about 0 to about 15 percent and more preferably from about 0 to about 10 percent of the total weight of the web.

In other embodiments, the present disclosure provides a multi-layered through air dried tissue web comprising two or more layers including a first layer and a second layer, wherein a greater weight percent of bamboo fiber is present in the second layer than in the first layer. In certain preferred embodiments the first layer comprises hardwood fibers and the second layer comprises bamboo and softwood fibers, wherein the weight ratio of bamboo fiber to softwood fiber is greater than 1:1.

In still other embodiments the disclosure provides a multi-layered tissue web comprising a first fibrous layer and a second fibrous layer, wherein the first fibrous layer comprises wood fibers and the second fibrous layer comprises bamboo fiber, wherein bamboo fibers comprise from about 75 to about 100 percent by weight of the second layer.

In other embodiments the disclosure provides a through-air dried tissue product comprising bamboo fibers, wherein the bamboo fibers are selected from the group consisting of temperate running bamboos including but not limited to *Phyllostachys heterocycla pubescens*, *Phyllostachys nigra* variant *Henon*, *Phyllostachys vivax* and *Phyllostachys Bambusoides*, and mixtures thereof.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic diagram of one embodiment of a process for forming an uncreped through-air dried tissue web for use in the present disclosure.

DEFINITIONS

It should be noted that, when employed in the present disclosure, the terms "comprises," "comprising," and other derivatives from the root term "comprise" are intended to be open-ended terms that specify the presence of any stated features, elements, integers, steps, or components, and are not intended to preclude the presence or addition of one or more other features, elements, integers, steps, components, or groups thereof.

As used herein, the term "Tear Index" refers to the quotient of the geometric mean tear strength (typically expressed in grams) divided by the geometric mean tensile strength (typically expressed in grams per 3 inches) multiplied by 1,000 where the geometric mean tear index is defined as the square root of the product of the machine directional tear strength and the cross directional tear strength.

$$\text{Tear Index} = \frac{\sqrt{\text{MD Tear} \times \text{CD Tear}}}{\text{GMT}} \times 1,000$$

While tear index may vary depending on the composition of the tissue web, as well as the basis weight of the web, webs prepared according to the present disclosure generally have a Tear Index greater than about 5, more preferably greater than about 6 and still more preferably greater than about 7 such as from about 7 to about 20.

As used herein, the term "Burst Index" refers to the quotient of the dry burst peak load (also referred to as the dry burst strength and typically expressed gram feet) divided by the geometric mean tensile strength multiplied by 10.

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$$\text{Burst Index} = \frac{\text{Dry Burst Strength}}{\text{GMT}} \times 10$$

While Burst Index may vary depending on the composition of the tissue web, as well as the basis weight of the web, webs prepared according to the present disclosure generally have a burst index greater than 3, more preferably greater than about 4 and still more preferably greater than about 5.

As used herein, the terms "geometric mean tensile" and "GMT" refer to the square root of the product of the machine direction tensile strength and the cross-machine direction tensile strength of the web. As used herein, tensile strength refers to geometric mean tensile strength as would be apparent to one skilled in the art unless otherwise stated.

As used herein, the terms "geometric mean tensile energy index" and "TEA Index" refer to the square root of the product of the MD and CD tensile energy absorption ("MD TEA" and "CD TEA," typically expressed in g-cm/cm²) divided by the GMT strength multiplied by 1,000.

$$\text{TEA Index} = \frac{\sqrt{\text{MD TEA} \times \text{CD TEA}}}{\text{GMT}} \times 1,000$$

While the TEA Index may vary depending on the composition of the tissue web, as well as the basis weight of the web, webs prepared according to the present disclosure generally have a TEA Index greater than about 6, more preferably greater than about 7 and still more preferably greater than about 8, such as from about 8 to about 20.

As used herein, the term "Durability Index" refers to the sum of the tear index, burst index and TEA Index and is an indication of the durability of the product at a given tensile strength.

$$\text{Durability Index} = \text{Tear Index} + \text{Burst Index} + \text{TEA Index}$$

While the Durability Index may vary depending on the composition of the tissue web, as well as the basis weight of the web, webs prepared according to the present disclosure generally have a Durability Index values of about 15 or greater, more preferably about 18 or greater and still more preferably about 20 or greater such as from about 20 to about 50.

As used herein, the term "Stiffness Index" refers to the quotient of the geometric mean tensile slope, defined as the square root of the product of the MD and CD tensile slopes, divided by the geometric mean tensile strength.

$$\text{Stiffness Index} = \frac{\sqrt{\text{MD Tensile Slope} \times \text{CD Tensile Slope}}}{\text{GMT}} \times 1,000$$

While the Stiffness Index may vary depending on the composition of the tissue web, as well as the basis weight of the web, webs prepared according to the present disclosure generally have a Stiffness Index values of less than about 16, more preferably less than about 15 and still more preferably less than about 14 such as from about 5 to about 14.

As used herein, the term "average fiber length" refers to the length weighted average length of fibers determined utilizing a Kajaani fiber analyzer model No. FS-100 available from Kajaani Oy Electronics, Kajaani, Finland. According to the test procedure, a pulp sample is treated with a macerating liquid to ensure that no fiber bundles or shives are present. Each pulp sample is disintegrated into hot water and diluted to

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an approximately 0.001 percent solution. Individual test samples are drawn in approximately 50 to 100 ml portions from the dilute solution when tested using the standard Kajaani fiber analysis test procedure. The weighted average fiber length may be expressed by the following equation:

$$\sum_{x_i=0}^k (x_i \times n_i) / n$$

where

k=maximum fiber length

x_i=fiber length

n_i=number of fibers having length x_i

n=total number of fibers measured.

As used herein, a "tissue product" generally refers to various paper products, such as facial tissue, bath tissue, paper towels, napkins, and the like. Normally, the basis weight of a tissue product of the present invention is less than about 80 grams per square meter (gsm), in some embodiments less than about 60 gsm, and in some embodiments, between about 10 to about 60 gsm.

Tissue products are further differentiated from other paper products in terms of their bulk. The bulk of the tissue and towel products of the present invention is calculated as the quotient of the caliper (hereinafter defined), expressed in microns, divided by the basis weight, expressed in grams per square meter. The resulting bulk is expressed as cubic centimeters per gram. In certain embodiments tissue products may have a bulk greater than about 5 cm³/g and still more preferably greater than about 7 cm³/g, such as from about 7 to about 15 cm³/g. Tissue webs prepared according to the present disclosure may have higher bulk than the tissue products incorporating the same webs. For example, tissue webs may have a bulk greater than about 7 cm³/g, such as greater than about 10 cm³/g, such as from about 12 to about 24 cm³/g.

As used herein, the term "layer" refers to a plurality of strata of fibers, chemical treatments, or the like within a ply.

As used herein, the terms "layered tissue web," "multi-layered tissue web," "multi-layered web," and "multi-layered paper sheet," generally refer to sheets of paper prepared from two or more layers of aqueous papermaking furnish which are preferably comprised of different fiber types. The layers are preferably formed from the deposition of separate streams of dilute fiber slurries, upon one or more endless foraminous screens. If the individual layers are initially formed on separate foraminous screens, the layers are subsequently combined (while wet) to form a layered composite web.

The term "ply" refers to a discrete product element. Individual plies may be arranged in juxtaposition to each other. The term may refer to a plurality of web-like components such as in a multi-ply facial tissue, bath tissue, paper towel, wipe, or napkin.

DETAILED DESCRIPTION

In general, the present disclosure relates to a through-air dried tissue product comprising a tissue web that has been formed from wood and bamboo fibers. It has been discovered that by replacing some of the wood fibers with bamboo fibers that a bulkier and more durable web may be produced without sacrificing softness.

Table 1 compares hardwood (Eucalyptus pulp fiber, Aracruz Cellulose, Brazil) softwood (NSWK pulp fiber, Northern Pulp, Canada) and kraft pulps prepared from three

different bamboo species, *Phyllostachys edulis*, *Bambusa vulgaris* and *Phyllostachys nigra* variant *Henon*.

TABLE 1

Fiber Type	Average Fiber Length (mm)	Average Fiber Width (μm)	Fiber Length: Fiber Width	Coarseness (mg/100 m)
<i>Phyllostachys edulis</i>	1.23	8.4	146	10.53
<i>Bambusa vulgaris</i>	2.09	10.9	192	10.37
<i>Phyllostachys nigra</i> variant <i>Henon</i>	1.65	9.0	184	10.85
NSWK Pulp	2.18	27.6	79	14.83
Fiber Eucalyptus	0.76	19.1	40	8.95
Pulp Fiber				

For bamboo pulp fibers, the ratio of length to width (commonly referred to as the "aspect ratio") generally varies between about 150 and about 200, although both length and width vary amongst species. Generally average fiber lengths for bamboo pulp fibers range from about 2 mm for *B. vulgaris* to about 1.2 mm for *Phyllostachys edulis*. As shown in Table 1, bamboo pulp fibers are generally greater in length than Eucalyptus fibers, but shorter than NSWK fibers. However, bamboo pulp fibers tend to have greater aspect ratios and higher coarseness than Eucalyptus fibers. Additionally, bamboo pulp fibers tend to have relatively slender lumens and thick cell walls, yielding Runkel Ratios (ratio of twice the cell wall thickness to the diameter of the lumen) greater than 1. For example, the reported Runkel Ratios for *Phyllostachys nigra* variant *Henon* and *Bambusa vulgaris* are 2.17 and 3.20 respectively. Fibers having Runkel Ratios greater than 1 are commonly considered poor candidates for use in tissue because the thick cell walls produce stiff webs having poor tensile strength and low bulk.

Despite the tendency of bamboo pulp fibers to have relatively thicker cell walls, higher Runkel Ratios, higher aspect ratios and shorter average fiber lengths compared to softwood fibers it has now been surprisingly discovered that they may replace softwood fibers in a through-air dried tissue web without decreasing durability and bulk or increasing stiffness. Even more surprising is that substitution of bamboo fibers for softwood fibers actually increases bulk without negatively affecting durability and stiffness.

Accordingly, in a preferred embodiment the disclosure provides a tissue web and more preferably a through-air dried tissue web and still more preferably a multi-layered through-air dried web comprising bamboo, wherein the bamboo fibers comprise at least about 10 percent of the total weight of the web. In a particularly preferred embodiment, the tissue web comprises a multi-layered through-air dried web wherein bamboo fiber is selectively disposed in only one of the layers such that the bamboo fiber is not brought into contact with the user's skin in-use. For example, in one embodiment the tissue web may comprise a two layered web wherein the first layer consists essentially of wood fibers and is substantially free of bamboo fibers and the second layer comprises bamboo fibers, wherein the bamboo fibers comprises at least about 50 percent by weight of the second layer, such as from about 50 to about 100 percent by weight of the second layer. It should be understood that, when referring to a layer that is substantially free of bamboo fibers, negligible amounts of the fibers may be present therein, however, such small amounts often arise from the bamboo fibers applied to an adjacent layer, and do not typically substantially affect the softness or other physical characteristics of the web.

The tissue webs may be incorporated into tissue products that may be either single or multi-ply, where one or more of the plies may be formed by a multi-layered tissue web having bamboo fibers selectively incorporated in one of its layers. A particularly preferred embodiment tissue product is constructed such that the bamboo fibers are not brought into contact with the user's skin in-use. For example, the tissue product may comprise two multi-layered through-air dried webs wherein each web comprises a first fibrous layer substantially free from bamboo and a second fibrous layer comprising bamboo. The webs are plied together such that the outer surface of the tissue product is formed from the first fibrous layers of each web, such that the surface brought into contact with the user's skin in-use is substantially free of bamboo fibers.

Generally, the bamboo fibers incorporated in the webs of the present disclosure are fibrous materials derived from any bamboo species. The bamboo fiber species may be selected from the group consisting of *Acidosasa* sp., *Ampleocalamus* sp., *Arundinaria* sp., *Bambusa* sp., *Bashania* sp., *Borinda* sp., *Brachystachyum* sp., *Cephalostachyum* sp., *Chimonobambusa* sp., *Chusquea* sp., *Dendrocalamus* sp., *Dinoclao* sp., *Drepanostachyum* sp., *Eremitis* sp., *Fargesia* sp., *Gaoligongshania* sp., *Gelidocalamus* sp., *Gigantocloa* sp., *Guadua* sp., *Hibanobambusa* sp., *Himalayacalamus* sp., *Indocalamus* sp., *Indosasa* sp., *Lithachne* sp., *Melocanna* sp., *Menstrucalamus* sp., *Nastus* sp., *Neohouzeaua* sp., *Neomicrocalamus* sp., *Ochlandra* sp., *Oligostachyum* sp., *Olmea* sp., *Oatea* sp., *Oxytenanthera* sp., *Phyllostachys* sp., *Pleiblastus* sp., *Pseudosasa* sp., *Raddia* sp., *Rhipidocladum* sp., *Sasa* sp., *Sasaella* sp., *Sasamorpha* sp., *Schizostachyum* sp., *Semiardunaria* sp., *Shibatea* sp., *Sinobambusa* sp., *Thamnocalamus* sp., *Thyrsostachys* sp., *Yushania* sp. and mixtures thereof.

In some embodiments, the bamboo fiber is from temperate bamboos of the *Phyllostachys* species, for example *Phyllostachys heterocycla pubescens*, also known as Moso Bamboo. However, it is to be understood that the compositions disclosed herein are not limited to containing any one bamboo fiber and may comprise a plurality of fibers of different species. For example, the composition may comprise a bamboo from a *Phyllostachys heterocycla pubescens* and a bamboo from a different species such as, for example, *Phyllostachys bambusoides*.

Bamboo fiber for use in the webs and products of the present disclosure may be produced by any appropriate methods known in the art. Preferably the bamboo fibers are pulped bamboo fibers, produced by chemical processing of crushed bamboo stalk. The chemical processing may comprise treating the crushed bamboo stalk with an appropriate alkaline solution. The skilled artisan will be capable of selecting an appropriate alkaline solution. Bamboo fiber may also be produced by mechanical processing of crushed bamboo stalk, which may involve enzymatic digestion of the crushed bamboo stalk.

Although bamboo fiber may be produced by any appropriate methods known in the art, the preferred method for manufacturing the bamboo pulp is as a chemical pulping method such as, but not limited to, kraft, sulfite or soda/AQ pulping techniques.

Preferably the bamboo fibers are bamboo pulp fibers and have an average fiber length of at least about 1 mm. When blends of fibers from various bamboo species are employed, it is noted that blends may comprise two or more species of bamboo, preferably three or more, such that the average fiber length is at least about 1.2 mm and more preferably at least about 1.5 mm, such as from about 1.2 to about 2 mm.

Regardless of the species or particular average fiber length, at least one layer of a multi-layered web comprises bamboo fiber. The multi-layered web may also contain wood fibers and may be layered such that one layer comprises wood fibers, which optionally is substantially free from bamboo fibers, while another layer comprises wood and bamboo fibers. The wood fibers may include fibers formed by a variety of pulping processes, such as kraft pulp, sulfite pulp, thermo-mechanical pulp, and the like. Further, the wood fibers may be any high-average fiber length wood pulp, low-average fiber length wood pulp, or mixtures of the same. One example of suitable high-average length wood pulp fibers include softwood fibers such as, but not limited to, northern softwood, southern softwood, redwood, red cedar, hemlock, pine (e.g., southern pines), spruce (e.g., black spruce), combinations thereof, and the like. One example of suitable low-average length wood pulp fibers include hardwood fibers, such as, but not limited to, eucalyptus, maple, birch, aspen, and the like. In certain instances, eucalyptus fibers may be particularly desired to increase the softness of the web. Eucalyptus fibers can also enhance the brightness, increase the opacity, and change the pore structure of the web to increase its wicking ability. Moreover, if desired, secondary fibers obtained from recycled materials may be used, such as fiber pulp from sources such as, for example, newsprint, reclaimed paper-board, and office waste.

In a particularly preferred embodiment bamboo fibers are utilized in the tissue web as a replacement for high average fiber length wood fibers such as softwood fibers and more specifically NSWK. In one particular embodiment, the bamboo fibers are derived from *Phyllostachys pubescens* and replace NSWK such that the total amount of NSWK, by weight of the web, is less than about 10 percent. In other embodiments it may be desirable to replace all of the wood fiber in a given layer such that the layer consists essentially of bamboo fiber.

In certain embodiments it may be desirable to have particular combinations of bamboo and wood pulp fibers within a given layer to provide desired characteristics. For example, it may be desirable to combine bamboo and wood fibers having different average fiber lengths, coarseness, cell wall thickness, or other characteristics, in certain layers.

Just as the amount of bamboo within any given layer may be varied, the ratio of bamboo fibers to total fiber in the web may generally vary depending on the desired properties of the tissue product. For instance, the use of a thicker bamboo layer typically results in a tissue product with higher durability but lower softness. Additionally, the use of a large amount of bamboo fibers may negatively impact sheet formation and may increase the cost of manufacture. Likewise, the use of very low amounts of bamboo fibers, i.e., less than about 10 percent of the total weight of the web, typically results in a tissue product having little discernable difference compared to tissue products manufactured without bamboo. Thus, in certain embodiments, tissue webs prepared according to the present disclosure comprise bamboo fibers in an amount from about 10 to about 80 percent by weight of the web, preferably from about 15 to about 60 percent and more preferably from about 25 to about 50 percent.

As noted previously, in a preferred embodiment bamboo fibers are introduced to the web as a replacement for softwood fibers, accordingly in such preferred embodiments the amount of softwood fibers in the web may range from about 0 to about 20 percent by weight of the total web, more preferably from 0 to about 10 percent and most preferably less than about 5 percent by weight of the total web. In one

preferred embodiment the amount of softwood fiber in the web is less than 1 percent by weight of the total web.

In addition to varying the amount of bamboo within the web, as well as the amount in any given layer, the physical properties of the web may be varied by specifically selecting particular layer(s) for incorporation of the bamboo fibers. It has now been discovered that the greatest increase in softness without adverse effects on tensile strength or other sheet properties is achieved by selectively incorporating the bamboo fibers in a multi-layered web such that the layer comprising bamboo is not brought into contact with the user's skin in-use. Further, if desired, the increase in cost often encountered with bamboo fibers can be reduced by restricting application of the bamboo fibers to only a single layer of the web. For instance, in one embodiment, a three-layered tissue web can be formed in which only the middle layer contains bamboo fibers, while the outer layers are substantially free of bamboo fibers.

Accordingly, in a preferred embodiment the tissue web is a multi-layered web comprising a first fibrous layer and a second fibrous layer, wherein the first fibrous layer comprises wood fibers and the second fibrous layer comprises bamboo fibers, wherein the amount of bamboo fibers is from about 50 to about 100 percent by weight of the second layer. In certain embodiments the second fibrous layer may comprise a blend of wood and bamboo fibers, and more preferably a blend of bamboo and softwood fibers wherein the amount of bamboo fibers is from about 50 to about 90 percent by weight of the second layer and still more preferably from about 80 to about 95 percent by weight of the second layer. In a particularly preferred embodiment the first fibrous layer comprises hardwood fiber.

In other embodiments the present disclosure provides a two-ply tissue product. In a particularly preferred embodiment, the tissue product contains an upper multi-layered tissue web and a lower multi-layered tissue web that are plied together using well-known techniques. The multi-layered webs comprise at least a first and a second layer, wherein bamboo fibers are selectively incorporated in only one of the layers, such that when the webs are plied together the layers containing the bamboo fibers are not brought into contact with the user's skin in-use. For example, the two-ply tissue product may comprise a first and second tissue web, wherein the tissue webs each comprise a first and second layer. The first layer of each tissue web comprises wood fibers and is substantially free of bamboo fibers, while the second layer of each tissue web comprises bamboo fibers. When the tissue webs are plied together to form the tissue product the second layers of each web are arranged in a facing relationship such that the bamboo fibers are not brought into contact with the user's skin in-use.

If desired, various chemical compositions may be applied to one or more layers of the multi-layered tissue web to further enhance softness and/or reduce the generation of lint or slough. For example, in some embodiments, a wet strength agent can be utilized, to further increase the strength of the tissue product. As used herein, a "wet strength agent" is any material that, when added to pulp fibers can provide a resulting web or sheet with a wet geometric tensile strength to dry geometric tensile strength ratio in excess of about 0.1. Typically these materials are termed either "permanent" wet strength agents or "temporary" wet strength agents. As is well known in the art, temporary and permanent wet strength agents may also sometimes function as dry strength agents to enhance the strength of the tissue product when dry.

Wet strength agents may be applied in various amounts, depending on the desired characteristics of the web. For

instance, in some embodiments, the total amount of wet strength agents added can be between about 1 to about 60 pound per ton (lb/T), in some embodiments, between about 5 to about 30 lb/T, and in some embodiments, between about 7 to about 13 lb/T of the dry weight of fibrous material. The wet strength agents can be incorporated into any layer of the multi-layered tissue web.

A chemical debonder can also be applied to soften the web. Specifically, a chemical debonder can reduce the amount of hydrogen bonds within one or more layers of the web, which results in a softer product. Depending on the desired characteristics of the resulting tissue product, the debonder can be utilized in varying amounts. For example, in some embodiments, the debonder can be applied in an amount between about 1 to about 30 lb/T, in some embodiments between about 3 to about 20 lb/T, and in some embodiments, between about 6 to about 15 lb/T of the dry weight of fibrous material. The debonder can be incorporated into any layer of the multi-layered tissue web.

Any material capable of enhancing the soft feel of a web by disrupting hydrogen bonding can generally be used as a debonder in the present invention. In particular, as stated above, it is typically desired that the debonder possess a cationic charge for forming an electrostatic bond with anionic groups present on the pulp. Some examples of suitable cationic debonders can include, but are not limited to, quaternary ammonium compounds, imidazolium compounds, bis-imidazolium compounds, diquaternary ammonium compounds, polyquaternary ammonium compounds, ester-functional quaternary ammonium compounds (e.g., quaternized fatty acid trialkanolamine ester salts), phospholipid derivatives, polydimethylsiloxanes and related cationic and non-ionic silicone compounds, fatty and carboxylic acid derivatives, mono and polysaccharide derivatives, polyhydroxy hydrocarbons, etc. For instance, some suitable debonders are described in U.S. Pat. Nos. 5,716,498, 5,730,839, 6,211,139, 5,543,067, and WO/0021918, all which are incorporated herein in a manner consistent with the present disclosure.

Still other suitable debonders are disclosed in U.S. Pat. Nos. 5,529,665 and 5,558,873, both of which are incorporated herein in a manner consistent with the present disclosure. In particular, U.S. Pat. No. 5,529,665 discloses the use of various cationic silicone compositions as softening agents.

Tissue webs of the present disclosure can generally be formed by any of a variety of papermaking processes known in the art. Preferably the tissue web is formed by through-air drying and be either creped or uncreped. For example, a papermaking process of the present disclosure can utilize adhesive creping, wet creping, double creping, embossing, wet-pressing, air pressing, through-air drying, creped through-air drying, uncreped through-air drying, as well as other steps in forming the paper web. Some examples of such techniques are disclosed in U.S. Pat. Nos. 5,048,589, 5,399,412, 5,129,988 and 5,494,554 all of which are incorporated herein in a manner consistent with the present disclosure. When forming multi-ply tissue products, the separate plies can be made from the same process or from different processes as desired.

For example, in one embodiment, tissue webs may be creped through-air dried webs formed using processes known in the art. To form such webs, an endless traveling forming fabric, suitably supported and driven by rolls, receives the layered papermaking stock issuing from headbox. A vacuum box is disposed beneath the forming fabric and is adapted to remove water from the fiber furnish to assist in forming a web. From the forming fabric, a formed web is transferred to a second fabric, which may be either a wire or a felt. The fabric

is supported for movement around a continuous path by a plurality of guide rolls. A pick up roll designed to facilitate transfer of web from fabric to fabric may be included to transfer the web.

Preferably the formed web is dried by transfer to the surface of a rotatable heated dryer drum, such as a Yankee dryer. The web may be transferred to the Yankee directly from the throughdrying fabric, or preferably, transferred to an impression fabric which is then used to transfer the web to the Yankee dryer. In accordance with the present disclosure, the creping composition of the present disclosure may be applied topically to the tissue web while the web is traveling on the fabric or may be applied to the surface of the dryer drum for transfer onto one side of the tissue web. In this manner, the creping composition is used to adhere the tissue web to the dryer drum. In this embodiment, as the web is carried through a portion of the rotational path of the dryer surface, heat is imparted to the web causing most of the moisture contained within the web to be evaporated. The web is then removed from the dryer drum by a creping blade. The creping web as it is formed further reduces internal bonding within the web and increases softness. Applying the creping composition to the web during creping, on the other hand, may increase the strength of the web.

In another embodiment the formed web is transferred to the surface of the rotatable heated dryer drum, which may be a Yankee dryer. The press roll may, in one embodiment, comprise a suction pressure roll. In order to adhere the web to the surface of the dryer drum, a creping adhesive may be applied to the surface of the dryer drum by a spraying device. The spraying device may emit a creping composition made in accordance with the present disclosure or may emit a conventional creping adhesive. The web is adhered to the surface of the dryer drum and then creped from the drum using the creping blade. If desired, the dryer drum may be associated with a hood. The hood may be used to force air against or through the web.

In other embodiments, once creped from the dryer drum, the web may be adhered to a second dryer drum. The second dryer drum may comprise, for instance, a heated drum surrounded by a hood. The drum may be heated from about 25 to about 200° C., such as from about 100 to about 150° C.

In order to adhere the web to the second dryer drum, a second spray device may emit an adhesive onto the surface of the dryer drum. In accordance with the present disclosure, for instance, the second spray device may emit a creping composition as described above. The creping composition not only assists in adhering the tissue web to the dryer drum, but also is transferred to the surface of the web as the web is creped from the dryer drum by the creping blade.

Once creped from the second dryer drum, the web may, optionally, be fed around a cooling reel drum and cooled prior to being wound on a reel.

For example, once a fibrous web is formed and dried, in one aspect, the creping composition may be applied to at least one side of the web and the at least one side of the web may then be creped. In general, the creping composition may be applied to only one side of the web and only one side of the web may be creped, the creping composition may be applied to both sides of the web and only one side of the web is creped, or the creping composition may be applied to each side of the web and each side of the web may be creped.

Once creped the tissue web may be pulled through a drying station. The drying station can include any form of a heating unit, such as an oven energized by infra-red heat, microwave energy, hot air or the like. A drying station may be necessary in some applications to dry the web and/or cure the creping

composition. Depending upon the creping composition selected, however, in other applications a drying station may not be needed.

In other embodiments, the base web is formed by an uncreped through-air drying process. Referring to FIG. 1, a process of carrying out using the present disclosure will be described in greater detail. The process shown depicts an uncreped throughdried process, but it will be recognized that any known papermaking method or tissue making method can be used in conjunction with the nonwoven tissue making fabrics of the present disclosure. Related uncreped through-air dried tissue processes are described for example, in U.S. Pat. Nos. 5,656,132 and 6,017,417, both of which are hereby incorporated by reference herein in a manner consistent with the present disclosure.

In FIG. 1, a twin wire former having a papermaking head-box 10 injects or deposits a furnish of an aqueous suspension of papermaking fibers onto a plurality of forming fabrics, such as the outer forming fabric 5 and the inner forming fabric 3, thereby forming a wet tissue web 6. The forming process of the present disclosure may be any conventional forming process known in the papermaking industry. Such formation processes include, but are not limited to, Fourdriniers, roof formers such as suction breast roll formers, and gap formers such as twin wire formers and crescent formers.

The wet tissue web 6 forms on the inner forming fabric 3 as the inner forming fabric 3 revolves about a forming roll 4. The inner forming fabric 3 serves to support and carry the newly-formed wet tissue web 6 downstream in the process as the wet tissue web 6 is partially dewatered to a consistency of about 10 percent based on the dry weight of the fibers. Additional dewatering of the wet tissue web 6 may be carried out by known paper making techniques, such as vacuum suction boxes, while the inner forming fabric 3 supports the wet tissue web 6. The wet tissue web 6 may be additionally dewatered to a consistency of at least about 20 percent, more specifically between about 20 to about 40 percent, and more specifically about 20 to about 30 percent.

The forming fabric 3 can generally be made from any suitable porous material, such as metal wires or polymeric filaments. For instance, some suitable fabrics can include, but are not limited to, Albany 84M and 94M available from Albany International (Albany, N.Y.) Asten 856, 866, 867, 892, 934, 939, 959, or 937; Asten Synweve Design 274, all of which are available from Asten Forming Fabrics, Inc. (Appleton, Wis.); and Voith 2164 available from Voith Fabrics (Appleton, Wis.). Forming fabrics or felts comprising nonwoven base layers may also be useful, including those of Scapa Corporation made with extruded polyurethane foam such as the Spectra Series.

The wet web 6 is then transferred from the forming fabric 3 to a transfer fabric 8 while at a solids consistency of between about 10 to about 35 percent, and particularly, between about 20 to about 30 percent. As used herein, a "transfer fabric" is a fabric that is positioned between the forming section and the drying section of the web manufacturing process.

Transfer to the transfer fabric 8 may be carried out with the assistance of positive and/or negative pressure. For example, in one embodiment, a vacuum shoe 9 can apply negative pressure such that the forming fabric 3 and the transfer fabric 8 simultaneously converge and diverge at the leading edge of the vacuum slot. Typically, the vacuum shoe 9 supplies pressure at levels between about 10 to about 25 inches of mercury. As stated above, the vacuum transfer shoe 9 (negative pressure) can be supplemented or replaced by the use of positive pressure from the opposite side of the web to blow the web onto the next fabric. In some embodiments, other vacuum

shoes can also be used to assist in drawing the fibrous web 6 onto the surface of the transfer fabric 8.

Typically, the transfer fabric 8 travels at a slower speed than the forming fabric 3 to enhance the MD and CD stretch of the web, which generally refers to the stretch of a web in its cross (CD) or machine direction (MD) (expressed as percent elongation at sample failure). For example, the relative speed difference between the two fabrics can be from about 1 to about 30 percent, in some embodiments from about 5 to about 20 percent, and in some embodiments, from about 10 to about 15 percent. This is commonly referred to as "rush transfer". During "rush transfer", many of the bonds of the web are believed to be broken, thereby forcing the sheet to bend and fold into the depressions on the surface of the transfer fabric 8. Such molding to the contours of the surface of the transfer fabric 8 may increase the MD and CD stretch of the web. Rush transfer from one fabric to another can follow the principles taught in any one of the following U.S. Pat. Nos. 5,667,636, 5,830,321, 4,440,597, 4,551,199, 4,849,054, all of which are hereby incorporated by reference herein in a manner consistent with the present disclosure.

The wet tissue web 6 is then transferred from the transfer fabric 8 to a throughdrying fabric 11. Typically, the transfer fabric 8 travels at approximately the same speed as the throughdrying fabric 11. However, it has now been discovered that a second rush transfer may be performed as the web is transferred from the transfer fabric 8 to a throughdrying fabric 11. This rush transfer is referred to herein as occurring at the second position and is achieved by operating the throughdrying fabric 11 at a slower speed than the transfer fabric 8. By performing rush transfer at two distinct locations, i.e., the first and the second positions, a tissue product having increased CD stretch may be produced.

In addition to rush transferring the wet tissue web from the transfer fabric 8 to the throughdrying fabric 11, the wet tissue web 6 may be macroscopically rearranged to conform to the surface of the throughdrying fabric 11 with the aid of a vacuum transfer roll 12 or a vacuum transfer shoe like the vacuum shoe 9. If desired, the throughdrying fabric 11 can be run at a speed slower than the speed of the transfer fabric 8 to further enhance MD stretch of the resulting absorbent tissue product. The transfer may be carried out with vacuum assistance to ensure conformation of the wet tissue web 6 to the topography of the throughdrying fabric 11.

While supported by the throughdrying fabric 11, the wet tissue web 6 is dried to a final consistency of about 94 percent or greater by a throughdryer 13. The web 15 then passes through the winding nip between the reel drum 22 and the reel 23 and is wound into a roll of tissue 25 for subsequent converting, such as slitting cutting, folding, and packaging.

The web is transferred to the throughdrying fabric for final drying preferably with the assistance of vacuum to ensure macroscopic rearrangement of the web to give the desired bulk and appearance. The use of separate transfer and throughdrying fabrics can offer various advantages since it allows the two fabrics to be designed specifically to address key product requirements independently. For example, the transfer fabrics are generally optimized to allow efficient conversion of high rush transfer levels to high MD stretch while throughdrying fabrics are designed to deliver bulk and CD stretch. It is therefore useful to have moderately coarse and moderately three-dimensional transfer fabrics and throughdrying fabrics which are quite coarse and three dimensional in the optimized configuration. The result is that a relatively smooth sheet leaves the transfer section and then is macroscopically rearranged (with vacuum assist) to give the high bulk, high CD stretch surface topology of the

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throughdrying fabric. Sheet topology is completely changed from transfer to throughdrying fabric and fibers are macroscopically rearranged, including significant fiber-fiber movement.

The drying process can be any noncompressive drying method which tends to preserve the bulk or thickness of the wet web including, without limitation, throughdrying, infrared radiation, microwave drying, etc. Because of its commercial availability and practicality, throughdrying is well known and is one commonly used means for noncompressively drying the web for purposes of this invention. Suitable throughdrying fabrics include, without limitation, fabrics with substantially continuous machine direction ridges whereby the ridges are made up of multiple warp strands grouped together, such as those disclosed in U.S. Pat. No. 6,998,024. Other suitable throughdrying fabrics include those disclosed in U.S. Pat. No. 7,611,607, which is incorporated herein in a manner consistent with the present disclosure, particularly the fabrics denoted as Fred (t1207-77), Jeston (t1207-6) and Jack (t1207-

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By combining bamboo fibers in a tissue web in this manner, the disclosure provides tissue webs having surprising characteristics. For example, through-air dried tissue webs comprising bamboo have improved bulk, without a loss of durability or softness. Table 2 below shows a comparison of through-air dried and conventional wet pressed control webs comprising hardwood and softwood fibers with comparable webs wherein the softwood fiber has been replaced with either bamboo or hardwood Eucalyptus fiber, respectively. As shown in Table 2, the addition of bamboo to the web results in an increase in sheet bulk without negatively effecting durability or softness. However, this effect is only observed for through-air dried tissue webs. When the web is manufactured using conventional wet pressed techniques the bulk actually decreases, while durability and softness are negatively affected. Similarly, replacement of the softwood fiber with hardwood fiber, while resulting in an increase in bulk, causes a decrease in both durability and softness.

TABLE 2

	Bamboo			Eucalyptus		
	Delta Bulk	Delta Durability Index	Delta Stiffness Index	Delta Bulk	Delta Durability Index	Delta Stiffness Index
Control						
TAD Web	7.7%	-0.8%	12.7%	7.9%	-14.8%	30.1%
CWP Web	-10.9%	-20.6%	31.4%	-7.0%	-30.5%	30.3%

12). The web is preferably dried to final dryness on the throughdrying fabric, without being pressed against the surface of a Yankee dryer, and without subsequent creping.

Once the wet tissue web 6 has been non-compressively dried, thereby forming the dried tissue web 15, it is possible to crepe the dried tissue web 15 by transferring the dried tissue web 15 to a Yankee dryer prior to reeling, or using alternative foreshortening methods such as microcreping as disclosed in U.S. Pat. No. 4,919,877.

In the wound product, it is often advantageous to wind the product with the softest side facing the consumer, and hence the shearing process to increase the softness of this side is preferred. However, it is also possible to treat the air side of the web rather than the fabric side, and in these embodiments, it would be possible to increase the air-side softness to a level higher than that of the fabric side.

The process of the present disclosure is well suited to forming multi-ply tissue products. The multi-ply tissue products can contain two plies, three plies, or a greater number of plies. In one particular embodiment, a two-ply rolled tissue product is formed according to the present disclosure in which both plies are manufactured using the same papermaking process, such as, for example, uncreped through-air dried. However, in other embodiments, the plies may be formed by two different processes. Generally, prior to being wound in a roll, the first ply and the second ply are attached together. Any suitable manner for laminating the webs together may be used. For example, the process includes a crimping device that causes the plies to mechanically attach together through fiber entanglement. In an alternative embodiment, however, an adhesive may be used in order to attach the plies together.

Additionally, webs prepared according to the present disclosure may be subjected to any suitable post processing including, but not limited to, printing, embossing, calendaring, slitting, folding, combining with other fibrous structures, and the like.

TEST METHODS

Sheet Bulk

Sheet Bulk is calculated as the quotient of the dry sheet caliper expressed in microns, divided by the dry basis weight, expressed in grams per square meter. The resulting Sheet Bulk is expressed in cubic centimeters per gram. More specifically, the Sheet Bulk is the representative thickness of a single tissue sheet measured in accordance with TAPPI test methods T402 "Standard Conditioning and Testing Atmosphere For Paper, Board, Pulp Handsheets and Related Products" and T411 om-89 "Thickness (caliper) of Paper, Paperboard, and Combined Board." The micrometer used for carrying out T411 om-89 is an Emveco 200-A Tissue Caliper Tester (Emveco, Inc., Newberg, Oreg.). The micrometer has a load of 2 kilo-Pascals, a pressure foot area of 2500 square millimeters, a pressure foot diameter of 56.42 millimeters, a dwell time of 3 seconds and a lowering rate of 0.8 millimeters per second.

Tear

Tear testing was carried out in accordance with TAPPI test method T-414 "Internal Tearing Resistance of Paper (Elmendorf-type method)" using a falling pendulum instrument such as Lorentzen & Wettre Model SE 009. Tear strength is directional and MD and CD tear are measured independently.

More particularly, a rectangular test specimen of the sample to be tested is cut out of the tissue product or tissue basesheet such that the test specimen measures 63 mm±0.15 mm (2.5 inches±0.006") in the direction to be tested (such as the MD or CD direction) and between 73 and 114 millimeters (2.9 and 4.6 inches) in the other direction. The specimen edges must be cut parallel and perpendicular to the testing direction (not skewed). Any suitable cutting device, capable of the proscribed precision and accuracy, can be used. The test specimen should be taken from areas of the sample that are

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free of folds, wrinkles, crimp lines, perforations or any other distortions that would make the test specimen abnormal from the rest of the material.

The number of plies or sheets to test is determined based on the number of plies or sheets required for the test results to fall between 20 to 80 percent on the linear range scale of the tear tester and more preferably between 20 to 60 percent of the linear range scale of the tear tester. The sample preferably should be cut no closer than 6 mm (0.25 inch) from the edge of the material from which the specimens will be cut. When testing requires more than one sheet or ply the sheets are placed facing in the same direction.

The test specimen is then placed between the clamps of the falling pendulum apparatus with the edge of the specimen aligned with the front edge of the clamp. The clamps are closed and a 20-millimeter slit is cut into the leading edge of the specimen usually by a cutting knife attached to the instrument. For example, on the Lorentzen & Wettre Model SE 009 the slit is created by pushing down on the cutting knife lever until it reaches its stop. The slit should be clean with no tears or nicks as this slit will serve to start the tear during the subsequent test.

The pendulum is released and the tear value, which is the force required to completely tear the test specimen, is recorded. The test is repeated a total of ten times for each sample and the average of the ten readings reported as the tear strength. Tear strength is reported in units of grams of force (gf). The average tear value is the tear strength for the direction (MD or CD) tested. The "geometric mean tear strength" is the square root of the product of the average MD tear strength and the average CD tear strength. The Lorentzen & Wettre Model SE 009 has a setting for the number of plies tested. Some testers may need to have the reported tear strength multiplied by a factor to give a per ply tear strength. For basesheets intended to be multiple ply products, the test results are reported as the tear of the multiple ply product and not the single ply basesheet. This is done by multiplying the single ply basesheet tear value by the number of plies in the finished product. Similarly, multiple ply finished product data for tear is presented as the tear strength for the finished product sheet and not the individual plies. A variety of means can be used to calculate but in general will be done by inputting the number of sheets to be tested rather than number of plies to be tested into the measuring device. For example, two sheets would be two 1-ply sheets for 1-ply product and two 2-ply sheets (4-ply) for 2-ply products.

Tensile

Tensile testing was done in accordance with TAPPI test method T-576 "Tensile properties of towel and tissue products (using constant rate of elongation)" wherein the testing is conducted on a tensile testing machine maintaining a constant rate of elongation and the width of each specimen tested is 3 inches. More specifically, samples for dry tensile strength testing were prepared by cutting a 3 inches $\pm$ 0.05" (76.2 mm $\pm$ 1.3 mm) wide strip in either the machine direction (MD) or cross-machine direction (CD) orientation using a JDC Precision Sample Cutter (Thwing-Albert Instrument Company, Philadelphia, Pa., Model No. JDC 3-10, Serial No. 37333) or equivalent. The instrument used for measuring tensile strengths was an MTS Systems Sintech 11S, Serial No. 6233. The data acquisition software was an MTS TestWorks® for Windows Ver. 3.10 (MTS Systems Corp., Research Triangle Park, N.C.). The load cell was selected from either a 50 Newton or 100 Newton maximum, depending on the strength of the sample being tested, such that the majority of peak load values fall between 10 to 90 percent of the load cell's full scale value. The gauge length between jaws

was 4 $\pm$ 0.04 inches (101.6 $\pm$ 1 mm) for facial tissue and towels and 2 $\pm$ 0.02 inches (50.8 $\pm$ 0.5 mm) for bath tissue. The cross-head speed was 10 $\pm$ 0.4 inches/min (254 $\pm$ 1 mm/min), and the break sensitivity was set at 65 percent. The sample was placed in the jaws of the instrument, centered both vertically and horizontally. The test was then started and ended when the specimen broke. The peak load was recorded as either the "MD tensile strength" or the "CD tensile strength" of the specimen depending on direction of the sample being tested. Ten representative specimens were tested for each product or sheet and the arithmetic average of all individual specimen tests was recorded as the appropriate MD or CD tensile strength the product or sheet in units of grams of force per 3 inches of sample. The geometric mean tensile (GMT) strength was calculated and is expressed as grams-force per 3 inches of sample width. Tensile energy absorbed (TEA) and slope are also calculated by the tensile tester. TEA is reported in units of gm cm/cm². Slope is recorded in units of kg. Both TEA and Slope are directional dependent and thus MD and CD directions are measured independently. Geometric mean TEA and geometric mean slope are defined as the square root of the product of the representative MD and CD values for the given property.

Multi-ply products were tested as multi-ply products and results represent the tensile strength of the total product. For example, a 2-ply product was tested as a 2-ply product and recorded as such. A basesheet intended to be used for a two ply product was tested as two plies and the tensile recorded as such. Alternatively, a single ply may be tested and the result multiplied by the number of plies in the final product to get the tensile strength.

Burst Strength

Burst strength herein is a measure of the ability of a fibrous structure to absorb energy, when subjected to deformation normal to the plane of the fibrous structure. Burst strength may be measured in general accordance with ASTM D-6548 with the exception that the testing is done on a Constant-Rate-of-Extension (MTS Systems Corporation, Eden Prairie, Minn.) tensile tester with a computer-based data acquisition and frame control system, where the load cell is positioned above the specimen clamp such that the penetration member is lowered into the test specimen causing it to rupture. The arrangement of the load cell and the specimen is opposite that illustrated in FIG. 1 of ASTM D-6548. The penetration assembly consists of a semi spherical anodized aluminum penetration member having a diameter of 1.588 $\pm$ 0.005 cm affixed to an adjustable rod having a ball end socket. The test specimen is secured in a specimen clamp consisting of upper and lower concentric rings of aluminum between which the sample is held firmly by mechanical clamping during testing. The specimen clamping rings has an internal diameter of 8.89 $\pm$ 0.03 cm.

The tensile tester is set up such that the crosshead speed is 15.2 cm/min, the probe separation is 104 mm, the break sensitivity is 60 percent and the slack compensation is 10 gf and the instrument is calibrated according to the manufacturer's instructions.

Samples are conditioned under TAPPI conditions and cut into 127 $\times$ 127 mm $\pm$ 5 mm squares. For each test a total of 3 sheets of product are combined. The sheets are stacked on top of one another in a manner such that the machine direction of the sheets is aligned. Where samples comprise multiple plies, the plies are not separated for testing. In each instance the test sample comprises 3 sheets of product. For example, if the product is a 2-ply tissue product, 3 sheets of product, totaling 6 plies are tested. If the product is a single ply tissue product, then 3 sheets of product totaling 3 plies are tested.

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Prior to testing the height of the probe is adjusted as necessary by inserting the burst fixture into the bottom of the tensile tester and lowering the probe until it was positioned approximately 12.7 mm above the alignment plate. The length of the probe is then adjusted until it rests in the recessed area of the alignment plate when lowered.

It is recommended to use a load cell in which the majority of the peak load results fall between 10 and 90% of the capacity of the load cell. To determine the most appropriate load cell for testing, samples are initially tested to determine peak load. If peak load is <450 gf a 10 Newton load cell is used, if peak load is >450 gf a 50 Newton load cell is used.

Once the apparatus is set-up and a load cell selected, samples are tested by inserting the sample into the specimen clamp and clamping the test sample in place. The test sequence is then activated, causing the penetration assembly to be lowered at the rate and distance specified above. Upon rupture of the test specimen by the penetration assembly the measured resistance to penetration force is displayed and recorded. The specimen clamp is then released to remove the sample and ready the apparatus for the next test.

The peak load (gf) and energy to peak (g-cm) are recorded and the process repeated for all remaining specimens. A minimum of five specimens are tested per sample and the peak load average of five tests is reported as the Dry Burst Strength.

EXAMPLES

Example 1

Conventional Wet Pressed Tissue Comprising Bamboo

Sample codes were made using a wet pressed process utilizing a Crescent Former. Accordingly, single ply bath and two ply facial tissue products were produced and tested according to the same tests described in the Test Methods section. The following tissue manufacturing process was used to produce the sample codes.

Initially, northern softwood kraft ("NSWK") pulp was dispersed in a pulper for 30 minutes at 3 percent consistency at about 100° F. In certain instances, as indicated in the tables below, NSWK pulp was refined at 1.5 to 5.0 hp-days/metric ton. The NSWK pulp was then transferred to a dump chest and subsequently diluted to approximately 0.75 percent consistency. Once diluted, in certain instances Kymene® 920A and/or Hercobond® 1366 (both available from Ashland, Covington, Ky.) was added to the NSWK. When utilized in a multi-layered tissue web, NSWK fibers were added to the middle layer of the 3-layered tissue web.

Aracruz ECF, a eucalyptus hardwood kraft ("EHWK") pulp (Aracruz, Rio de Janeiro, RJ, Brazil) was dispersed in a pulper for 30 minutes at about 3 percent consistency at about 100° F. The EHWK pulp was then transferred to a dump chest and subsequently diluted to about 0.75 percent consistency. The EHWK pulp fibers were used in the two outer layers of the 3-layered tissue structure.

Commercial bleached bamboo pulps were obtained from Guizhou Chitianhua Paper Co., Ltd., Guizhou, China (herein after "Chinese Bamboo") and Phoenix Pulp and Paper PCL, Khon-Kaen, Thailand (hereinafter "That Bamboo"). The Chinese Bamboo was a mixture of 3 species of tropical bamboo *Neosinocalamus affinis*, *Bambusa rigida*, and *Bambusa pervariabilis* × *Dendrocalamopsis Daii*. The Chinese Bamboo was pulped by a TCF sulfate process. The That Bamboo was an ECF Bleached Kraft pulp consisting of a mixture of four

tropical bamboo species: *Bambusa Bluemeana*, *Bambusa Tulda*, *Bambusa Nana* and *Dendrocalamus Asper*.

Moso Bamboo pulp fibers were prepared from chipped green Moso bamboo poles by a Kraft pulp process using Na₂S and NaOH for digestion followed by oxygen delignification and bleaching with chlorine dioxide. After bleaching the pulp was dried to 30 to 50 percent consistency on a belt press to form a never dried crumb pulp. Never dried pulp was converted to dry lap pulp having a basis weight of around 250 g/m² by slurring 350 oven dried basis pounds of bamboo crumb pulp in 1400 gallons of water in a hydropulper at about 125° F. The slurry was pulped for about 20 minutes to give 3 percent consistency bamboo pulp slurry. The slurry was passed to a headbox and deposited on a Fourdiner forming belt moving at about 90 feet per minute and dewatered. Minimal pressing was done in the water removal process using only the roll weights in the wet press section of the machine. The dewatered pulp sheet was then passed over three stacks of calendar dryers, dried and rolled on 4-inch cores. Steam pressures in the calendar stacks were controlled to provide a dry lap pulp having between 6 and 8 percent moisture.

Bamboo or NSWK pulp fibers were dispersed in a pulper for 25 minutes at 3 percent consistency at about 100° F. In certain instances, as indicated in the tables below, the bamboo pulp was refined at 1.5 to 5.0 hp-days/metric ton. The bamboo or NSWK pulp was then transferred to a dump chest and subsequently diluted to approximately 0.75 percent consistency. Once diluted, in certain instances Kymene® 920A and/or Hercobond® 1366 were added to the NSWK. When utilized in a multi-layered tissue web, bamboo and NSWK fibers were added to the middle layer of the 3-layered tissue web.

Similarly Bleached Eucalyptus Hardwood Kraft pulp fibers obtained from Fibria, S.A., were dispersed in a pulper for 25 minutes at 3 percent consistency at 100° F. The Eucalyptus pulp slurry was then transferred to a dump chest and subsequently diluted to approximately 0.75 percent consistency. Once diluted, in certain instances Kymene® 920A, Hercobond® 1366, were added to the NSWK. When utilized in a multi-layered tissue web, bamboo and NSWK fibers were added to the middle layer of the 3-layered tissue web.

In certain instances the pulp fibers from the machine chests were pumped to the headbox at a consistency of about 0.1 percent. Pulp fibers from each machine chest were sent through separate manifolds in the headbox to create a 3-layered tissue structure. The flow rates of the stock pulp fiber slurries into the flow spreader were adjusted to give a target web basis. In those instances where a layer structure was produced, flow of stock pulp fiber slurries was controlled to provide a layer split of about 30 to about 35 percent by total weight of the tissue web EHWK fibers on both outer layers and 30 to about 40 percent NSWK or bamboo pulp fibers in the center layer. The fibers were deposited onto a felt in using a Crescent Former.

In other instances a blended web was produced by weighing out the appropriate amount of the first pulp fiber into the pulper and dispersing for 30 minutes at 3 percent consistency at about 100° F. In some instances the pulp was refined at 1.5 to 5.0 hp-days/metric ton. The first pulp slurry was then transferred equally to three dump chests. The amount of the second pulp fiber was then weighed into the pulper and dispersed and refined in similar fashion if so required. The second pulp slurry was then transferred equally to the three dump chests. The three dump chests now contained a blended mix of the fibers. The dump chests were subsequently diluted to approximately 0.75 percent consistency. Once diluted, in certain instances Kymene® 920A and/or Hercobond® 1366

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were added to the blended furnishes in the dump chests. The blended slurries were then diluted to approximately 0.1 percent consistency before being pumped to a 3-layer headbox such that all 3-layer splits were evenly distributed. Alternatively, when no refining was required, the pulps could be blended together in the pulper per the procedure proscribed and then the blended slurry transferred from the pulper to the machine chests.

The wet sheet, about 10 to 20 percent consistency, was adhered to a Yankee dryer, traveling at about 80 to 120 fpm through a nip via a pressure roll.

The consistency of the wet sheet after the pressure roll nip (post-pressure roll consistency or PPRC) was approximately 40 percent. A spray boom situated underneath the Yankee dryer sprayed a creping composition at a pressure of 60 psi at a rate of approximately 0.25 g solids/m² of product. The creping composition comprised 0.16 percent by weight of polyvinyl alcohol (PVOH), (Celvol™ 523 available from Celanese Chemicals, Calvert City, Ky.), 0.013 percent by weight PAE resin (Kymene™ 6500 available from Ashland, Covington, Ky.) and 0.0013 percent by weight of Resozol™ 2008 (Ashland, Covington, Ky.).

The sheet was dried to about 98 to 99 percent consistency as it traveled on the Yankee dryer and to the creping blade. The creping blade subsequently scraped the tissue sheet and a portion of the creping composition off the Yankee dryer. The creped tissue basesheet was then wound onto a core traveling at about 50 to about 100 fpm into soft rolls for converting.

To produce the 2-ply facial tissue products (Sample Nos. 1-4), two soft rolls of the creped tissue were then rewound, calendared, and plied together so that both creped sides were on the outside of the 2-ply structure. Mechanical crimping on the edges of the structure held the plies together. The plied sheet was then slit on the edges to a standard width of approximately 8.5 inches and folded, and cut to facial tissue length. Tissue samples were conditioned and tested.

Samples produced according to the present example are summarized in Table 3, below.

TABLE 3

Sample	Single Ply Basis Weight (gsm)	Web Structure	Plies	NSWK (wt %)	EHWK (wt %)	Bamboo (wt %)
1	15.1	Layered	2	30	70	0
2	15.1	Layered	2	40	60	0
3	15.1	Layered	2	0	70	30
4	15.1	Layered	2	0	60	40
5	16.7	Blended	1	40	60	0
6	16.7	Blended	1	40	60	0

TABLE 3-continued

Sample	Single Ply Basis Weight (gsm)	Web Structure	Plies	NSWK (wt %)	EHWK (wt %)	Bamboo (wt %)
7	16.7	Blended	1	0	100	0
8	16.7	Blended	1	0	100	0
9	16.7	Blended	1	0	60	40
10	16.7	Blended	1	0	60	40

Example 2

Uncreped Through-Air Dried Tissue Comprising Bamboo

A single ply through-air dried tissue web was made generally in accordance with U.S. Pat. No. 5,607,551, which is herein incorporated by reference in a manner consistent with the present disclosure.

More specifically, from about 60 to about 100 pounds (oven dry basis) of Aracruz ECF, a eucalyptus hardwood kraft ("EHWK") pulp (Aracruz, Rio de Janeiro, RJ, Brazil) was dispersed in a pulper at 100° F. for 25 minutes at a consistency of 3 percent before being transferred in equal parts to two machine chests and diluted to a consistency of 1 percent. When used, Hercobond 1366 was weighed out and diluted to a 1 percent actives solution with water prior to being added to the machine chest. The fiber slurry and chemical was allowed to mix for five minutes prior to the stock solution being sent to the headbox.

Forty pounds (oven dry basis) of northern softwood kraft fiber ("NSWK") (or bamboo pulp when used) were dispersed in a pulper at 100° F. for 25 minutes at a consistency of 3 percent before being transferred to a second machine chest and diluted to 1 percent consistency. The softwood fibers may be refined after pulping and prior to transfer to the machine chest as noted in examples.

To produce a layered tissue web, prior to forming each stock was further diluted to approximately 0.1 percent consistency and transferred to a 3-layer headbox in such a manner as to provide a layered sheet. The fiber composition of the layered sheets are described in the table below. Generally, the outer layers comprised EH WK and the inner layer comprised NSWK, bamboo fibers or a mixture of both.

Blended tissue webs were produced as described above.

The formed web was non-compressively dewatered and rush transferred to a transfer fabric traveling at a speed about 25 percent slower than the forming fabric. The web was then transferred to a throughdrying fabric and dried. Samples 11-15 were converted into rolled products to produce single ply bath tissue products. Samples were produced as described in Table 4, below.

TABLE 4

Sample	Basis Weight (gsm)	Web Structure	Basesheet or Finished Product	Plies	NSWK (wt %)	EHWK (wt %)	Bamboo (wt %)
11	27.1	Layered	Finished	1	35	65	0
12	27.1	Layered	Finished	1	25	65	10
13	27.1	Layered	Finished	1	10	65	25
14	27.1	Layered	Finished	1	0	65	35
15	27.1	NA	Finished	1	0	0	100
16	27.1	NA	Finished	1	0	100	0
17	36.5	NA	Basesheet	1	0	100	0
18	36.5	Layered	Basesheet	1	0	60	40
19	36.5	Layered	Basesheet	1	40	60	0
20	36.5	NA	Basesheet	1	0	100	0
21	36.5	Layered	Basesheet	1	0	50	50
22	36.5	Layered	Basesheet	1	0	60	40
23	36.5	Layered	Basesheet	1	40	60	0

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TABLE 4-continued

Sample	Basis Weight (gsm)	Web Structure	Basesheet or Finished Product	Plies	NSWK (wt %)	EHWK (wt %)	Bamboo (wt %)
24	36.5	Layered	Basesheet	1	40	60	0
25	36.5	Layered	Basesheet	1	0	60	40

Example 3

Uncreped Through-Air Dried Towels Comprising Bamboo

A single ply uncreped through-air dried (UCTAD) tissue web was made generally in accordance with U.S. Pat. No. 5,607,551.

More specifically, from about 50 to about 90 pounds (oven dry basis) of Aracruz ECF, a EHWK pulp (Aracruz, Rio de Janeiro, RJ, Brazil) was dispersed in a pulper for 25 minutes with from about 10 to about 50 pounds of bleached chemi-thermo mechanical pulp ("BCTMP") at a consistency of 3 percent before being transferred in equal parts to three machine chests and diluted to a consistency of 1 percent.

Forty pounds (oven dry basis) of NSWK pulp (or bamboo pulp when used) was dispersed in a pulper for 25 minutes at a consistency of 3 percent and refined at between 1 and 5 horsepower tons/day before being transferred in equal parts to the three machine chests containing the EHWK and BCTMP fibers. The machine chests were then diluted to a consistency of 1 percent. Kymene 920A was added to each machine chest at the rate of 1 percent dry actives to oven dried basis of total pulp. The stock solutions were then passed in equal amounts to a 3-layer headbox after dilution to 0.75 percent consistency to form a blended sheet.

The formed web was non-compressively dewatered and rush transferred to a transfer fabric traveling at a speed about 25 percent slower than the forming fabric. The web was then transferred to a throughdrying fabric, dried and calendered. Samples were produced as described in Table 5, below.

TABLE 5

Sample	Single Ply Basis Weight (gsm)	Web Structure	Plies	Bamboo (wt %)	NSWK (wt %)	EHWK (wt %)	BCTMP (wt %)
26	39.0	Blended	1	0	50	25	25
27	39.0	Blended	1	70	0	5	25

Web Strength and Bulk

The effect of bamboo on various tissue strength and durability properties was explored by preparing samples using several levels of bamboo. Table 6 summarizes the physical properties of basesheets prepared as described above. Table 7 summarizes the physical properties of finished produce prepared as described above.

TABLE 6

Sample	Single Ply Basis Weight (gsm)	Plies	Bamboo Total Web (wt %)	Bulk (cm ³ /g)	GMT (g/3")	TEA Index	CD TEA (g*cm/cm ²)
1	15.1	2	0	9.5	924	10.3	3.6
2	15.1	2	0	11.3	1235	10.2	4.9
3	15.1	2	30	9.0	1158	9.3	3.9
4	15.1	2	40	8.9	1116	10.1	4.8
5	16.7	1	0	9.7	1061	15.0	6.6
6	16.7	1	0	10.4	656	15.8	4.3
7	16.7	1	0	9.3	728	12.7	3.8
8	16.7	1	0	9.3	1024	12.4	5.2
9	16.7	1	40	9.1	1158	11.2	5.5
10	16.7	1	40	9.2	758	12.6	4.3
11	27.1	1	0	9.4	625	8.5	3.3
12	27.1	1	10	9.8	769	8.9	4.2
13	27.1	1	25	10.9	557	8.5	3.2
14	27.1	1	35	10.1	662	9.3	4.2
15	27.1	1	100	10.3	954	10.1	6.5
16	27.1	1	0	9.8	857	8.1	5.0
17	36.5	1	0	21.2	1160	11.2	8.8
18	36.5	1	40	21.9	1089	13.3	10.1
19	36.5	1	0	20.4	1051	12.0	8.9
20	36.5	1	0	22.1	1056	12.0	8.7
21	36.5	1	50	21.5	968	13.3	10.5
22	36.5	1	40	21.0	1167	13.6	13.7
23	36.5	1	0	19.8	1160	13.4	9.6
24	36.5	1	0	20.5	1248	14.7	11.3

TABLE 6-continued

Sample	Single Ply Basis Weight (gsm)	Plies	Bamboo Total Web (wt %)	Bulk (cm ³ /g)	GMT (g/3")	TEA Index	CD TEA (g*cm/cm ²)
25	36.5	1	40	22.0	1136	13.0	10.2
26	39.0	1	0	20.8	2738	10.9	17.7
27	39.0	1	70	22.6	1616	10.1	12.5

The relative change in bulk (Delta Bulk %), compared to a 10 control to an identical control containing NBSK in place of bamboo, is summarized in the table below.

TABLE 7

Sample	Basis Weight (gsm)	Web Structure	Plies	Method of Manufacture	Bamboo Total Web (wt %)	Bulk (cm ³ /g)	Delta Bulk (%)
3	15.1	Layered	2	CWP	30	9.0	-4.5%
4	15.1	Layered	2	CWP	40	8.9	-21.4%
9	16.7	Blended	1	CWP	40	9.1	-6.2%
10	16.7	Blended	1	CWP	40	9.2	-11.7%
12	27.1	Layered	1	UCTAD	10	9.8	3.5%
13	27.1	Layered	1	UCTAD	25	10.9	15.1%
14	27.1	Layered	1	UCTAD	35	10.1	7.1%
15	27.1	Blended	1	UCTAD	100	10.3	9.4%
18	36.5	Layered	1	UCTAD	40	21.9	7.6%
21	36.5	Layered	1	UCTAD	50	21.5	8.6%
22	36.5	Layered	1	UCTAD	40	21.0	5.9%
25	36.5	Layered	1	UCTAD	40	22.0	7.3%
27	39.0	Blended	1	UCTAD	70	22.6	8.7%

Web Softness and Durability

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The effect of bamboo on the durability (Durability Index) and softness (Stiffness Index) of the tissue web was explored by preparing samples using several levels of bamboo, the results of which are summarized below.

TABLE 8

Sample	Basis Weight (gsm)	Web Structure	Plies	Bamboo Total Web (wt %)	Tear Index	Stiffness Index	Durability Index
1	15.1	Layered	2	0	10.3	9.4	24.3
2	15.1	Layered	2	0	10.2	10.0	23.2
3	15.1	Layered	2	30	9.3	12.7	19.8
4	15.1	Layered	2	40	10.1	13.0	21.2
5	16.7	Blended	1	0	15.0	9.1	30.2
6	16.7	Blended	1	0	15.8	8.4	33.1
7	16.7	Blended	1	0	12.7	8.6	23.5
8	16.7	Blended	1	0	12.4	9.3	20.5
9	16.7	Blended	1	40	11.2	10.2	20.6
10	16.7	Blended	1	40	12.6	13.3	27.3
11	27.1	Layered	1	0	8.49	10.9	25.6
12	27.1	Layered	1	10	8.92	10.1	25.8
13	27.1	Layered	1	25	8.46	11.4	23.9
14	27.1	Layered	1	35	9.34	11.3	23.9
15	27.1	Blended	1	100	10.08	11.6	28
16	27.1	Blended	1	0	8.1	11.6	20.5
17	36.5	NA	1	0	11.2	6.0	27.1
18	36.5	Layered	1	40	13.3	5.3	33.5
19	36.5	Layered	1	0	12.0	4.9	31.9
20	36.5	NA	1	0	12.0	6.6	29.2
21	36.5	Layered	1	50	13.3	5.3	34.9
22	36.5	Layered	1	40	13.6	5.8	33.6
23	36.5	Layered	1	0	13.4	4.8	34.2
24	36.5	Layered	1	0	14.7	4.9	37.4
25	36.5	Layered	1	40	13.0	5.5	33.9
26	39.0	Blended	1	0	10.9	4.7	31.8
27	39.0	Blended	1	70	10.1	7.5	31.6

The relative change in the Durability Index and Stiffness Index, compared to an identical control containing NBSK in place of bamboo, is summarized in the table below.

TABLE 9

Sample	Single Ply Basis Weight (gsm)	Web Structure	Plies	Method of Manufacture	Bamboo Total Web (wt %)	Delta Durability Index (%)	Delta Stiffness Index (%)
3	15.1	Layered	2	CWP	30	-20.1%	32.6%
4	15.1	Layered	2	CWP	40	-12.9%	30.2%
9	16.7	Blended	1	CWP	40	-31.7%	31.6%
10	16.7	Blended	1	CWP	40	-17.6%	43.0%
12	27.1	Layered	1	UCTAD	10	0.6%	0.4%
13	27.1	Layered	1	UCTAD	25	-6.5%	-2.2%
14	27.1	Layered	1	UCTAD	35	-6.7%	10.4%
15	27.1	Blended	1	UCTAD	100	9.2%	9.9%
18	36.5	Layered	1	UCTAD	40	5.1%	7.1%
21	36.5	Layered	1	UCTAD	50	2.0%	11.1%
22	36.5	Layered	1	UCTAD	40	-1.6%	20.4%
25	36.5	Layered	1	UCTAD	40	-9.3%	12.2%
27	39.0	Blended	1	UCTAD	70	-0.4%	61.4%

While tissue webs and products comprising the same have been described in detail with respect to the specific embodiments thereof, it will be appreciated that those skilled in the art, upon attaining an understanding of the foregoing, may readily conceive of alterations to, variations of, and equivalents to these embodiments. Accordingly, the scope of the present invention should be assessed as that of the appended claims and any equivalents thereto.

I claim:

1. A layered through-air dried tissue web, the web comprising a first fibrous layer and a second fibrous layer, the first fibrous layer comprising wood fibers and the second layer comprising bamboo fibers, wherein the first fibrous layer is substantially free of bamboo fibers and wherein the bamboo fibers comprise at least about 10 percent of the total weight of the through-air dried web.

2. The layered through-air dried tissue web of claim 1 wherein the first fibrous layer consists essentially of hardwood fibers and the second fibrous layer comprises bamboo and softwood fibers, wherein the amount of softwood fiber in the second fibrous layer is less than about 10 percent by weight of the layer.

3. The layered through-air dried tissue web of claim 1 wherein the first fibrous layer comprises at least about 75 percent hardwood fibers by weight of the first fibrous layer and the second layer comprises at least about 50 percent bamboo fibers by weight of the second fibrous layer.

4. The layered through-air dried tissue web of claim 1 wherein the through-air dried web comprises less than about 10 percent softwood fibers by weight of the through-air dried web.

5. The layered through-air dried tissue web of claim 1 having a Durability Index greater than about 20.

6. The layered through-air dried tissue web of claim 1 having a Stiffness Index less than about 7.

7. The layered through-air dried tissue web of claim 1 having a Bulk greater than about 10 cubic centimeters per gram.

8. A tissue product comprising a first through-air dried tissue web, the web comprising a first fibrous layer and a second fibrous layer, the first fibrous layer comprising wood fibers and the second layer comprising bamboo fibers, wherein the first fibrous layer is substantially free of bamboo

fibers and wherein the bamboo fibers comprise at least about 10 percent of the total weight of the through-air dried web, the tissue product having a basis weight from about 10 to about 60 grams per square meter.

9. The tissue product of claim 8 further comprising a second tissue web plied to the first through-air dried tissue web.

10. The tissue product of claim 8 having a Durability Index greater than about 20.

11. The tissue product of claim 8 having a Stiffness Index less than about 13.

12. The tissue product of claim 8 having a Bulk greater than about 10 cubic centimeters per gram.

13. The tissue product of claim 8 wherein the web further comprises a third fibrous layer comprising wood fibers and substantially free of bamboo fibers.

14. The tissue product of claim 8 wherein the bamboo fibers comprise from about 20 to about 50 percent of the total weight of the through-air dried web and the web comprises less than about 10 percent softwood fibers by weight of the through-air dried web.

15. The tissue product of claim 8 having a basis weight from about 20 to about 45 grams per square meter and a Bulk from about 10 to about 22 cubic centimeters per gram.

16. The tissue product of claim 8 having a Stiffness Index from about 5 to about 10.

17. The tissue product of claim 8 wherein the web further comprises a third fibrous layer comprising wood fibers and substantially free of bamboo fibers, the web having a basis weight from about 20 to about 45 grams per square meter, a Bulk from about 10 to about 22 cubic centimeters per gram and Stiffness Index from about 5 to about 10.

18. The tissue product of claim 8 wherein the bamboo fibers have an average fiber length from about 1 to about 2 mm.

19. The tissue product of claim 18 wherein the bamboo fiber is derived from a bamboo species selected from the group consisting of *Phyllostachys heterocycla pubescens*, *Phyllostachys nigra* variant *Henon*, *Phyllostachys vivax* and *Phyllostachys bambusoides*.

20. The tissue product of claim 8 wherein the through-air dried web is uncreped.

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