



No. 07-096486-00000-0000

Fecha: 2007-09-18 16:35:03 Dep. 2020 NUECREACIONI
Tra. 11 PATENTEIYII Eva: 379 FASENACIONALI
Act. 411 PRESENTACION Folios: 53

FORMULARIO ÚNICO DE SOLICITUD DE PATENTE
PCT
ENTRADA EN FASE NACIONAL

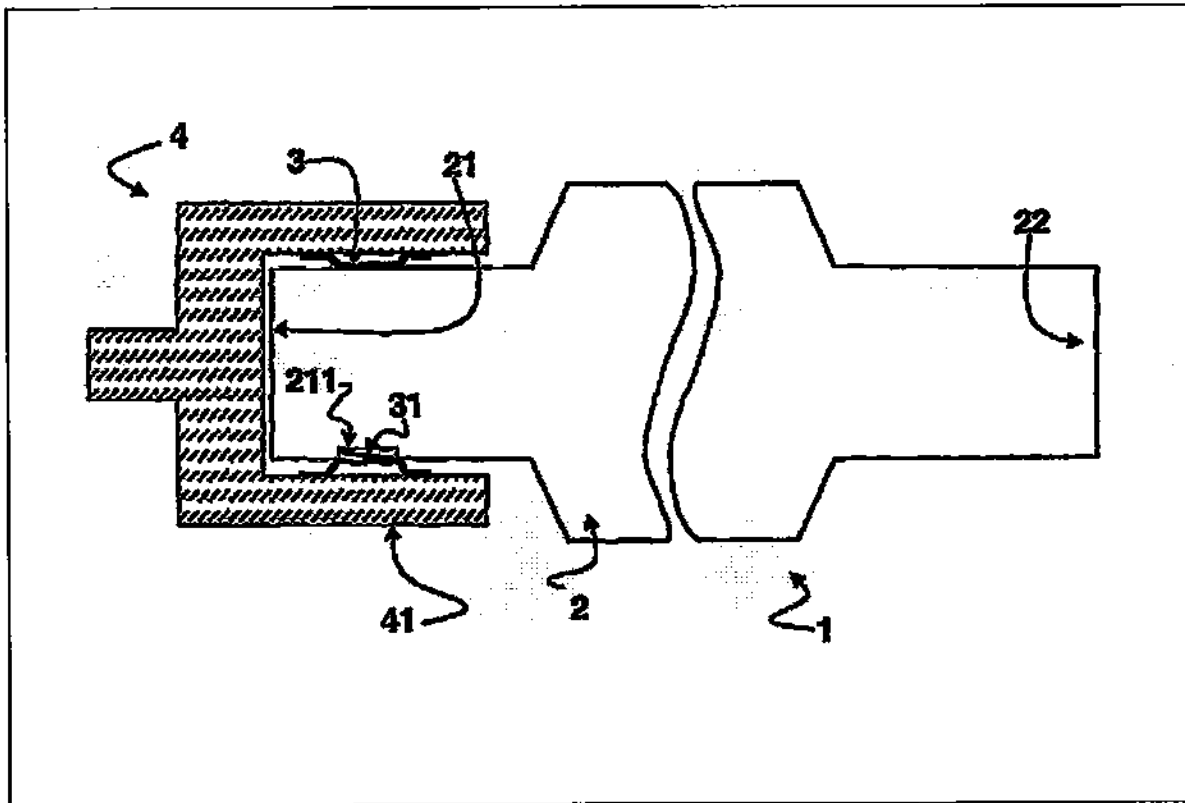
1) SOLICITUD DE:			
☒ Patente de invención		☐ Patente de Modelo de Utilidad	
☐ Capítulo I.		☒ Capítulo II. 22/09/2007	
2) SOLICITANTE (71)	Nombre: VESUVIUS GROUP S.A. <i>Ver folio 54</i> Dirección: 17, rue de Douvrain, B-7011 Ghlin, Bélgica Nacionalidad o domicilio: Ghlin, Bélgica Lugar de constitución: Bélgica		IDENTIFICACIÓN C.C. ☐ NIT: ☒ C.E. ☐ OTRO ☐ Cual _____ NÚMERO _____
	Teléfono: _____ Fax: _____ E. Mail: _____		
3) REPRESENTANTE O APODERADO	Nombre: DILIA MARÍA RODRÍGUEZ D'ALEMAN Dirección: Carrera 11 N°. 86-53 Piso 6 Bogotá D.C. Teléfono: 6181088 Fax: 6350824 E. Mail: info@clarkemodet.com.co		IDENTIFICACIÓN C.C. ☒ NIT: ☐ C.E. ☐ OTRO ☐ NÚMERO: 41.654.882 TP: 20824 CSJ
	4) INVENTOR (ES) (72) Nombre: 1. GAUTIER, David; 2. FLAMME, Arnaud Dirección: 32 rue Drombois, F-59750 Feignies, Francia; 2. 71 route d'Aulnoye, F-59330 Saint-Remy-Du-Nord, Francia Nacionalidad o Domicilio: Todos los anteriores, Franceses		
5) PCT (86) Solicitud Internacional No. PCT/EP2006/001563 Fecha: Febrero 21, 2006 Publicación Internacional No. WO2006/089716 A1 Fecha: Agosto 31, 2006			
6) Título (54) RODILLO TRANSPORTADOR Y PROCESO PARA SU MONTAJE			
7) Clasificación Internacional:			
8) PRIORIDAD	33) País de Origen	(32) Fecha	(31) Número de Solicitud
SI ☒ NO ☐	EP	FEBRERO 22, 2005	05447040.6
9) Comprobante de pago N°. 07-74,447 DE SEPT. 13, 2007			

10)

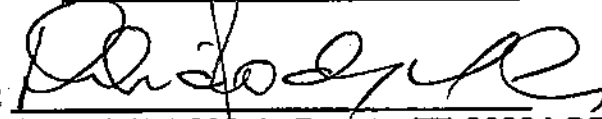
ANEXOS

- ☒ Comprobante de pago de la tasa de presentación de la solicitud
☐ Comprobante de pago por reivindicación de prioridad
☒ Documento que acredita la existencia y representación legal cuando el solicitante sea persona Jurídica
☒ Poderes, si fuera el caso
☐ Documento de cesión del inventor al solicitante o a su causante
☐ Declaraciones
☒ Copia de la solicitud Internacional. (Resumen, descripción, reivindicación, Dibujos).
☒ Traducción de la solicitud internacional al castellano. (Resumen, descripción, reivindicación, Dibujos)
☐ Copia del examen preliminar efectuado por la IPEA
☐ De ser el caso, copia del contrato de acceso
☐ De ser el caso, documento que acredite la licencia o autorización de uso de conocimientos tradicionales de las comunidades indígenas
☐ De ser el caso, certificado de depósito del material biológico
☐ Arte final 12 x 12 y 6 x 6 cm
☐ De ser el caso, información sobre otras solicitudes de patente o títulos obtenidos en el extranjero por el mismo titular o su causante, relacionados parcial o totalmente con la invención de esta solicitud.
☒ Otros:
 1. Reporte internacional de búsqueda
 2. IB/304, Opinión escrita

11) FIGURA CARACTERÍSTICA:

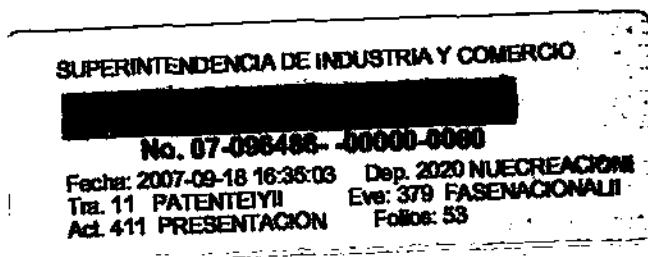


12) Solicitud concesión de la patente,

NOMBRE: DILIA RODRÍGUEZ D'ALEMANFIRMA: 

C.C. 41.654.882 de Bogotá TP 20824 CSJ

Instrucciones para el diligenciamiento del presente formulario. Ver reverso de esta página



SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

NIT : 800176089-2

RECIBO OFICIAL DE CAJA : 07 - 74,447
FECHA : SEPTIEMBRE 13 DE 2007

***** CONSIGNACION *****

DEPOSITANTE	TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PAGO	Gr. PAGO
CLARKE HENRY Y CO. COLOMBIA	CONSIGNACION	BANCO POPULAR	030-00110-6	67331718	13/09/2007	10,960,000.00

***** CONCEPTO *****

CANT. NUMERICO	CONCEPTO	TOTAL CONCEPTO
1 30003-01-01 SOLICITUDES	1 TRAMITES DE SOL. DE PATENTE DE IN	482,000.00
	TOTAL :	\$ 482,000.00

SOL: CUATROCIENTOS OCHENTA Y DOS MIL PESOS

p=990
M

P. 990 4

TRADUCCIÓN OFICIAL No. 07/335 de un documento escrito en inglés, el cual para su identificación se sella con el sello del traductor al tiempo con la presente. Esta traducción ha sido preparada por Juan Pablo Piedrahíta Aguilera, Traductor e Intérprete Oficial debidamente reconocido de conformidad con el Certificado de Idoneidad Profesional No. 0045 expedido por la Universidad Nacional de Colombia, por el Ministerio de Relaciones Exteriores y autorizado por el Ministerio del Interior y de Justicia, por resolución número 718 de 2003.

(Se traduce un Poder otorgado por la compañía Vesuvius Crucible Company, firmado por Donald M. Satina, con fecha 24 de Julio, 2007, certificado notarial y Apostilla No. 200728109, escritos en inglés.)

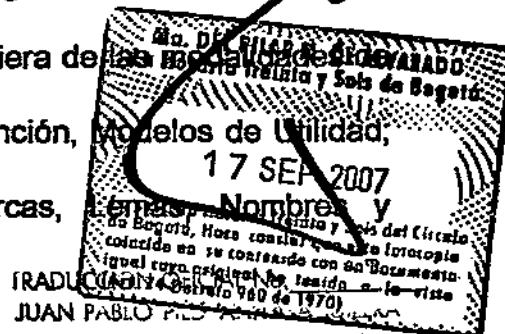
COLOMBIA

(Dirección en español)

PODER

Yo (nosotros), Donald M. SATINA, representante(s) legal(es) de VESUVIUS CRUCIBLE COMPANY, sociedad constituida y existente bajo las leyes del Estado de Delaware, Estados Unidos de América y en actual cumplimiento de su objeto social, con domicilio en 103 Foulk Road, Wilmington DE, Estados Unidos de América, por el presente confiero (conferimos) poder especial a favor de a DILIA MARÍA RODRÍGUEZ D'ALEMÁN, identificada con cédula de ciudadanía No. 41.654.882 de Bogotá y Tarjeta Profesional 20824 y CLAUDIA LUCIA CARO RAMIREZ, identificada con Tarjeta Profesional 36448 y cédula de ciudadanía No 40.017.374 de Tunja, con domicilio en Bogotá, Colombia, para que actuando en su orden en nombre de la otorgante la representen ante cualquier entidad, autoridad y/o persona, especialmente ante las del orden Administrativo, Contencioso Administrativo, Judicial, Tribunales de Arbitramento y/o cualquier otro en lo referente a la siguiente:

- 1) Solicitar, tramitar, obtener y/o registrar cualesquiera de las Propiedad Industrial, tales como: Patentes de Invención, Modelos de Utilidad, Diseños Industriales, variedades vegetales, Marcas, Nombres y



TRADUCTOR E INTERPRETE OFICIAL
RES. 718 DE MAYO 2003
DEL MIN. INTERIOR Y DE JUSTICIA

Enseñas Comerciales y Denominaciones de Origen; así como sus renovaciones, prórrogas, traspasos, cambios de nombre y/o domicilio, contratos y licencias.

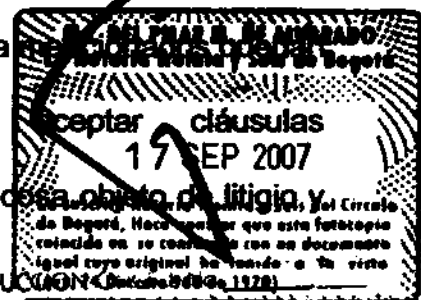
2) Solicitar, tramitar, obtener, y/o registrar derechos de autor, en cualquiera de sus presentaciones así como la protección de secretos industriales y know-how.

3) Solicitar, tramitar, obtener y/o registrar registros sanitarios, permisos y/o licencias de funcionamiento; así como sus renovaciones o prórrogas, cesiones, traspasos, cambios de nombre y/o domicilio, contratos y licencias.

4) Ejercer acciones de oposición, observación, reclamos, reivindicaciones, reconsideración, reposición, apelación, cancelación administrativa o judicial, nulidad, protección al consumidor, concesión de licencias, protección de secretos industriales y demás acciones y recursos relacionados con derechos derivados de los asuntos arriba indicados y en contra de la competencia desleal, acciones derivadas de la obtención o explotación de licencias, acciones de indemnización de perjuicios. También podrán intervenir en juicios civiles, comerciales, penales, contencioso-administrativos, tutelas y de policía; acciones o juicios promovidos por el mandante o contra él.

5) Registrar nombres de dominio ante la entidad competente.

6) En el ejercicio de este mandato los mandatarios arriba mencionados y sus delegados facultados para: conciliar, cancelar, transigir, aceptar cláusulas compromisorias, desistir, recibir y tomar posesión de la cosa objeto de litigio y



TRADUCCIÓN (Artículo 1128)
JUAN PABLO PIEDRA AGUILERA
TRADUCTOR E INTERPRETE OFICIAL
RES. 718 DE MAYO 2003
DEL MIN. INTERIOR Y DE JUSTICIA

renunciar o desistir derechos concedidos o en curso de concesión, admitir los hechos del proceso.

7) Ratificar o no la agencia oficiosa.

8) Así mismo facultamos a los mencionados apoderados para recibir notificaciones y designar apoderados judiciales o extrajudiciales, sustituir el presente poder y revocar las sustituciones que hicieren.

Dado y firmado en Pittsburgh, hoy día 24 de Julio, 2007.

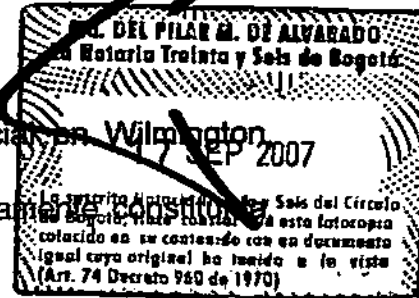
Por: (Firmado) Donald M. Satina

CERTIFICADO NOTARIAL (Cuando el solicitante es una SOCIEDAD)

(Poderes otorgados en El Salvador, México, Estados Unidos de América y Venezuela)

Expedido hoy día 26 de Julio, 2007, el suscrito Notario CERTIFICA que:

- 1). Donald M. Satina, (nombre de quien firma el poder), mayor de edad y domiciliado en Pittsburgh, PA, Estados Unidos de América, suscribió el anterior documento.
- 2) El otorgante le es conocido personalmente y tiene capacidad para firmar el documento.
- 3) El otorgante ha suscrito el anterior documento en su calidad de Secretario de la persona jurídica Vesuvius Crucible Company.
- 4) La mencionada persona jurídica con domicilio comercial en Wilmington, Delaware, 19803, Estados Unidos de América, está debidamente constituida.



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tiene actualmente existencia legal y el fin para el cual se otorga este poder se encuentra dentro de su objeto social.

5) El otorgante tiene en efecto la capacidad referida y su representación es legal y está autorizado para otorgar este poder.

6) Fundamento las certificaciones 3), 4) y 5) en los documentos auténticos que para tal fin me fueron exhibidos.

(Firmado) Agnes L. Marshall, Notario Público

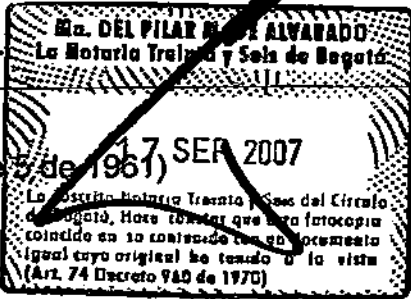
(Sello notarial en relieve)

(Sello notarial a tinta: Agnes L. Marshall, Notario Público, Carnegie Boro, Condado de Allegheny, Mi comisión vence el 18 de Mayo, 2008.

Nota: El Consulado de Colombia debe autenticar la firma del Notario Público.

Para todos los demás países el Señor Cónsul de Colombia o ante quien se otorgue, debe expedir una certificación dejando constancia de: 1) la existencia legal de la sociedad, 2) que cumple actualmente con su objeto social, y 3) que la persona o personas que otorgan este poder están facultadas para hacerlo. El Cónsul también certificará que los tuvo a la vista los documentos que prueban y acreditan tales circunstancias.

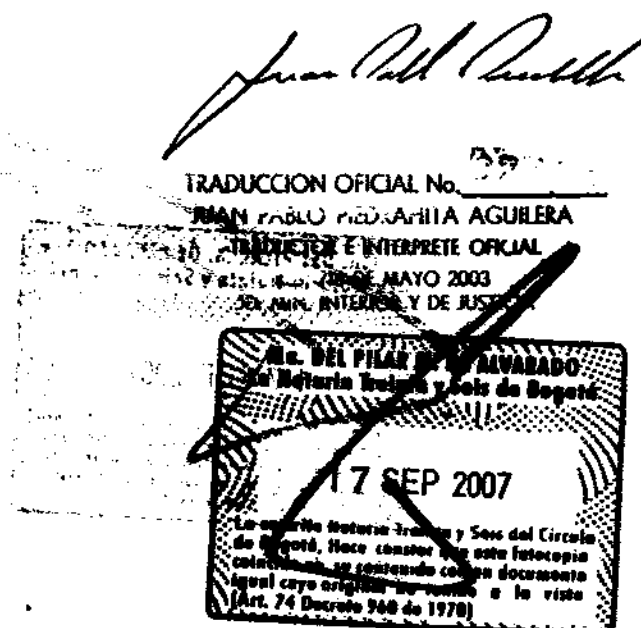
LEGALIZACIÓN POR EL CÓNSUL DE COLOMBIA A O POR APOSTILLA

APOSTILLA	
(Convenio de la Haya de Octubre 5 de 1961)	
1. País: Estados Unidos de América	
Este documento público	

2. Ha sido firmado por AGNES L. MARSHALL
3. Actuando en calidad de Notario Público
4. Lleva el sello/estampilla AGNES L. MARSHALL, Notario Público, Condado Allegheny, Mancomunidad de Pensilvania
- CERTIFICADA**
5. En Harrisburg, Pensilvania.
6. Hoy 27 de Julio, 2007
7. Por Pedro A. Cortés, Secretario de la Mancomunidad de Pensilvania
8. No. 200728109
9. Sello (Sello de Oblea Dorado de la Secretaría de la Mancomunidad de Pensilvania)
10. Firma (Firmado)
Pedro A. Cortés

ES TRADUCCIÓN FIEL Y COMPLETA de la cual se deja copia en los archivos de esta oficina para su confrontación y a la cual me remito.

Bogotá, Septiembre 13, 2007.



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APOSTILLE

(Convention de La Haye du 5 octobre 1961)

1. Country : United States Of America
2. This public document has been signed by **AGNES L MARSHALL**
3. acting in the capacity of NOTARY PUBLIC
4. bears the seal/stamp AGNES L MARSHALL, NOTARY PUBLIC, ALLEGHENY COUNTY, COMMONWEALTH OF PENNSYLVANIA

Certified

5. at Harrisburg, Pennsylvania
7. by Pedro A. Cortés, Secretary of the Commonwealth of Pennsylvania
8. No : 200728109
9. Seal/Stamp

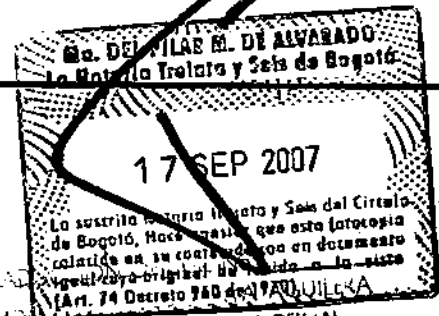
6. The 27th day of July, 2007

10. Signature



Pedro A. Cortés

Pedro A. Cortés



INTERPRETE OFICIAL
JUNIO 2003
CORTE DE JUSTICIA

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POWER OF ATTORNEY

I (we), the undersigned
Donald M. SATINA

legal representative(s) of
VESUVIUS CRUCIBLE COMPANY

an organization existing under the laws of
the state of Delaware (USA)

and in present execution of its business activity, domiciled at
103 Foulk Road

Wilmington DE 19803, USA
do hereby grant POWER OF ATTORNEY to DILIA MARIA RODRIGUEZ D'ALEMAN, identification card No. 41.654.882 of Bogotá, and tp. 20824 and CLAUDIA LUCIA CARO RAMIREZ, tp. 36448, identification card No. 40.017.374 of Tunja, residing in Bogotá, Colombia, to act in the order of their appointment in behalf of grantor before any entity, authority and/or natural or juridical person, specially before those Administrative, Administrative-Contentious, Judicial, arbitration courts, and/or any other, in all matters concerning the following:

- 1) To apply, process, obtain and/or register any of the modalities of Industrial Property, such as: Patents of Invention, Utility Models; Designs, plant varieties; Marks, Slogans, Trade Names and emblems and appellations of Origin; as well as their renewals, assignments, changes of name and/or domicile, agreements and licenses.
- 2) To apply, process, obtain and/or register copyrights of any kind as well as protection of industrial secrets or know-how.
- 3) To apply, process, obtain and/or register sanitary registrations, operating authorizations and/or licenses, as well as their renewals or assignments, changes of name and/or domicile, agreements and licenses.
- 4) To bring actions of opposition, observations, claims, reconsideration, appeal or legal remedies, cancellations, nullity, protection to the consumer, granting of licenses, protection of trade secrets and other actions related with rights derived from the above-mentioned matters and against the unfair competition, actions resulting from the obtaining or exploitation of licenses, recovering damages actions. They can also intervene or participate in Civil, Commercial, Criminal or Contentious-Administrative Trials; the actions for writ mandamus, police actions; in actions, lawsuits or litigations instituted by the grantor or against him.
- 5) To register domain names before the competent entity
- 6) To the effect of this mandate the above-named proxy are empowered to conciliate, cancel, settle, submit to arbitration, withdraw and to receive and take possession of the litigation related object and waive or renounce the rights granted or in process of granting, admit the facts stated in the lawsuit.
- 7) To ratify or not the officious agency.
- 8) I (we) hereby appoint the afore mentioned agency with full power to give notifications and to designate judicial and extrajudicial representatives, and to give this Power of Attorney and to revoke such institutions.

Granted and signed at Pittsburgh

on this 29th day of

the competent entity
the above-named proxy are empowered to:
arbitration, withdraw and to receive and
ated object and waive or renounce the rights
admit the facts alleged.
ney.
mentioned agreement with the other
cial and extrajudicial arbitrators, and que
such arbitrations.

LA HOJITA PILAR EL DE ALVARADO
La Hojita Treinta y Seis de Agosto

17 SEP 2007

La suscrita Hojita Treinta y Seis del Círculo
de Bogotá, hace constar que esta fotocopia
coincide en su contenido con un documento
del cual el original se guarda a la vista
(Art. 74 Decreto 2450 de 1977)

PROMOCION OFICIAL NO.
JUAN PABLO RIO ARIETA

CERTIFICADO NOTARIAL

(Cuando el solicitante es SOCIEDAD)

(Poderes otorgados en: El Salvador, Estados Unidos, México y Venezuela)

A los _____ días del mes de _____ de _____
el Notario que suscribe DA FE de que:

1. _____
(nombre de la persona que firma el poder)

mayor de edad y domiciliado _____
y letra el documento que antecede.

2. Conoce al (a) otorgante y que este (a) está legalmente capacitado para el otorgamiento.

3. El otorgante ha firmado el referido documento en su carácter de _____
de la persona jurídica _____

4. La citada persona jurídica con sede en _____ está legalmente
constituida, que tiene actualmente
existencia legal y que el acto para el cual se ha otorgado este
poder está comprendido entre los que constituyen su objeto social.

5. El otorgante tiene efectivamente la representación que ostenta, que
esta es legítima y que está facultado para otorgar este poder.

6. Las anteriores certificaciones de los puntos 3, 4 y 5, me constan porque
he tenido a la vista los documentos auténticos.

Notario Público

NOTA: A continuación de lo anterior, el Cónsul de Colombia debe
autenticar la firma del Notario Público.

CERTIFICADO NOTARIAL (Cuando el solicitante es INDIVIDUO)

A los _____ días del mes de _____ de _____
el Notario que suscribe DA FE de que:

1. _____
(nombre de la persona que firma el poder)

mayor de edad y domiciliado en _____
firmó en su presencia
el documento que antecede, conoce al otorgante y que este está
legalmente capacitado para el otorgamiento.

Notario Público

NOTA: A continuación de lo anterior, el Cónsul de Colombia debe
autenticar la firma del Notario Público.

Para todos los demás países el Señor Cónsul de Colombia o ante
quien se otorgue, debe expedir una certificación dejando constancia
1) de la existencia legal de la sociedad, 2) de que esta ejerce actual-
mente su objeto social, y 3) de que la persona o personas que otorgan
el poder están facultadas para hacerlo, dejando
constancia así mismo de que tuvo a la vista las pruebas que acrediten
tales circunstancias.

**LEGALIZACIÓN POR EL CONSUL DE COLOMBIA
O POR APOSTILLA**

NOTARIAL CERTIFICATE

(When the applicant is a CORPORATION)

(Powers of attorney granted in: El Salvador, Mexico, U.S.A. and Venezuela)

This 23rd day of July, 2007
the undersigned Notary CERTIFIES that:

1. DONALD M. SATIWA
(name of the person who signs the power of attorney)

of Pittsburgh, PA, USA legal age and domiciled
in the foregoing document.

2. The grantor is to him personally known and that he/she has legal capacity to
execute the document.

3. The grantor has executed the foregoing document in his capacity
of SECRETARY
of the juridical person

Vesuvius Crucible Company
4. The mentioned juridical person with place of business in
Wilmington, Delaware, 19803, USA
is duly organized, has actual legal existence and that the purposes for
which the power of attorney is granted are within the scope of its corporate
purposes.

5. The grantor has in fact the referred quality and that his/her
representation is legal and that he/she is empowered to grant this power
of attorney.

6. I have based the above certifications 3, 4 and 5, on the authentic documents
which for such purpose were exhibited to me.

Notary Public

NOTA: Then the Colombian Consul must legalize the signature of the Notary
Public.

**NOTARIAL CERTIFICATE
INDIVIDUAL)**

On this _____ day of _____
the undersigned Notary CERTIFIES that _____
member, Pennsylvania Association Of Notaries

1. _____
(name of the person who signs the Power of Attorney)

of legal age and domiciled at _____
signed in his presence the foregoing
document, the grantor is to him personally known and that he/she has legal
capacity to execute the document.

Notary Public

NOTA: Then the Colombian Consul must legalize the signature of the Notary
Public.

For all other countries the Colombian Consul or before whom the grantor
must issue a certification stating 1) the legal existence of the corporation,
2) that the corporate purposes are within the scope of its corporate
purposes, 3) that the person or persons who grant this power of attorney are
duly authorized to do it. The Consul will certify also the circumstances
circumstances were exhibited to him.

**LEGALIZATION BY THE COLOMBIAN CONSUL OR BY
APOSTILLE.**

TRADUCCION OFICIAL No. _____

COLOMBIA APOSTILLA

COLOMBIA APOSTILLA

COLOMBIA APOSTILLA

COLOMBIA APOSTILLA

(19) World Intellectual Property Organization
International Bureau



PCT

(10) International Publication Number
WO 2006/089716 A1

(51) International Patent Classification:
F27D 3/02 (2006.01) F16D 1/08 (2006.01)
B65G 39/02 (2006.01)

(21) International Application Number:
PCT/EP2006/001563

(22) International Filing Date:
21 February 2006 (21.02.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
05447040.6 22 February 2005 (22.02.2005) EP

(71) Applicant (for all designated States except US): VESUVIUS CRUCIBLE COMPANY [US/US]; 103 Foulk road, Wilmington, DE 19803 (US).

(71) Applicant (for ZM only): VESUVIUS GROUP S.A. [BE/BE]; 17, rue de Douvrain, B-7011 Ghlin (BE).

(72) Inventors; and

(75) Inventors/Applicants (for US only): GAUTIER, David [FR/FR]; 32 rue Drombois, F- 59750 Feignies (FR).
FLAMME, Arnaud [FR/FR]; 71 route d'Aulnoye, F-59330 Saint-Remy-Du-Nord (FR).

(74) Agent: DEHLED, Thierry; Vesuvius Group S.A., Rue de Douvrain, 17, B-7011 Ghlin (BE).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GR, GH, GM, HR, HU, ID, IL, IN, IS, JP, KR, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

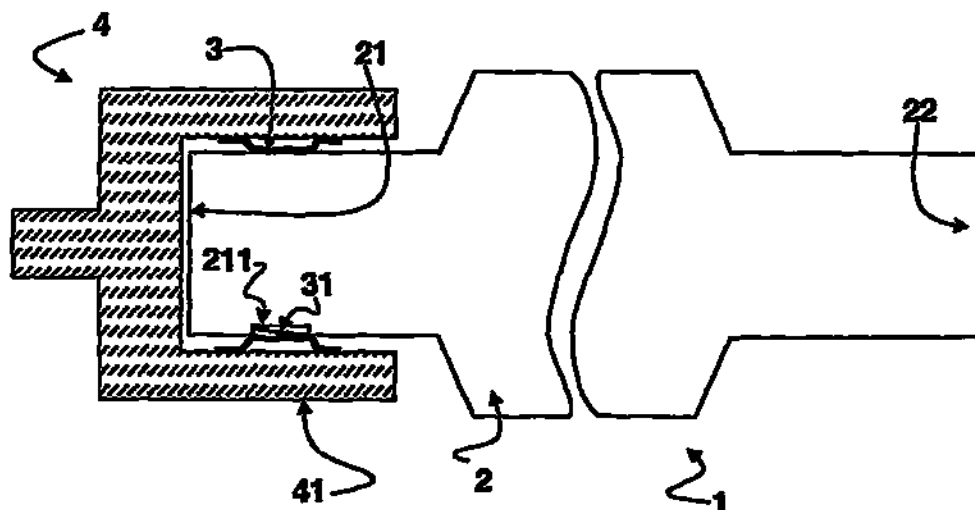
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

[Continued on next page]

(54) Title: CERAMIC CONVEYOR ROLL WITH METAL END CAPS AND ITS ASSEMBLY



(57) Abstract: The present invention relates to conveyor rolls used in high temperature applications, and more particularly concerns an improved end cap assembly for such rolls. According to the invention, the conveyor roll (1) comprises a) a ceramic spool (2), b) at each end (21, 22) of the ceramic spool (2), an end cap (4) comprising a metal ferrule (41) and having a certain internal circumference adapted to fit over an end (21) of the ceramic spool; and c) interposed between each end (21, 22) of the ceramic spool (2) and the end cap (4) a tolerance ring (3) of resilient metal having a plurality of circumferentially arranged corrugations. This conveyor roll can resist temporary overheat or blockage without damages.

WO 2006/089716 A1

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CERAMIC CONVEYOR ROLL WITH METAL END CAPS AND ITS ASSEMBLY

Description.

[0001] The present invention relates to conveyor rolls used in high temperature applications, and more particularly concerns an improved end cap assembly for such rolls.

[0002] A conveyor roll used in high temperature applications may comprise a ceramic spool
5 having metal end caps. Typically, the ceramic spool comprises fused silica. The end caps permit facile mounting to a bearing or drive wheel. For example, in glass tempering applications, the ceramic spool supports glass sheet, and the end caps permit mechanical coupling to the drive mechanism. The end caps should securely adhere to the spool, thereby permitting the spool to rotate at the desired speed. Eccentric rotation is generally undesirable, as this would
10 create an uneven support surface for the glass sheet.

[0003] The different thermal expansions of the ceramic spool and the metal end caps makes securely fastening the end caps to the spool difficult and can create eccentric rotations. Various methods have been proposed to overcome this difficulty. U.S. Pat. No. 3,867,748 teaches fastening end caps to a spool using an adhesive. U.S. Pat. No. 4,242,782 proposes fastening
15 end caps using rubber O-rings. Adhesives and O-rings can become pliable and lose holding power at elevated temperatures causing eccentric rotation of the spool and slippage between the end caps and the spool. If, by accident, the adhesive and O-ring have been subjected to such elevated temperatures, they lose definitely their holding power so that even when the temperature returns to its normal value, slippage is still observed. For this reason, the fastening
20 of end caps to a spool using adhesive or O-ring is limited to applications at low temperature (lower than 250°C).

[0004] Metallic connectors have also been used to secure an end cap to a spool. U.S. Pat. No. 5,316,129 or U.S. Pat. No. 4,404,011 describes the use of a helically wound coil between the spool and the end cap. The coil includes bent portions and straight portions that permit
25 continuous contact between the end cap and the spool despite disparate thermal expansion coefficients. The flat sided spring coil of this document consists in a succession of relatively long portions which are relatively thin. In these conditions, a significant flexibility of the coil elements is observed. Consequently, to obtain a torque sufficient to secure the end cap to the spool, it is necessary to pre-stress the coil very significantly. If the temperature increases accidentally
30 (temporary overheat), the torque and consequently the fastening of the end cap to the spool are lost. Moreover, when the system cools down, the torque is not recovered. U.S. Pat. Nos. 5,906,567 and 5,370,596 describe curved bimetallic shims for securing the end cap to the spool. The curvature of the bimetallic shims changes with temperature thereby retaining a secure attachment between the spool and the end cap. Assembling and repairing a coil spring or
35 bimetallic system can, however, be difficult. In addition, such metallic connectors are particularly adapted to specific temperature ranges (generally 400°C and higher). Outside of this range, eccentric rotation can be observed.

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15 [0005] Mechanical fasteners can be used to fasten an end cap to a spool. U.S. Pat. No. 4,751,776 shows an end cap having an annular distribution of screws that thread into a ferrule on the end of a spool. The screws are tightened to secure the end cap to the spool, but thermal expansion and contraction can loosen the screws causing eccentric rotation and slippage. In this case, the screws will seriously damage the surface of the spool. Screws have also been
5 keyed to a flat surface machined on face of the spool so as to ensure coaxial rotation. Assembling and repairing such sleeve and locking key is time consuming. FR 2 550 172 describes an end cap including a metallic collar between the spool and the end cap. The end cap is locked in place with a key fitted to a flat surface of the spool. The collar has a thermal
10 expansion greater than the end cap, and is intended to compensate for the difference in thermal expansion between the end cap and the spool. U.S. Pat. No. 5,146,675 discloses a screw that can be tightened to force a metal plate against a flat on the spool, which presses the spool against the inner surface of the end cap. The end cap includes an access opening that permits the screw, metal plate and end cap to be welded together, thereby preventing the screw from
15 backing out. Effectively, the end cap and the spool connect across a single axis, that is, the screw. Thermal cycling across a single axis of contact can cause eccentric rotation and movement of the metal plate relative to the spool. Such movement can even cause the plate to contact the edge of the flat and crack the spool.

[0006] Another problem which is often observed with the conveyor rolls of the prior art is that of
20 jamming. For example, in case the conveyed article is blocked or in case of mechanical seizing, the drive mechanism will continue to operate and will transmit a moment of torsion to the end cap. In these conditions, either the ceramic spool or the fastening means will break. The same consequences are observed on the long run when the conveyor roll is subjected to a brutal acceleration or deceleration.

25 [0007] A need persists for an end cap that fixedly and centrally secures to a ceramic spool within a wide range of application temperatures. The end cap should be able to resist a temporary overheat and to recover its holding power when the temperature is back to normal without causing eccentric rotation. The end cap should also be easy to install. The conveyor roll should also be able to resist temporary jamming or seizing of the line as well as to brutal
30 acceleration or deceleration.

[0008] These objectives and others are fulfilled with a conveyor roll according to claim 1. Indeed, the tolerance ring interposed between the end cap and the end of the ceramic spool (also called roll neck) will fasten fixedly the spool in the end cap and ensure very efficient torque transfer and prevent eccentric rotation of the spool. In addition, in case of a temporary overheat,
35 the end cap and the tolerance ring will thermally expand while the dimensions of the ceramic spool will not significantly change. Thereby, the fastening power of the tolerance ring will diminish and the spool will start slipping in the end cap. When the temperature will return back to normal, the end cap and tolerance ring will return to their "normal" dimensions and the holding power will be integrally recovered. It is important to note that during this temporary overheat, the

spool will remain coaxial with the end cap thanks to the tolerance ring.

- [0009] Tolerance rings are known from U.S. Pat. No. 3,061,388. They are described as made from resilient metal and have a plurality of circumferentially arranged corrugations of defined height and pitch, with both the height and pitch of the corrugations significantly lower than the diameter of the ring. Typically, the pitch is lower than 10% of the diameter and preferably lower than 8% of the diameter. Typically, the height is lower than 5 % of the diameter and preferably lower than 3% of the diameter. U.S. Pat. No. 3,142,887 indicates a method of making such tolerance rings. This design is very particular and can be opposed to an helicoidally wound flat sided coil. Due to this particular design, the tolerance ring shows very significant flexibility.
- 10 Numerous variants of the tolerance rings have been described in the art (variable heights, pitches, multiple rows of corrugations aligned or offset, ...) and are sold by various companies. In principle all these kinds of tolerance rings can be used. It is preferable to have an open tolerance ring having a length lower than the internal circumference of the end cap since when the roll neck is introduced into the end cap provided with the tolerance ring, this must be able to
- 15 accommodate the small dimensional variations that might occur during manufacturing of the spool or end cap. It might be advantageous to have a second open tolerance ring parallel to the first one but with their opening offset so as to improve the coaxiality of the spool in the end cap. It is also very advantageous to have a relatively limited pitch (less than 20 mm between two wave "highs") to obtain an increased rigidity.
- 20 [0010] It is preferred to have the corrugations oriented inwardly so that in case of slippage, this will occur only with respect to the "tolerance ring - end cap" couple and will not damage the surface of the spool.
- [0011] According to an advantageous embodiment of the invention, at least one of the tolerance rings is provided with at least one tab while, in parallel, the corresponding end of the ceramic spool is provided with one or more notch(es) adapted to receive the tab(s) of the
- 25 tolerance ring. Such an arrangement will prevent relative movement in one axial direction between the tolerance ring and the spool. Since it is preferable to prevent the withdrawal of the spool from the tolerance ring especially during a temporary overheat (i.e., when the pressure exerted on the spool by the tolerance ring is minimal), it is preferable to have the tab(s) oriented
- 30 so that the end of the tab will cooperate with the wall of the notch the closest to the end of the spool. Thereby, the spool can only move slightly towards its end and abut the bottom of the end cap. If such tolerance rings provided with these advantageous tabs are provided on both sides of the spool, all relative movements of the spool are prevented.
- [0012] According to another embodiment, the tolerance ring is provided with at least two tabs and one tab has an orientation opposite to at least another tab. Thereby, all relative movements of the spool with respect to a single tolerance ring are prevented.
- 35 [0013] As indicated above, the end cap has an inner circumference to receive a tolerance ring and one end of a spool. Advantageously, the end cap is provided with a step to limit relative movements between the tolerance ring and the end cap. According to a particularly preferred

embodiment, the end cap is provided with a groove adapted to receive the tolerance ring. Thereby all axial movements of the tolerance ring with respect to the end cap are prevented even in case of a temporary overheating. It is especially advantageous to combine the presence of tabs on the tolerance ring with the groove in the end cap to avoid any relative movement of the spool with respect to the end cap during a temporary overheating.

[0014] According to a particular embodiment of the invention, both the end cap and the ceramic spool receives a mark once assembled together. Both marks are in register one to the other so that if a temporary overheating has occurred and the torque has ceased to be transmitted to the spool, the operator will notice this phenomenon, just by realising that the marks are offset. He could then take the appropriate measures.

[0015] The present invention also relates to a process for assembling a conveyor roll as described hereabove. This process comprises the steps of fitting a tolerance ring in the ferrule of an end cap and forcing each end of the ceramic spool into the end cap. The order of the steps is important otherwise, the position of the tolerance ring with respect to the spool can change during their insertion in the end cap. Generally, the end of the ceramic spool is forced in the end cap provided with the tolerance ring with a hydraulic press exerting a pressure of several hundreds kg/cm^2 , for example 1000 kg/cm^2 .

[0016] In case the tolerance ring is provided with one or more tab(s), the process comprises a further step of bending the(se) tab(s) inwardly and of aligning the spool so that the tab(s) match(es) the corresponding notch(es) of the spool.

[0017] The conveyor roll according to the invention can be used for conveying a foil or sheet (for example of glass or metal) for any kind of thermal treatment of the foil or sheet or of a coating applied thereon. This conveyor roll is particularly suitable for transporting flat articles in an environment subject to important temperature variations.

[0018] In order to better explain the invention, a method of implementation given by way of a non-limitative example is described below with reference to the attached drawings in which :

- Figs. 1, 2 and 3 are schematic section views of conveyor rolls according to an embodiment of the invention; and

- Fig 4 shows a graph of the transmitted torque (Nm) vs. the temperature ($^{\circ}\text{C}$)

[0019] On these figures, 1 depicts generally a conveyor roll comprising a ceramic spool 2 having two ends 21 and 22. An end cap 4 comprising a ferrule 41 is arranged on both ends of the spool 2 (only the end cap provided at the end 21 is shown on Fig. 1). A tolerance ring 3 is inserted in the end cap 4. The end cap 4 has a regular inner surface on Fig. 1, while Fig. 2 and 3 show respectively an end cap 4 provided with a step 42 or a groove 43 for restraining the movements of the tolerance ring 3 in the end cap. .

[0020] The tolerance ring can be provided with a tab 31 cooperating with the wall of a notch provided in the end of the ceramic spool 21. On Figs. 1 to 3, the tab 31 cooperates with the wall of the notch the closest to end 21 of the spool 2.

[0021] Trials have been performed with a conveyor roll according to Fig. 2 so as to demonstrate

the possibility of the conveyor roll to resist a temporary overheat and to recover its normal operating conditions when the temperature returns back to normal.

[0022] An open tolerance ring 3 with inwardly oriented corrugations (length: 242 mm; width: 25 mm; height: 1.9 mm; pitch: 9.4; stainless steel) is inserted into an end cap 4 (carbon steel)

- 5 having an internal diameter of 80 mm. The operation is repeated for the second end cap. Both ends of a spool 21 and 22 (diameter of 77 mm) are forced in the end caps 4. Such a conveyor roll is intended to work at temperatures comprised between room temperature and 200°C. The skilled person will easily find by routine experiments different arrangements (different metal operating at different temperatures.
- 10 [0023] Fig 4 shows the transmitted torque (Nm) vs. the temperature (°C). It can be seen that the torque decreases progressively until about 300°C where its value is of less than 50 Nm and the spool starts sliding. When the temperature returns back to normal (down curve), the transmitted torque increases rapidly to recover its original value. From 300°C, the spool stops sliding.
- 15 After dismounting of the conveyor roll, it has been observed that both ends of the ceramic spool were in perfect condition and had not been damaged at all during the temporary overheat. Fig. 4 also shows (dotted lines) the transmitted torque (Nm) vs. the temperature (°C) for a system as described in the U.S. Pat. 5,316,129. Such a system is constituted of relatively long and flat elements. When the system is subject to heat, the transmitted torque decreases progressively (curve A) until about 300°C where the limit of elasticity of the system is reached.
- 20 At that point, the transmitted torque drops dramatically and the roll starts sliding in the end cap. When the system returns back to normal (curve B), the system does not recover entirely the original torque since the elasticity limit of the system has been exceeded. When again subjected to temperature and cooled down (curves C and D)), the same phenomenon is observed with the consequence that after only a few heating/cooling cycles, the torque is no longer transmitted so
- 25 that the conveyor roll must be replaced. Such conveyor rolls are clearly not suitable for use in an environment suitable to significant temperature variations. On the opposite, the conveyor roll of the invention has proved to be fully satisfactory for such a demanding use.

Claims.

1. Conveyor roll (1) for high temperature applications comprising
a) a ceramic spool (2);
5 b) at each end (21,22) of the ceramic spool (2), an end cap (4) comprising a metal ferrule (41) and having a certain internal circumference adapted to fit over an end (21) of the ceramic spool; and
c) interposed between each end (21,22) of the ceramic spool (2) and the end cap (4), a
10 tolerance ring (3) of resilient metal having a plurality of circumferentially arranged corrugations.
2. Conveyor roll according to claim 1, characterized in that the tolerance ring has a pitch lower than 20 mm
3. Conveyor roll according to claim 1 or 2, characterized in that the tolerance ring (3) is open and has a length lower than the internal circumference of the end cap (4).
- 15 4. Conveyor roll according to any one of claims 1 to 3, characterized in that the corrugations of the tolerance ring (24) extend inwardly.
5. Conveyor roll according to claim 3 or 4, characterized in that a plurality of open tolerance rings (3) are interposed between each end (21,22) of the ceramic spool (2) and the end cap (4) and in that the openings of the tolerance rings are offset.
- 20 6. Conveyor roll (1) according to any one of claims 1 to 5, characterised in that at least one of the tolerance rings (3) is provided with at least one tab (31) and in that the corresponding end (21) of the ceramic spool (2) is provided with notch(es) (211) adapted to receive the tab(s) (31) of the tolerance ring (3).
7. Conveyor roll according to claim 6, characterised in that the tab(s) (31) is (are)
25 oriented so that the end of the tab will cooperate with the wall of the notch (211) the closest to end (21) of the spool (2).
8. Conveyor roll according to claim 7, characterised in that the tolerance ring is provided with at least two tabs and in that at least one tab has an orientation opposite to at least another tab.
- 30 9. Conveyor roll according to any one of claims 1 to 8, characterised in that the end cap is provided with a step (42) or a groove adapted to receive the tolerance ring (3).
10. Process for the assembly of a conveyor roll according to any one of claims 1 to 9, comprising the steps of
a) fitting a tolerance ring in the ferrule of an end cap;
35 b) forcing each end of the ceramic spool into the end cap.

INTERNATIONAL SEARCH REPORT

International application No

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A. CLASSIFICATION OF SUBJECT MATTER

INV. F27D3/02 B65G39/02 F16D1/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F27D B65G F16D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 316 129 A (DAILY ET AL) 31 May 1994 (1994-05-31) cited in the application	1,2,9,12
Y	column 1, lines 13-16	3,4
A	column 5, line 50 - column 6, line 21; figures 2-5	5-7,9,10
Y	US 3 061 386 A (DIX WILLY ET AL) 30 October 1962 (1962-10-30) cited in the application	3,4
	column 5, lines 61-75; figures 5,5a column 6, line 49 - column 7, line 11; figure 11	



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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Rodillo transportador y proceso para su montaje.

Descripción.

[0001] La presente invención se refiere a rodillos transportadores utilizados en aplicaciones de alta temperatura, y más específicamente a un conjunto de tapa terminal mejorado para tales rodillos.

5 [0002] Un rodillo transportador utilizado en aplicaciones de alta temperatura puede comprender un carretel cerámico con tapas terminales metálicas. Típicamente, el carretel cerámico comprende sílice en fusión. Las tapas terminales permiten un fácil montaje a un cojinete o rueda de accionamiento. Por ejemplo, en aplicaciones de templado de vidrio, el carretel cerámico soporta la hoja de vidrio, y las tapas terminales permiten el acoplamiento mecánico al
10 mecanismo de accionamiento. Las tapas terminales debe adherirse con firmeza al carretel, por medio de lo cual el carretel puede girar a la velocidad deseada. En general la rotación excéntrica no es deseable, dado que se generaría una superficie de soporte despareja para la hoja de vidrio.

[0003] Las diferentes expansiones térmicas del carretel cerámico y las tapas terminales
15 metálicas dificultan la fijación de las tapas terminales al carretel y pueden generar rotaciones excéntricas. Se han propuesto varios métodos tendientes a superar esta dificultad. La Patente Estadounidense 3.867.748 revela la fijación de las tapas terminales a un carretel usando un adhesivo. La Patente Estadounidense 4.242.782 propone la fijación de las tapas terminales usando anillos O de goma. Los adhesivos o anillos pueden plegarse y perder el poder de
20 fijación a elevadas temperaturas dando lugar a la rotación excéntrica del carretel y un deslizamiento entre las tapas terminales y el carretel. Si, por accidente, el adhesivo y el anillo O han sido sometido a tales altas temperaturas, pierden definitivamente su poder de sujeción de modo que aún cuando la temperatura descienda a su valor normal, aún se observará el deslizamiento. Por esta razón, la sujeción de las tapas terminales a un carretel usando un
25 adhesivo o anillo O está limitada a aplicaciones de baja temperatura (inferiores a 250°C).

[0004] También se han utilizado conectores metálicos para fijar una tapa terminal a un carretel. La Patente Estadounidense 5.316.129 o la Patente 4.404.011 describen el uso de una bobina helicoidal entre el carretel y la tapa terminal. La bobina incluye porciones curvas y porciones rectas que permitan un contacto continuo entre la tapa terminal y el carretel a pesar de los
30 distintos coeficientes de expansión térmica. La bobina de lados planos de este documento comprende una serie sucesiva de porciones relativamente largas que son relativamente delgadas. En estas condiciones, se observa una flexibilidad significativa de los elementos de la bobina. En consecuencia, para obtener un torque suficiente en orden a fijar la tapa terminal al carretel, es necesario pre-tensar la bobina en un grado muy significativo. Si la temperatura se
35 incrementa accidentalmente (sobrecalentamiento momentáneo), el torque y en consecuencia la fijación de la tapa terminal a la bobina se pierden. Por otra parte, cuando el sistema se enfría, el torque no se recupera. Las Patentes Estadounidenses 5.906.567 y 5.370.596 describen

planchas bimetálicas curvas para fijar la tapa terminal al carretel. La curvatura de las planchas bimetálicas se modifica con la temperatura por medio de lo cual se mantiene una fijación segura entre el carretel y la tapa terminal. El montaje y reparación de una bobina de resorte o sistema bimetálico pueden, sin embargo, resultar dificultosos. Además, tales conectores metálicos están particularmente adaptados a rangos térmicos específicos (en general de 400°C y superiores). Fuera de este rango, es posible observar rotación excéntrica.

[0005] Es posible emplear sujetadores mecánicos para fijar una tapa terminal a un carretel. La Patente Estadounidense 4.751.776 ilustra una tapa terminal que posee una distribución anular de tornillos que se fijan a un casquillo sobre el extremo del carretel. Los tornillos se aprietan para fijar la tapa terminal al carretel, no obstante lo cual la expansión y contracción térmica pueden aflojar los tornillos provocando rotación excéntrica y deslizamiento. En este caso, los tornillos dañarán seriamente la superficie de la bobina. Asimismo, se han calzado tornillos a una superficie plana torneada sobre la cara del carretel en orden a garantizar una rotación coaxial. El montaje y reparación de tales manguito y fijación lleva tiempo. FR 2.550.172 describe una tapa terminal que incluye un collar metálico entre el carretel y la tapa terminal. La tapa terminal se fija con un chaveta montada en una superficie plana del carretel. El collar posee una expansión térmica superior a la tapa terminal, y tiene por objeto compensar la diferencia en la expansión térmica entre la tapa y el carretel. La Patente Estadounidense 5.146.675 revela un tornillo que puede ser apretado para forzar una placa metálica contra una planchuela en el carretel, que comprime el carretel contra la superficie interna de la tapa terminal. La tapa terminal incluye una abertura de acceso que permite que el tornillo, la placa metálica y la tapa terminal se suelden entre sí, evitándose de este modo que el tornillo se salga. Efectivamente, la tapa terminal y el carretel se conectan a lo largo de un solo eje, es decir, el tornillo. Los ciclos térmicos a través de un solo eje de contacto pueden provocar rotación excéntrica y desplazamiento de la placa metálica en relación con el carretel. Este desplazamiento puede aún hacer que la placa se ponga en contacto con el borde del planchuela y que se quiebre el carretel.

[0006] Otro problema que a menudo se observa en los rodillos transportadores del arte previo radica en el atascamiento. Por ejemplo, cuando el artículo transportado sea bloqueado o en caso que se trabe el sistema, el mecanismo de accionamiento seguirá andando y transmitirá un momento de torsión a la tapa terminal. En estas condiciones, el carretel cerámico o los medios de fijación se romperán. Las mismas consecuencias se observan a largo plazo cuando el rodillo transportador es sometido a una aceleración o desaceleración brusca.

[0007] Aún se necesita una tapa terminal capaz de fijarse con firmeza y centrada a un carretel cerámico dentro de un amplio rango de temperaturas de aplicación. La tapa terminal debe ser capaz de resistir un sobrecalentamiento momentáneo y recuperar su poder de sujeción cuando la temperatura vuelva a ser normal sin provocar rotación excéntrica. La tapa terminal también debe ser fácil de instalar. El rodillo transportador también debe ser capaz de soportar un atascamiento o traba temporal de la línea así como aceleraciones o desaceleraciones bruscas.

- [0008] Estos objetivos y otros se logran a través de un rodillo transportador conforme a la reivindicación 1. De hecho, el anillo de tolerancia interpuesto entre la tapa terminal y el extremo del carretel cerámico (también denominado cuello de cilindro) sujetará con firmeza el carretel en la tapa terminal y garantizará una transferencia de torque muy eficiente y evitará la rotación
- 5 excéntrica del carretel. Además, en caso de un sobrecalentamiento momentáneo, la tapa terminal y el anillo de tolerancia se expandirán térmicamente en tanto las dimensiones del carretel cerámico no se modificarán significativamente. En consecuencia, el poder de sujeción del anillo de tolerancia disminuirá y el carretel comenzará a deslizarse en la tapa terminal. Cuando la temperatura vuelva al valor normal, la tapa terminal y el anillo de tolerancia
- 10 recuperarán sus dimensiones "normales" recuperándose por completo el poder de sujeción. Es importante notar que durante este sobrecalentamiento momentáneo, el carretel permanecerá coaxial con la tapa terminal gracias al anillo de tolerancia.
- [0009] Los anillos de tolerancia han sido revelados por la Patente Estadounidense 3.061.386. Son descritos como hechos de un metal resiliente con una pluralidad de corrugaciones
- 15 dispuestas en circunferencia de una altura y paso determinados, con la altura y el paso de las corrugaciones significativamente más bajos que el diámetro del anillo. Típicamente, el paso es más bajo que el 10% del diámetro y preferiblemente más bajo que el 8% del diámetro. Típicamente, la altura es más baja que el 5 % del diámetro y preferiblemente más baja que el 3% del diámetro. La Patente Estadounidense 3.142.887 indica un método de fabricación de
- 20 tales anillos de tolerancia. Este diseño es muy particular y puede ser opuesto a una bobina de caras planas helicoidal. Debido a este diseño particular, el anillo de tolerancia exhibe una flexibilidad muy significativa. En el arte se han descrito numerosas variantes de anillos de tolerancia (alturas, pasos variables, múltiples filas de corrugaciones alineadas o desplazadas, ...), las cuales son comercializadas por varias compañías. En principio todas estas clases de
- 25 anillos de tolerancia pueden ser usadas. Es preferible contar con un anillo de tolerancia abierto que posea una longitud menor que la circunferencia interna de la tapa terminal dado que al introducirse el cuello de cilindro en la tapa terminal provista del anillo de tolerancia, debe ser capaz de adaptarse a las pequeñas variaciones de dimensiones que podrían producirse durante la fabricación del carretel o la tapa terminal. Podría ser conveniente disponer un segundo anillo
- 30 de tolerancia abierto paralelo al primero pero con un abertura desplazada en orden a mejorar la coaxialidad del carretel en la tapa terminal. Asimismo resulta muy beneficioso contar con un paso relativamente limitado (inferior a 20 mm entre dos ondas "highs") para obtener una mayor rigidez.
- [0010] Es preferible contar con corrugaciones orientadas hacia el interior de manera que en caso de deslizamiento, éste se produzca únicamente con relación a la pareja "anillo de tolerancia - tapa terminal" sin que se dañe la superficie del carretel.
- 35 [0011] De acuerdo a una realización ventajosa de la invención, al menos uno de los anillos de tolerancia está provisto de al menos una lengüeta mientras que, en paralelo, el extremo correspondiente del carretel cerámico está provisto de una o más muescas adaptadas para

recibir a la o las lengüetas del anillo de tolerancia. Esta disposición evitará el movimiento relativo en una dirección axial entre el anillo de tolerancia y la bobina. Dado que es preferible evitar la expulsión del carretel del anillo de tolerancia en especial durante un sobrecalentamiento momentáneo (es decir, cuando la presión ejercida sobre el carretel por el anillo de tolerancia es mínima), es preferible tener la o las lengüetas orientadas de modo que el extremo de aquellas coopere con la pared de la muesca más cercana al extremo del carretel. En consecuencia, el carretel sólo puede desplazarse ligeramente hacia su extremo poniéndose en contacto con la base de la tapa terminal. Si estos anillos de tolerancia provistos de estas convenientes lengüetas son montados a ambos lados del carretel, todos los desplazamientos relativos de aquél se evitan.

[0012] De acuerdo a otra realización, el anillo de tolerancia está provisto de al menos dos lengüetas teniendo una de ellas una orientación opuesta a la otra. En consecuencia, se impiden todos los desplazamientos relativos de la bobina con respecto a un solo anillo de tolerancia.

[0013] Según se ha indicado, la tapa terminal posee cierta circunferencia interna para recibir un anillo de tolerancia y un extremo de un carretel. Convenientemente, la tapa terminal está provista de un escalón en orden a limitar los movimientos relativos entre el anillo de tolerancia y ésta. De acuerdo a una realización particularmente preferida, la tapa terminal está provista de un canal adaptado para recibir el anillo de tolerancia. Por lo tanto, se impiden los desplazamientos axiales del anillo de tolerancia con relación a la tapa terminal aún en caso de un sobrecalentamiento momentáneo. Resulta especialmente conveniente combinar la presencia de las lengüetas sobre el anillo de tolerancia con el canal en la tapa terminal para evitar todo desplazamiento relativo del carretel en relación con la tapa terminal durante un sobrecalentamiento momentáneo.

[0014] De acuerdo a una realización particular de la invención, tanto la tapa terminal con el carretel cerámico reciben una marca una vez que se montan. Ambas marcas se corresponden entre sí de modo que en caso de sobrecalentamiento momentáneo y pérdida de transmisión de torque al carretel, el operador advertirá este fenómeno, solamente verificando que las marcas están desplazadas. Entonces, podría tomar las medidas necesarias.

[0015] La presente invención además se refiere a un proceso de montaje de un rodillo transportador como el descrito. Este proceso comprende los pasos de colocar un anillo de tolerancia en el casquillo de una tapa terminal y forzar cada extremo del carretel cerámico en la tapa terminal. El orden de los pasos es importante, de lo contrario la posición del anillo de tolerancia en relación con el carretel puede modificarse durante su inserción en la tapa terminal. En general, el extremo del carretel cerámico es colocado en la tapa terminal con el anillo de tolerancia con una prensa hidráulica que ejerce una presión de varios cientos de kg/cm^2 , por ejemplo 1000 kg/cm^2 .

[0016] En caso que el anillo de tolerancia esté provisto de una o más lengüetas, el proceso comprende un paso adicional de curvado de la/las lengüetas hacia el interior y alineación del carretel de manera que aquella/s concuerde/n con la/las muescas del carretel.

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[0017] El rodillo transportador de acuerdo a la invención puede ser utilizado para transportar una hoja o lámina (por ejemplo de vidrio o metal) para cualquier tipo de tratamiento térmico de aquellas o del recubrimiento aplicado sobre las mismas. Este rodillo transportador es particularmente conveniente para transportar artículos planos en un ambiente sujeto a variaciones importantes de temperatura.

[0018] En orden a explicar de una mejor manera la invención, se provee a continuación un método de implementación a modo de ejemplo no limitativo con relación a los dibujos que se acompañan

Las Figuras 1, 2, y 3 son vistas en sección esquemáticas de rodillos transportadores de acuerdo a una realización de la invención; y

La Figura 4 ilustra un gráfico del torque transmitido (Nm) vs. la temperatura (°C).

[0019] En estas figuras, la referencia 1 describe en general un rodillo transportador que comprende un carretel cerámico 2 que posee dos extremos 21 y 22. Una tapa terminal 4 con un casquillo 41 está dispuesta sobre ambos extremos del carretel 2 (sólo la tapa terminal provista en el extremo 21 es ilustrada en la Figura 1). Un anillo de tolerancia 3 se inserta en la tapa terminal 4. A tapa terminal 4 posee una superficie interna regular en la Figura 1, mientras que las Figuras 2 y 3 respectivamente ilustran una tapa terminal 4 provista de un escalón 42 o canal 43 en orden a limitar el desplazamiento del anillo de tolerancia 3 en la tapa terminal.

[0020] El anillo de tolerancia puede estar provisto de una lengüeta 31 que coopera con la pared de una muesca provista en el extremo del carretel cerámico 21. En las Figuras 1 a 3, la lengüeta coopera con la pared de la muesca más cercana al extremo 21 del carretel 2.

[0021] Se han conducido ensayos con un rodillo transportador de acuerdo a la Figura 2 en orden a demostrar la posibilidad de que el rodillo resista un sobrecalentamiento momentáneo y recupere sus condiciones operativas normales cuando la temperatura se normalice.

[0022] Un anillo de tolerancia abierto 3 con corrugaciones orientadas hacia el interior (longitud 242 mm; ancho 25 mm; altura 1.9 mm; paso 9.4 mm; acero inoxidable) se inserta en una tapa terminal 4 (acero al carbón) con un diámetro interno de 80 mm. La operación se repite para la segunda tapa terminal. Ambos extremos de un carretel 21 y 22 (diámetro 77 mm) son colocados a presión en las tapas terminales 4. Este rodillo transportador está pensado para trabajar a temperaturas que oscilen entre la marca ambiente y 200°C. El experto en el arte advertirá con facilidad a través de experimentos de rutina otras disposiciones (metales distintos que funcionen a temperaturas diversas).

[0023] La Figura 4 ilustra el torque transmitido (Nm) vs. la temperatura (°C). Puede observarse que el torque disminuye progresivamente hasta aproximadamente 300°C donde su valor es inferior a 50 Nm cuando el carretel comienza a deslizarse. Cuando la temperatura recupera la marca normal (curva descendente), el torque transmitido se incrementa rápidamente para recuperar su valor original. A partir de los 300°C, el carretel deja de deslizarse. Luego de desarmar el rodillo transportador, se ha observado que ambos extremos del carretel cerámico estaban en perfecto estado sin presentar daños derivados del sobrecalentamiento

momentáneo. La fig. 4 también demuestra (líneas discontinuas) el torque transmitido (Nm) contra la temperatura (°C) para un sistema según lo descrito por la Patente Estadounidense 5.316.129. Tal sistema se constituye de elementos relativamente largos y planos. Cuando el sistema está sujeto a calor, el torque transmitido disminuye progresivamente (curva A) hasta

5 aproximadamente 300°C alcanzándose el límite de la elasticidad del sistema. Es entonces que el torque transmitido cae dramáticamente y el rodillo comienza a deslizar en el tapa terminal. Cuando el sistema recupera a marca normal (curva B), el sistema no recupera enteramente el torque original puesto que se ha excedido el límite de la elasticidad del sistema. Cuando está

10 sujetado de nuevo a el calor y enfriar lo de nuevo (curvas C y D)), el mismo fenómeno se observa con la consecuencia que después solamente de algunos ciclos de calentamiento / enfriamiento, la transmisión del torque es interrumpida, teniéndose que substituir el rodillo transportador. Tales rodillos del transportador son claramente no convenientes para el uso en un ambiente sujeto a variaciones significativas de temperatura. Al contrario, el rodillo transportador de la invención ha demostrado ser completamente satisfactorio para un uso tan

15 exigente.

REIVINDICACIONES.

1. Un rodillo transportador (1) para aplicaciones de alta temperatura, **caracterizado porque** comprende:
 - a) un carretel cerámico (2);
 - b) en cada extremo (21,22) del carretel cerámico (2), una tapa terminal (4) que comprende un casquillo metálico (41) y que *presenta cierta circunferencia interna preparada para calzar sobre un extremo (21) del carretel cerámico; y*
 - c) interpuesto entre cada extremo (21,22) del carretel cerámico (2) y la tapa terminal (4), un anillo de tolerancia (3) abierto de metal resiliente que posee una longitud inferior a la circunferencia interna de la tapa terminal (4) con una pluralidad de corrugaciones dispuestas en circunferencia.
2. Un rodillo transportador de acuerdo a la Reivindicación 1 **caracterizado porque** el anillo de tolerancia posee un paso inferior a 20 mm.
3. Un rodillo transportador de acuerdo a la Reivindicación 1 o 2 **caracterizado porque** el anillo de tolerancia (3) es abierto y tiene una longitud menor que la circunferencia interna de la tapa terminal (4).
4. Un rodillo transportador de acuerdo a la Reivindicaciones 1 a 3 **caracterizado porque** las corrugaciones del anillo de tolerancia (24) se extienden hacia el interior.
5. Un rodillo transportador de acuerdo a la Reivindicación 3 o 4 **caracterizado porque** una pluralidad de anillos de tolerancia abiertos (3) se disponen entre cada extremo (21, 22) del carretel cerámico (2) y la tapa terminal (4), **en tanto** las aberturas de los anillos de tolerancia están desplazadas.
6. Un rodillo transportador (1) de acuerdo a cualquiera de las Reivindicaciones 1 a 5 **caracterizado porque** al menos uno de los anillos de tolerancia (3) está provisto de por lo menos una lengüeta (31) en tanto el extremo correspondiente (21) del carretel cerámico (2) está provisto de una o más muescas (211) adaptadas para recibir la/las lengüetas (31) del anillo de tolerancia (3).
7. Un rodillo transportador de acuerdo a la Reivindicación 6 **caracterizado porque** la/las lengüetas (31) están orientadas de manera que el extremo de aquellas coopere con la pared de la muesca (211) más cercana al extremo (21) del carretel (2).
8. Un rodillo transportador de acuerdo a la Reivindicación 7 **caracterizado porque** el anillo de tolerancia está provisto de por lo menos dos lengüetas en tanto una de las lengüetas posee una orientación opuesta a la otra.
9. Un rodillo transportador de acuerdo a cualquiera de las Reivindicaciones 1 a 8 **caracterizado porque** la tapa terminal está provista de un escalón (42) o un canal adaptado para recibir el anillo de tolerancia (3).

PATENT COOPERATION TREATY

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From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

To:

DEBLED, Thierry
VESUVIUS GROUP S.A.
Intellectual Property Department
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RECEIVED

23 -11- 2006

VESUVIUS
Intellectual Property Dept.

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
REPORT ON PATENTABILITY

(PCT Rule 71.1)

Date of mailing
(day/month/year)

21.11.2006

Applicant's or agent's file reference
1497 WO

IMPORTANT NOTIFICATION

International application No.
PCT/EP2006/001563

International filing date (day/month/year)
21.02.2006

Priority date (day/month/year)
22.02.2005

Applicant
VESUVIUS CRUCIBLE COMPANY et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary report on patentability and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international preliminary examining authority:



European Patent Office
D-80298 Munich
Tel. +49 89 2339 - 0 Tx: 523656 epmu d
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Authorized Officer

DE SANTIAGO GOMEZ, A

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PATENT COOPERATION TREATY
PCT
INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
 (Chapter II of the Patent Cooperation Treaty)
 (PCT Article 36 and Rule 70)

Applicant's or agent's file reference 1497 WO	FOR FURTHER ACTION See Form PCT/PEAA18	
International application No. PCT/EP2006/001563	International filing date (day/month/year) 21.02.2006	Priority date (day/month/year) 22.02.2005
International Patent Classification (IPC) or national classification and IPC INV. F27D3/02 B65G39/02 F16D1/08		
Applicant VESUVIUS CRUCIBLE COMPANY et al.		
1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of 4 sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: a. ☒ sent to the applicant and to the International Bureau a total of 2 sheets, as follows: ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions). ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box. b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).		
4. This report contains indications relating to the following items: ☒ Box No. I Basis of the report ☐ Box No. II Priority ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability ☐ Box No. IV Lack of unity of invention ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement ☐ Box No. VI Certain documents cited ☐ Box No. VII Certain defects in the international application ☐ Box No. VIII Certain observations on the international application		
Date of submission of the demand 02.10.2006	Date of completion of this report 21.11.2006	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80293 Munich Tel. +49 89 2339 - 0 Tlx 523866 epmu d Fax +49 89 2339 - 4485	Authorized officer HILLEBRAND, A Telephone No. +49 89 2339-2642	

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**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/EP2006/001563

Box No. 1 Basis of the report

1. With regard to the language, this report is based on
- ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of:
 - ☐ international search (under Rules 12.3(a) and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4(a))
 - ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a))
2. With regard to the elements* of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

Description, Pages

1-5 as originally filed

Claims, Numbers

1-11 filed with telefax on 17.10.2006

Drawings, Sheets

1, 2 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (specify):
- ☐ any table(s) related to sequence listing (specify):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (specify):
- ☐ any table(s) related to sequence listing (specify):

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY
REPORT ON PATENTABILITY
(SEPARATE SHEET)**

International application No.

PCT/EP2006/001563

Re Item V.

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

Reference is made to documents

D1: US-A-5 316 129

D2: US-A-3 061 386

The document D1 is regarded as being the closest prior art to the subject-matter of claim 1 and shows a conveyor roll for high temperature applications, made from a ceramic body and metallic end caps. Tolerance rings in the form of spring coils are interposed between body and end caps, see fig.s 1-3.

The subject-matter of claim 1 differs from this known conveyor roll in that the tolerance rings are open (see feature c)).

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as use of a roll of D1 in an high temperature environment subject to important temperature variations.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) as the available prior art does not suggest the claimed configuration for tolerance rings used in a high temperature environment.

Similar considerations apply to independent claims 9 and 11. They also involve an inventive step (Article 33(3) PCT).

Claims 2-8 and 10 are dependent claims and as such also meet the requirements of the PCT with respect to novelty and inventive step.

OK

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Claims.

1. Conveyor roll (1) for high temperature applications suitable for use in an environment subject to important temperature variations comprising
 - 5 a) a ceramic spool (2);
 - b) at each end (21,22) of the ceramic spool (2), an end cap (4) comprising a metal ferrule (41) and having a certain internal circumference adapted to fit over an end (21) of the ceramic spool; and
 - 10 c) interposed between each end (21,22) of the ceramic spool (2) and the end cap (4), an open tolerance ring (3) of resilient metal having a length lower than the internal circumference of the end cap (4) and having a plurality of circumferentially arranged corrugations.
2. Conveyor roll according to claim 1, characterized in that the tolerance ring has a pitch lower than 20 mm
- 15 3. Conveyor roll according to claims 1 or 2, characterized in that the corrugations of the tolerance ring (24) extend inwardly.
4. Conveyor roll according to claim 3, characterized in that a plurality of open tolerance rings (3) are interposed between each end (21,22) of the ceramic spool (2) and the end cap (4) and in that the openings of the tolerance rings are offset.
- 20 5. Conveyor roll (1) according to any one of claims 1 to 4, characterised in that at least one of the tolerance rings (3) is provided with at least one tab (31) and in that the corresponding end (21) of the ceramic spool (2) is provided with notch(es) (211) adapted to receive the tab(s) (31) of the tolerance ring (3).
6. Conveyor roll according to claim 5, characterised in that the tab(s) (31) is (are)
25 oriented so that the end of the tab will cooperate with the wall of the notch (211) the closest to end (21) of the spool (2).
7. Conveyor roll according to claim 6, characterised in that the tolerance ring is provided with at least two tabs and in that at least one tab has an orientation opposite to at least another tab.
- 30 8. Conveyor roll according to any one of claims 1 to 7, characterised in that the end cap is provided with a step (42) or a groove adapted to receive the tolerance ring (3).
9. Process for the assembly of a conveyor roll according to any one of claims 1 to 8, comprising the steps of
 - 35 a) fitting an open tolerance ring having a length lower than the internal circumference of the end cap in the ferrule of an end cap;
 - b) forcing each end of the ceramic spool into the end cap.

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REIVINDICACIONES.

1. Un rodillo transportador (1) para aplicaciones de alta temperatura y conveniente para el uso en un ambiente sujeto a variaciones significativas de temperatura, **caracterizado porque** comprende:
 - 5 a) un carretel cerámico (2);
 - b) en cada extremo (21, 22) del carretel cerámico (2), una tapa terminal (4) que comprende un casquillo metálico (41) y que presenta cierta circunferencia interna preparada para calzar sobre un extremo (21) del carretel cerámico; y
 - c) interpuesto entre cada extremo (21, 22) del carretel cerámico (2) y la tapa terminal (4), un
10 anillo de tolerancia (3) abierto de metal resiliente que posee una longitud inferior a la circunferencia interna de la tapa terminal (4) con una pluralidad de corrugaciones dispuestas en circunferencia.
2. Un rodillo transportador de acuerdo a la Reivindicación 1 **caracterizado porque** el anillo de tolerancia posee un paso inferior a 20 mm.
- 15 3. Un rodillo transportador de acuerdo a la Reivindicación 1 o 2 **caracterizado porque** las corrugaciones del anillo de tolerancia (24) se extienden hacia el interior.
4. Un rodillo transportador de acuerdo a la Reivindicación 3 **caracterizado porque** una pluralidad de anillos de tolerancia abiertos (3) se disponen entre cada extremo (21, 22) del carretel cerámico (2) y la tapa terminal (4), en tanto las aberturas de los anillos de
20 tolerancia están desplazadas.
5. Un rodillo transportador (1) de acuerdo a cualquiera de las Reivindicaciones 1 a 4 **caracterizado porque** al menos uno de los anillos de tolerancia (3) está provisto de por lo menos una lengüeta (31) en tanto el extremo correspondiente (21) del carretel cerámico (2) está provisto de una o más muescas (211) adaptadas para recibir la/las lengüetas (31) del
25 anillo de tolerancia (3).
6. Un rodillo transportador de acuerdo a la Reivindicación 5 **caracterizado porque** la/las lengüetas (31) están orientadas de manera que el extremo de aquellas coopere con la pared de la muesca (211) más cercana al extremo (21) del carretel (2).
7. Un rodillo transportador de acuerdo a la Reivindicación 6 **caracterizado porque** el anillo de
30 tolerancia está provisto de por lo menos dos lengüetas en tanto una de las lengüetas posee una orientación opuesta a la otra.
8. Un rodillo transportador de acuerdo a cualquiera de las Reivindicaciones 1 a 7 **caracterizado porque** la tapa terminal está provista de un escalón (42) o un canal adaptado para recibir el anillo de tolerancia (3).
- 35 9. Un proceso de montaje de un rodillo transportador de acuerdo a cualquiera de las Reivindicaciones 1 a 8, **caracterizado porque** comprende los pasos de:

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From the INTERNATIONAL BUREAU

PCT

**NOTIFICATION CONCERNING
SUBMISSION OR TRANSMITTAL
OF PRIORITY DOCUMENT**

To:

DEBLED, Thierry
Vesuvius Group S.A.
Rue de Douvrain, 17
B-7011 Ghlin
BELGIQUE

(PCT Administrative Instructions, Section 411)

Date of mailing (day/month/year) 08 May 2006 (08.05.2006)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 1497 WO	
International application No. PCT/EP2006/001563	
International filing date (day/month/year) 21 February 2006 (21.02.2006)	
International publication date (day/month/year) Not yet published	Priority date (day/month/year) 22 February 2005 (22.02.2005)
Applicant VESUVIUS CRUCIBLE COMPANY et al	

- By means of this Form, which replaces any previously issued notification concerning submission or transmittal of priority documents, the applicant is hereby notified of the date of receipt by the International Bureau of the priority document(s) relating to all earlier application(s) whose priority is claimed. Unless otherwise indicated by the letters "NR", in the right-hand column or by an asterisk appearing next to a date of receipt, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
- (If applicable) The letters "NR" appearing in the right-hand column denote a priority document which, on the date of mailing of this Form, had not yet been received by the International Bureau under Rule 17.1(a) or (b). Where, under Rule 17.1(a), the priority document must be submitted by the applicant to the receiving Office or the International Bureau, but the applicant fails to submit the priority document within the applicable time limit under that Rule, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
- (If applicable) An asterisk (*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b) (the priority document was received after the time limit prescribed in Rule 17.1(a) or the request to prepare and transmit the priority document was submitted to the receiving Office after the applicable time limit under Rule 17.1(b)). Even though the priority document was not furnished in compliance with Rule 17.1(a) or (b), the International Bureau will nevertheless transmit a copy of the document to the designated Offices, for their consideration. In case such a copy is not accepted by the designated Office as the priority document, Rule 17.1(c) provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

Priority date	Priority application No.	Country or regional Office or PCT receiving Office	Date of receipt of priority document
22 February 2005 (22.02.2005)	05447040.6	EP	23 March 2006 (23.03.2006)

The International Bureau of WIPO
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Form PCT/IB/304 (October 2005)

CUCGRG7B

45

PATENT COOPERATION TREATY

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From the
INTERNATIONAL SEARCHING AUTHORITY

To: see form PCT/ISA/220

PCT

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43bis.1)**

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference see form PCT/ISA/220	FOR FURTHER ACTION See paragraph 2 below
International application No. PCT/EP2006/001563	International filing date (day/month/year) 21.02.2006
Priority date (day/month/year) 22.02.2005	
International Patent Classification (IPC) or both national classification and IPC INV. F27D3/02 B65G39/02 F16D1/08	
Applicant VESUVIUS CRUCIBLE COMPANY	

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:  European Patent Office D-80298 Munich Tel. +49 89 2369 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4405	Date of completion of this opinion see form PCT/ISA/210	Authorized Officer Hillebrand, A Telephone No. +49 89 2399-2642
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X

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/EP2006/001563

Box No. 1 Basis of the opinion

1. With regard to the language, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ on paper
 - ☐ in electronic form
 - c. time of filing/furnishing:
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in electronic form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING
AUTHORITY (SEPARATE SHEET)**

International application No.

PCT/EP2006/001563

Re Item V.

1. The conveyor roll for high temperature applications, known from the document D1=US5316129, forms the closest prior art. The roll D1 is made up from a ceramic body and two metallic end caps, see fig.1 and col.4 l.61 - col.5 l.49. For connecting the components, hexagonal spring coils are interposed between the body and the end caps. These spring coils obviously perform the function of tolerance rings and may be regarded as corrugated due to their particular cross sectional shape (see particularly col.5 l.50 - col.6 l.21 and figure 5). In summary, the roll of D1 anticipates all the features of the conveyor roll of claim 1, which therefore lacks novelty (Article 33(2) PCT).

Dependent claims 2, 3, 4, 9 and 12 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT with respect to novelty or inventive step. The groove of claim 9 is already known from D1, see the step formed by the threads in figures 4 and 6. Also the use of ceramic rolls in environment with temperature variations according to claim 12 is known from D1, see use in the vicinity of a furnace for glass sheets. The additional features of claims 3 and 4 are known from the tolerance ring shown in document D2=US3061386; open design of the ring - fig. 5A; corrugations - fig. 2 and 8 (there are inward and outward corrugations). The additional features of claim 2 are deemed a usual design option.

Box No. VII (iv) DECLARATION: INVENTORSHIP (only for the purposes of the designation of the United States of America)
The declaration must conform to the following standardized wording provided for in Section 21-4; see Notes to Boxes Nos. VII, VIII (i) to (iv) (in general) and the specific Notes to Box No. VII (iv). If this Box is not used, this sheet should not be included in the request.

Declaration of inventorship (Rules 4.17(iv) and 51bis.1(a)(iv))
 for the purposes of the designation of the United States of America

I hereby declare that I believe I am the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventor of the subject matter which is claimed and for which a patent is sought.

This declaration is directed to the international application of which it forms a part (if filing declaration with application).

This declaration is directed to international application No. PCT/..... (if furnishing declaration pursuant to Rule 26ter).

I hereby declare that my residence, mailing address, and citizenship are as stated next to my name.

I hereby state that I have reviewed and understand the contents of the above-identified international application, including the claims of said application. I have identified in the request of said application, in compliance with PCT Rule 4.10, my claim to foreign priority, and I have identified below, under the heading "Prior Applications," by application number, country or Member of the World Trade Organization, day, month and year of filing, my application for a patent or inventor's certificate filed in a country other than the United States of America, including any PCT international application designating at least one country other than the United States of America, having a filing date before that of the application on which foreign priority is claimed.

Prior Applications: 06447040.6 EP, February 22, 2006

I hereby acknowledge the duty to disclose information that is known by me to be material to patentability as defined by 37 C.F.R. § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the PCT international filing date of the continuation-in-part application.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name: GAUTIER David

Residence: Feignies FR
 (city and either US state, if applicable, or country)

Mailing Address: 32 Rue Drombois
 F-59750 Feignies

Citizenship: French

Inventor's Signature: 
 (The signature must be that of the inventor, not that of the agent)

Date: 08/02/06

Name: FLAMME Armand

Residence: Saint-Remy-Du-Nord, FR
 (city and either US state, if applicable, or country)

Mailing Address: 71 Route d'Autoye
 F-59330 Saint-Remy-Du-Nord

Citizenship: French

Inventor's Signature: 
 (The signature must be that of the inventor, not that of the agent)

Date: 07/02/06

☐ This declaration is continued on the following sheet, "Continuation of Box No. VII (iv)".

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Box No. VIII (B) DECLARATION: ENTITLEMENT TO APPLY FOR AND BE GRANTED A PATENT

The declaration must conform to the standardized wording provided for in Section 212; see Notes to Boxes Nos. VIII, VIII (i) to (v) (in general) and the specific Notes to Box No. VIII (B). If this Box is not used, this sheet should not be included in the request.

Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent (Rules 4.17(ii) and 51bis.1(a)(ii)), in a case where the declaration under Rule 4.17(iv) is not appropriate:

VESUVIUS CRUCIBLE COMPANY is entitled to apply for and be granted a patent by virtue of the following:

an assignment from

GAUTIER David, 32 Rue Drombois, F-59750 Felgnies, France.

FLAMME Arnaud, 71 Route d'Aulnoye, F-59330 Saint-Remy-Du-Nord, France.

This declaration is made for the purposes of all designations, except the designation of the United States of America.

☐ This declaration is continued on the following sheet, "Continuation of Box No. VIII (B)".

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Box No. VIII (H) DECLARATION: ENTITLEMENT TO CLAIM PRIORITY

The declaration must conform to the standardized wording provided for in Section 213; see Notes to Boxes Nos. VII, VIII (I) to (G) (in general) and the specific Notes to Box No. VIII (H). If this Box is not used, this sheet should not be included in the request.

Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application specified below, where the applicant is not the applicant who filed the earlier application or where the applicant's name has changed since the filing of the earlier application (Rules 4.17(H) and 51bis.1(a)(H)):

In relation to this international application,

VESUVIUS CRUCIBLE COMPANY is entitled to claim priority of earlier application:

No. 05447040.6

by virtue of the following:

an assignment from GAUTIER DAVID, FLAMME ARNAUD dated February 22, 2005.

This declaration is made for the purposes of all designations, except the designation of the United States of America.

☐ This declaration is continued on the following sheet, "Continuation of Box No. VIII (H)".

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No. 07-096486-00000-0000

Fecha: 2007-09-18 16:35:03 Dep. 2020 NUECREACION
Tra. 11 PATENTLIYI: Lva: 379 FASENACIONAL
Act 411 PRESENTACION Folios: 53**Industria y Comercio**
SUPERINTENDENCIA**REQUISITOS MINIMOS PARA ADMISION A TRAMITE**
PCTPATENTE DE INVENCION ☒MODELO DE UTILIDAD ☐

- ◆ Indicación de que se solicita la concesión de una patente ☒
- ◆ Datos de identificación del solicitante o de la persona que presenta la solicitud ☒
- ◆ Descripción de la invención ☒
- ◆ Dibujos de ser estos pertinentes ☒
- ◆ Comprobante de pago de las tasas establecidas ☒

COMPLETA ☒INCOMPLETA ☐DISEÑO INDUSTRIAL ☐

- ◆ Indicación de que se solicita el registro de Diseño Industrial ☐
- ◆ Datos de identificación del solicitante o de la persona que presenta la solicitud ☐
- ◆ Representación gráfica y fotográfica del Diseño Industrial o muestra del material que incorpora el diseño ☐
- ◆ Comprobante de pago de las tasas establecidas ☐

COMPLETA ☐INCOMPLETA ☐ESQUEMA DE TRAZADO ☐

- ◆ Indicación de que se solicita el registro de un Esquema de Trazado ☐
- ◆ Datos de identificación del solicitante o de la persona que presenta la solicitud ☐
- ◆ Representación gráfica del esquema trazado ☐
- ◆ Comprobante de pago de las tasas establecidas ☐

COMPLETA ☐INCOMPLETA ☐Firma Responsable 

Fecha _____

Carrera 13 No. 27-00 Piso 5, 7 y 10
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www.slc.gov.co
Bogotá, D.C., Colombia

55

REPUBLICA DE COLOMBIA
SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

Folio 55

2020

Bogotá D.C.,

Doctor(a)

RODRIGUEZ DALEMAN DILIA MARIA

Apoderado(a) y/o Representante de
VESUVIUS GROUP S.A

REFERENCIA

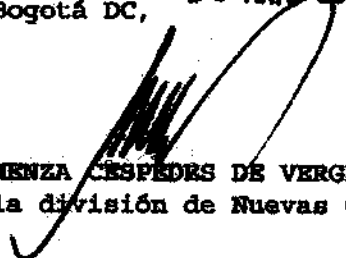
Radicación No.	7 96486
Solicitud internacional	PCT/EP2006/001563
Fecha inicio fase nacional	22/09/2007
Trámite	11
Evento	379
Actuación	416
Oficio No.	6168
Folios	1

Teniendo en cuenta que la solicitud de privilegio de patente que se tramita bajo el expediente indicado en la referencia, reúne los requisitos de forma establecidos en la Decisión 486 de la Comisión de la Comunidad Andina, el Tratado de Cooperación en Materia de Patentes (PCT), el Reglamento y la Circular Única de la Superintendencia de Industria y Comercio, se envía el extracto de la solicitud a la Oficina de Comunicaciones para efecto de su publicación en la Gaceta de Propiedad Industrial.

Cúmplase

Dado en Bogotá DC,

29 MAYO 2008


ALIX CARMENZA CESPEDRS DE VERGEL
Jefe de la división de Nuevas Creaciones

jfernand