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ABOGADOS

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Señora Directora
DIRECCION DE NUEVAS CREACIONES
Superintendencia de Industria y Comercio
E. S. D.

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



No. 10-121086- -00002-0000

Fecha: 2010-11-30 11:03:00 Dep. 2020 DIR.NUEVASCR
Tra. 2 PATENTES Eve: 1 REGDEPOSITO
Act. 444 RESPUESTAREQUE Folios: 53

Trámite : 002
Evento : 001
Actuación : 444

Referencia : Expediente No. 10.121.086
Asunto : Solicitud de patente para **ALIMENTACION OXIDATIVA PRIMARIA A LECHO FLUIDIZADO CIRCULANTE OXI - INCINERADO**
Solicitante : **BABCOCK & WILCOX POWER GENERATION GROUP, INC**
Clase : B01J 008/000
Fecha de Solicitud : 30 de septiembre de 2010

CONTESTACION OFICIO No. 13993

1. Yo, Luz Clemencia de PAEZ, en mi condición de apoderada de la sociedad solicitante, **BABCOCK & WILCOX POWER GENERATION GROUP, INC**, doy contestación dentro de la prorroga solicitada al requerimiento efectuado por este Despacho mediante Oficio No. **13993** notificado por fijación en lista el 28 de octubre de 2010, para lo cual presento los siguientes documentos:

1.1. Un (1) documento en que consta la cesión del derecho a la patente efectuado por los cuatro (4) inventores en favor de la sociedad **BABCOCK & WILCOX POWER GENERATION GROUP, INC**.

Se presenta este documento en copia certificada del original que fue debidamente suscrito, notariado y legalizado por Apostille, junto con su correspondiente traducción oficial al español.

1.2. **Prioridad:** Adicionalmente, presento con este escrito copia certificada de la solicitud de patente No. 12/571,187 presentada en Estados Unidos de América el 30 de septiembre de 2009, de la cual se reclama prioridad en esta solicitud de patente, junto con la correspondiente traducción al español.

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2. De acuerdo con lo anterior, comedidamente solicito a Usted proseguir con el trámite de este asunto y ordenar la publicación de la solicitud de la patente identificada en la referencia.

Señora Directora,



LUZ CLEMENCIA DE PAEZ

C.C. 35.456.344 de Usaquén

T.P.A. No. 23.555

COLO-16645-801-005-4
SDC\SCT\ID-182993\WPC16645
No. M-2010-182993\SDC

85

APOSTILLE

(Convention de La Haye du 5 octobre 1961)

1. Country: United States of America

This public document

2. has been signed by N. Williams

3. acting in the capacity of Certifying Officer

4. bears the seal/stamp of U.S. Patent and Trademark Office

Certified

5. at Washington, D.C.

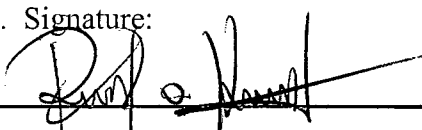
6. the thirtieth of September, 2010

7. by Assistant Authentication Officer, United States Department of State

8. No. 10043581-5

9. Seal/Stamp:

10. Signature:



Patrick O. Hatchett

A 7258338



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

September 17, 2010

THIS IS TO CERTIFY THAT ANNEXED IS A TRUE COPY FROM THE
RECORDS OF THIS OFFICE OF A DOCUMENT RECORDED ON
OCTOBER 26, 2009.

By Authority of the
Under Secretary of Commerce for Intellectual Property
and Director of the United States Patent and Trademark Office


N. WILLIAMS
Certifying Officer



PATENT ASSIGNMENT

Electronic Version v1.1
Stylesheet Version v1.1

SUBMISSION TYPE:	NEW ASSIGNMENT										
NATURE OF CONVEYANCE:	ASSIGNMENT										
CONVEYING PARTY DATA											
<table border="1"><thead><tr><th>Name</th><th>Execution Date</th></tr></thead><tbody><tr><td>Mikhail Maryamchik</td><td>10/07/2009</td></tr><tr><td>Mark C. Godden</td><td>10/07/2009</td></tr><tr><td>Kiplin C. Alexander</td><td>10/07/2009</td></tr><tr><td>David L. Kraft</td><td>10/07/2009</td></tr></tbody></table>		Name	Execution Date	Mikhail Maryamchik	10/07/2009	Mark C. Godden	10/07/2009	Kiplin C. Alexander	10/07/2009	David L. Kraft	10/07/2009
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Kiplin C. Alexander	10/07/2009										
David L. Kraft	10/07/2009										
RECEIVING PARTY DATA											
<table border="1"><tr><td>Name:</td><td>Babcock & Wilcox Power Generation Group, Inc.</td></tr><tr><td>Street Address:</td><td>20 S. Van Buren Avenue</td></tr><tr><td>City:</td><td>Barberton</td></tr><tr><td>State/Country:</td><td>OHIO</td></tr><tr><td>Postal Code:</td><td>44203</td></tr></table>		Name:	Babcock & Wilcox Power Generation Group, Inc.	Street Address:	20 S. Van Buren Avenue	City:	Barberton	State/Country:	OHIO	Postal Code:	44203
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PROPERTY NUMBERS Total: 1											
<table border="1"><thead><tr><th>Property Type</th><th>Number</th></tr></thead><tbody><tr><td>Application Number:</td><td>12571187</td></tr></tbody></table>		Property Type	Number	Application Number:	12571187						
Property Type	Number										
Application Number:	12571187										
CORRESPONDENCE DATA											
Fax Number: (330)860-6609 <i>Correspondence will be sent via US Mail when the fax attempt is unsuccessful.</i>											
Phone: 330-860-6605											
Email: cmahoney@babcock.com											
Correspondent Name: BABCOCK & WILCOX POWER GENERATION GROUP,											
Address Line 1: PATENT DEPARTMENT											
Address Line 2: 20 SOUTH VAN BUREN AVENUE											
Address Line 4: BARBERTON, OHIO 44203											
ATTORNEY DOCKET NUMBER:	7283										
NAME OF SUBMITTER:	Carolyn Mahoney										
Total Attachments: 3											

500997173

PATENT
REEL: 023420 FRAME: 0446

CH \$40.00 12571187

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source=executed_assignment#page3.tif

PATENT
REEL: 023420 FRAME: 0447

69

THIS ASSIGNMENT made the 7th day of October, 2009, by MIKHAIL MARYAMCHIK, residing at 3800 Rosemount Blvd. #113D, Fairlawn, Ohio 44333; and by KIPLIN C. ALEXANDER, residing at 476 Rolling Hills Drive, Wadsworth, Ohio 44281; and by MARK C. GODDEN, residing at 2359 Sesame Street NW, Mogadore, Ohio 44260; and by DAVID L. KRAFT, residing at 5882 Great Court Circle NW, Massillon, Ohio 44646, all citizens of the United States of America;

WITNESSETH: That

WHEREAS, we are the joint inventors of a certain new and useful improvement and invention in

**PRIMARY OXIDANT FEED TO OXY-FIRED
CIRCULATING FLUIDIZED BED (CFB)**

for which we have prepared and filed an application for Letters Patent of the United States on the 30th day of September, 2009, and

WHEREAS, BABCOCK & WILCOX POWER GENERATION GROUP, INC., a Corporation organized under the laws of the state of Delaware, U.S.A., and having its principal office at 20 S. Van Buren Ave., Barberton, Ohio, U.S.A., is desirous of acquiring the entire right, title, and interest in and to said improvement and invention, and any and all Letters Patent which shall be granted therefor;

NOW, THEREFORE, To All Whom It May Concern, be it known that for and in consideration of the sum of One Dollar (\$1.00) to us in hand paid, and other good and valuable considerations, the receipt of which is hereby acknowledged, we, MIKHAIL MARYAMCHIK, KIPLIN C. ALEXANDER, MARK C. GODDEN and DAVID L. KRAFT, have sold, assigned, transferred and set over, and by these presents do sell, assign, transfer and set over, unto said BABCOCK & WILCOX POWER GENERATION GROUP, INC., its successors and assigns, the entire right, title, and interest in and to the above-mentioned improvement, invention, and application for Letters Patent therefor, and in and to any and all Letters Patent of the United States which may hereinafter be granted therefor, and in and to any and all extensions, divisions, or reissues of said Letters Patent, the same to be held and enjoyed by said BABCOCK & WILCOX POWER GENERATION GROUP, INC., for its own use and behoof, and the use and behoof of its successors and assigns, to the full end of the term for which said Letters Patent may be granted, as fully and entirely as the same

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ASSIGNMENT TO BABCOCK & WILCOX POWER GENERATION GROUP, INC.

CASE 7283

would have been held and enjoyed by us had this assignment and sale not been made;

AND, for the consideration aforesaid, we hereby covenant and agree with said BABCOCK & WILCOX POWER GENERATION GROUP, INC., its successors and assigns, that at the time of the execution and delivery of these presents, we are the joint and lawful owners of the entire right, title, and interest in and to the above-mentioned improvement, invention, application, and Letters Patent above mentioned, and that the same are unencumbered, and that we have good right and lawful authority to sell and convey the same in the manner herein set forth;

AND, for the consideration aforesaid, we hereby covenant and agree with said BABCOCK & WILCOX POWER GENERATION GROUP, INC., its successors and assigns, that we will, whenever its counsel or the counsel of its successors or assigns, learned in the law, shall advise that an amendment or division or any other proceeding in connection with said application, including interference proceedings, is lawful and desirable or that a reissue or extension of said Letters Patent is lawful and desirable, sign all papers and drawings, take all rightful oaths, and do all acts necessary or required to be done for the procurement of valid Letters Patent for said improvement and invention, or for the reissue or extension of same, without charge to said BABCOCK & WILCOX POWER GENERATION GROUP, INC., or its successors or assigns, but at its or their expense.

We hereby request the Honorable Commissioner of Patents and Trademarks of the United States to issue the Letters Patent in accordance with this instrument.

AND, for the consideration aforesaid, we have sold, assigned, transferred and set over, and by these presents do sell, assign, transfer and set over, unto said BABCOCK & WILCOX POWER GENERATION GROUP, INC., its successors, assigns, or nominees, the entire right, title, and interest in and to any and all Letters Patent or other form of protection which may be granted in countries foreign to the United States, or other form of protection which may be granted and in and to any and all applications for Letters Patent or other form of protection which may be filed for said improvement and invention in countries foreign to the United States, including all rights to claim priority, and in and to the invention described in said applications; and we hereby authorize and empower said BABCOCK & WILCOX

ASSIGNMENT TO BABCOCK & WILCOX POWER GENERATION GROUP, INC.

CASE 7283

POWER GENERATION GROUP, INC., its successors, assigns, or nominees, to apply for Letters Patent, or other form of protection, on said improvement and invention, in its own name or in the name of its successors, assigns, or nominees, in any and all countries where it may desire to file such applications and where such applications may be filed by another other than the inventors; and we hereby covenant and agree to sign all papers and drawings, take all rightful oaths, and do all acts necessary or required to be done for the procurement of valid Letters Patent, or other form of protection, for said improvement and invention in countries foreign to the United States, and for further investing or confirming the right and title thereto in said BABCOCK & WILCOX POWER GENERATION GROUP, INC., its successors, assigns, or nominees, without charge to said BABCOCK & WILCOX POWER GENERATION GROUP, INC., its successors, assigns, or nominees, but at its or their expense.

IN WITNESS WHEREOF, we have hereunto set our hands and seal on the day and year first above written.

Mikhail Maryamchik
MIKHAIL MARYAMCHIK

Mark C. Godden
MARK C. GODDEN

Kiplin C. Alexander
KIPLIN C. ALEXANDER

David L. Kraft
DAVID L. KRAFT

WITNESSES:

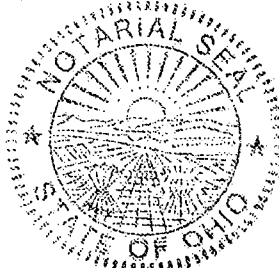
Carolyn Mahoney

Amy M. Salis

STATE OF Ohio)
COUNTY OF Summit) ss.

On this, the 7th day of October, 2009, before me personally appeared Mikhail Maryamchik, Kiplin C. Alexander, Mark C. Godden, and David L. Kraft, me known and known to me to be the persons described in and who executed the foregoing instrument; and they acknowledged to me that they executed the same for the purpose therein stated.

SEAL



AMY M. SALIS
Notary Public, State of Ohio
Stark County
My Commission Expires Dec. 19, 2010

TRADUCCIÓN OFICIAL NO.816/2010

EL TEXTO QUE SIGUE ES TRADUCCIÓN FIEL Y COMPLETA DE UN DOCUMENTO ESCRITO EN INGLES; LLEVA SELLO Y FIRMA DE HELENA URIBE DE LEMOINE, TRADUCTORA E INTERPRETE OFICIAL, SEGÚN RESOLUCION No. 3618 EXPEDIDA POR EL MINISTERIO DE JUSTICIA EL 6 DE SEPT. DE 1972.

ESTADOS UNIDOS DE AMERICA

A QUIEN CORRESPONDA, SALUDA Y HACE SABER:

**DEPARTAMENTO DE COMERCIO DE LOS ESTADOS UNIDOS
OFICINA DE PATENTES Y MARCAS COMERCIALES
DE LOS ESTADOS UNIDOS**

17 DE SEPTIEMBRE DE 2010

POR MEDIO DEL PRESENTE CERTIFICAMOS QUE EL DOCUMENTO ADJUNTO ES UNA COPIA FIDEDIGNA Y CORRECTA DE LOS REGISTROS DE ESTE DESPACHO Y SE RELACIONA CON EL DOCUMENTO RADICADO EL 26 DE OCTUBRE DE 2009.

POR AUTORIZACIÓN DEL SUB-SECRETARIO DE COMERCIO PARA LA PROPIEDAD INTELECTUAL Y DIRECTOR DE LA OFICINA DE MARCAS COMERCIALES Y PATENTES DE LOS ESTADOS UNIDOS.

FIRMADO: **N. WILLIAMS**, FUNCIONARIO CERTIFICADOR
HAY SELLO DE LA OFICINA DE MARCAS COMERCIALES Y PATENTES DE
LOS ESTADOS UNIDOS DE AMERICA.



APOSTILLA

CONVENIO DE LA HAYA DEL 5 DE OCTUBRE DE 1961

1. PAÍS: ESTADOS UNIDOS DE AMÉRICA

EL PRESENTE DOCUMENTO PÚBLICO

2. HA SIDO FIRMADO POR: **N. WILLIAMS**
3. ACTUANDO EN SU CAPACIDAD DE: **FUNCIONARIO CERTIFICADOR**
4. LLEVA EL SELLO DE: OFICINA DE PATENTES Y MARCAS DE LOS
ESTADOS UNIDOS

CERTIFICADO

5. EN: WASHINGTON, D.C.
6. EL: 13 DE SEPTIEMBRE DE 2010
7. POR: FUNCIONARIO ASISTENTE DE AUTENTICACIONES DEL
DEPARTAMENTO DE ESTADO, ESTADOS UNIDOS
8. BAJO EL NO.: **10044681-5**
9. SELLO: DEPARTAMENTO DE ESTADO, ESTADOS UNIDOS DE AMÉRICA
10. FIRMADO: PATRICK O. HATCHETT

LA TRADUCTORA OFICIAL

HELENA URIBE DE LEMOINE



2010 OCT 28 A 9:28
JEFE DE LEGALIZACIONES
BOGOTÁ D.C.

MINISTERIO DE
RELACIONES EXTERIORES

036471
#4681-5
CUYA FIRMA APARECE EN EL
DOCUMENTO DESEMPENA
AS FUNCIONES INDICADAS

NO SE ASUME
RESPONSABILIDAD
DEL TEXTO

TRADUCCIÓN OFICIAL NO.816/2010

CESIÓN DE PATENTE

Versión Electrónica v1.1

Versión Impresa v1.1

TIPO DE PRESENTACIÓN	NUEVA CESIÓN
NATURALEZA DEL TRASPASO	CESIÓN

DATOS DE LA PARTE CEDENTE

NOMBRE	FECHA DE EJECUCIÓN
MIKHAIL MARYAMCHIK	10/07/2009
MARK C. GODDEN	10/07/2009
KIPLIN C. ALEXANDER	10/07/2009
DAVID L. KRAFT	10/07/2009

DATOS DE LA PARTE RECEPTORA

Nombre:	BABCOCK & WILCOX POWER GENERATION GROUP, INC.
Dirección	20. S. VAN BUREN AVENUE
CIUDAD	BARBERTON
ESTADO	OHIO
CÓDIGO POSTAL	44203

TOTAL NÚMEROS DE PROPIEDAD: 1

Tipo de Propiedad	Número
Número de solicitud	12571187

DATOS PARA LA CORRESPONDENCIA

Número de Fax: (330) 880 6609

La correspondencia será enviada por la oficina postal de los Estados Unidos cuando el envío por fax no sea posible.

Teléfono: 330 860 6605

Email: cmahoney@babcock.com

Nombre del Corresponsal: BABCOCK & WILCOX POWER GENERATION GROUP

Dirección Línea 1: DEPARTAMENTO DE PATENTES

Dirección Línea 2: 20 SOUTH VAN BUREN AVENUE

Dirección Línea 3: BARBERTON, OHIO 44203

NUMERO DEL EXPEDIENTE	7283
NOMBRE DEL PRESENTADOR:	CAROLYN MAHONEY

TOTAL ANEXOS: 3

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500997173

ROLLO: 023420 - MICROFICHA: 0446



TRADUCCIÓN OFICIAL NO.816/2010

CESIÓN A BABCOCK & WILCOX POWER GENERATION GROUP, INC.

CASOS 7283

LA PRESENTE CESIÓN se celebra el día 7 de Octubre de 2009 por MIKHAIL MARYAMCHIK, residente en 3800 Rosemount Blvd. #113D, Fairlawn, Ohio 44333; y por KIPLIN C. ALEXANDER, residente en 476 Rolling Hills Drive, Wadsworth, Ohio 44281; y por MARK C. GODDEN, residente en 2359 Sesame Street NW Mogadore, Ohio 44260; y por DAVID L. KRAFT, residente en 5882 Great Court Circle NW, Massillon, Ohio 44646, todos ellos ciudadanos de los Estados Unidos de América.

CONSIDERANDO

Que todos nosotros somos los inventores conjuntos de una cierta nueva y útil mejora e invención de

**ALIMENTACIÓN PRIMARIA DE OXIDANTE PARA UN LECHO FLUIDIZADO
CIRCULANTE DE OXI-COMBUSTIÓN**

Para la cual se preparó y se radicó la Solicitud de Patente en los Estados Unidos, el **30 de Septiembre de 2009** y

Que **BABCOCK & WILCOX POWER GENERATION GROUP, INC.**, una corporación constituida bajo las leyes del Estado de Delaware, Estados Unidos de América, que tiene su oficina principal en 20 S. Van Buren Ave., Barberton, Ohio, U.S.A., desea adquirir el derecho, título e interés total en dicha mejora e invención y todas las Cartas de Patentes que sean otorgadas bajo la misma;

POR LO TANTO, nos permitimos informar a todos los interesados que en consideración a la suma de Un Dólar (US1.00) que reconocemos nos ha sido pagada y a otras buenas y valiosas consideraciones, cuyo recibo y suficiencia por el presente nosotros **MIKHAIL MARYAMCHIK, KIPLIN C. ALEXANDER, MARK**



TRADUCCIÓN OFICIAL NO.816/2010

C. GODDEN y DAVID L. KRAFT,, hemos vendido, cedido, transferido y traspasado y por los presentes vendemos, cedemos, transferimos y traspasamos a la mencionada **BABCOCK & WILCOX POWER GENERATION GROUP, INC.**, a sus sucesores y cesionarios, el derecho, título e interés total sobre las arriba mencionadas mejora, invención, y solicitudes de patente correspondientes y sobre todas las Cartas de Patentes de los Estados Unidos que puedan ser otorgadas de aquí en adelante a éste respecto, y todas las extensiones, divisiones o reemisiones de dichas Cartas de Patentes para que las mismas sean poseídas y disfrutadas por la mencionada **BABCOCK & WILCOX POWER GENERATION GROUP, INC.**, para su propio uso y disfrute y el uso y disfrute de sus sucesores y cesionarios hasta el final del término para el cual dichas cartas de Patentes sean otorgadas tan plena y totalmente como si las mismas hubiesen sido poseídas y disfrutadas por nosotros si la presente Cesión y venta no se hubiese efectuado;

Y por la consideración arriba mencionada por medio del presente aceptamos y acordamos con la mencionada **BABCOCK & WILCOX POWER GENERATION GROUP, INC.**, sus sucesores y cesionarios, que en el momento de la ejecución y entrega de las presentes somos los propietarios conjuntos y legales del derecho, título e interés total en la mejora, invención y solicitud arriba mencionadas, las Cartas de Patentes arriba mencionadas y que las mismas no han sido pignoradas y que nosotros poseemos el pleno derecho y la autoridad legal de vender y traspasar las mismas en la forma estipulada aquí;

Y por la consideración arriba mencionada declaramos y acordamos con la mencionada **BABCOCK & WILCOX POWER GENERATION GROUP, INC.**, sus sucesores y cesionarios, que nosotros, cuando sus asesores legales o los de sus sucesores o cesionarios, doctos en leyes, consideren que es legal y deseable efectuar una modificación o división o cualquier otro proceso en relación con dicha solicitud, incluyendo los procesos de interferencia, o que es legal y deseable la



TRADUCCIÓN OFICIAL NO.816/2010

reemisión o prórroga de dichas Cartas de Patentes, firmaremos todos los documentos y diseños, tomaremos todos los juramentos y efectuaremos todos los actos que sean necesarios o requeridos para obtener Cartas de Patentes válidas para dicha mejora e invento o para la reemisión o prórroga de las mismas sin cargo alguno para **BABCOCK & WILCOX POWER GENERATION GROUP, INC.** o sus sucesores o cesionarios, pero por propia cuenta y gasto de los mismos;

Por medio del presente solicitamos al Honorable Comisionado de Patentes y Marcas Comerciales de los Estados Unidos que expida las Cartas de Patente de conformidad con el presente Instrumento;

Y, por la consideración arriba mencionada hemos vendido, cedido, transferido y traspasado y por los presentes vendemos, cedemos, transferimos y traspasamos a la mencionada **BABCOCK & WILCOX POWER GENERATION GROUP, INC.**, a sus sucesores y cesionarios, o a sus respectivos nombrados el derecho, título e interés total en las mencionadas Cartas de Patentes o cualquier otra forma de protección que pueda ser otorgada en países distintos a los Estados Unidos o cualquier otra forma de protección que pueda ser otorgada así como para todas las solicitudes de Cartas de Patentes u otra forma de protección que pueda ser radicada para dicha mejora e invención en países distintos a los Estados Unidos, incluyendo todos los derechos de reclamar prioridad sobre el invento descrito y dichas solicitudes; y por medio del presente autorizamos y facultamos a la mencionada **BABCOCK & WILCOX POWER GENERATION GROUP, INC.**, a sus sucesores y cesionarios, o personas nombradas que soliciten las Cartas de Patentes u otras formas de protección sobre dicha mejora e invento en su propio nombre y a nombre de sus sucesores, cesionarios o personas nombradas en todos los países en donde pueda desearse radicar dicha solicitudes y en donde dichas solicitudes puedan ser radicadas por alguien distinto a los inventores y por medio del presente nos comprometemos y aceptamos firmar todos los



TRADUCCIÓN OFICIAL NO.816/2010

documentos y diseños, tomar todos los juramentos pertinentes y hacer todos los actos necesarios o que se requiera hacer para procurarse Cartas de Patentes válidas u otras formas de protección para dicha mejora e invento, en países distintos a los Estados Unidos y para investigar o confirmar con mayor extensión el derecho y título sobre los mismos a **BABCOCK & WILCOX POWER GENERATION GROUP, INC.**, sus sucesores, cesionarios o personas nombradas sin cargo alguno para la mencionada **BABCOCK & WILCOX POWER GENERATION GROUP, INC.**, sus sucesores, cesionarios o personas nombradas pero por cuenta de éstos.

En testimonio de lo anterior firmamos y ponemos el sello el día y el año que se especificó al inicio de éste documento.

FIRMADO: MIKHAIL MARYAMCHIK

FIRMADO: MARK C. GODDEN

FIRMADO: KIPLIN C. ALEXANDER

FIRMADO: DAVID L. KRAFT

TESTIGOS:

FIRMADO: Carolyn Mahoney

FIRMADO: Amy M. Saus



TRADUCCIÓN OFICIAL NO.816/2010

ESTADO DE OHIO

CONDADO DE SUMMIT

A LOS 7 DÍAS DEL MES DE OCTUBRE DE 2009 ANTE MI PERSONALMENTE
COMPARECIERON MIKHAIL MARYAMCHIK, KIPLIN C. ALEXANDER, MARK C.
GODDEN y DAVID L. KRAFT, A QUIENES CONOZCO Y SE QUE SON LAS
PERSONAS DESCRITAS Y QUIENES EJECUTARON EL ANTERIOR
INSTRUMENTO, Y RECONOCIERON ANTE MI, QUE EJECUTARON EL MISMO
PARA LOS FINES ALLI ESPECIFICADOS.

FIRMADO: AMY M. SAUS, NOTARIO PÚBLICO, ESTADO DE OHIO CONDADO
DE STARK, CON COMISIÓN HASTA EL 19 DE DICIEMBRE DE 2010.

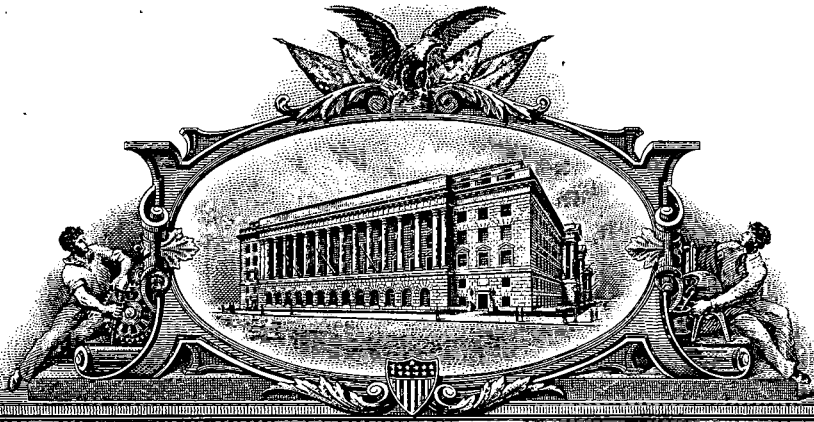
HAY SELLO DEL NOTARIO.

PATENTE

REGISTRADO: 10/26/2009

CARRETE: 023420 MICROFICHA: 0450





THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office

September 14, 2010

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM
THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK
OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT
APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A
FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: *12/571,187*

FILING DATE: *September 30, 2009*

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY
APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS
CONVENTION, IS *US12/571,187*

By Authority of the
Under Secretary of Commerce for Intellectual Property
and Director of the United States Patent and Trademark Office



P. SWAIN
Certifying Officer

82
X

Electronic Acknowledgement Receipt

EFS ID:	6181201
Application Number:	12571187
International Application Number:	
Confirmation Number:	1541
Title of Invention:	PRIMARY OXIDANT FEED TO OXY-FIRED CIRCULATING FLUIDIZED BED (CFB)
First Named Inventor/Applicant Name:	MIKHAIL MARYAMCHIK
Customer Number:	41669
Filer:	Eric Marich
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1		7283appl.pdf	131146 f5d56d7216640223ccfd17db7387c9bb63a d832e	yes	19
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	Claims		11	18	
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2	Drawings-only black and white line drawings	7283_Figs_4shts.pdf	98248 f516a119f43b5a0354a98fdb04bada6ed79 d1bc7	no	4
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3	Oath or Declaration filed	DECLARATION.pdf	96196 efd8654248276fe520b3ce25039310c1f4dc abf0	no	1
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**PRIMARY OXIDANT FEED TO OXY-FIRED
CIRCULATING FLUIDIZED BED (CFB)**

FIELD AND BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates generally to the field of circulating fluidized bed (CFB) reactors or boilers such as those used in industrial or electric power generation facilities and, in particular, to a primary oxidant feed designed to provide fluidization of bed material through the floor of the CFB.

2. Description of the Related Art

[0002] A combustion process where a mix of recycle gas and oxygen is utilized instead of air for firing fossil fuels (also known as oxy-combustion or oxy-firing) is gaining attention as a means for alleviating global warming by reducing the release of green house gases, particularly carbon dioxide (CO₂). Replacing the nitrogen contained in the air with the recycle gas results in a higher concentration of CO₂ in the flue gas that in turn reduces the cost of sequestering CO₂ for its storage underground or underwater.

[0003] In the field of oxy-combustion, a circulating fluidized bed (CFB) boiler presents certain advantages over a pulverized coal (PC) boiler. Since the bulk of the matter to be heated in a CFB is represented by the circulating bed material, its "normal" furnace temperature in the case of oxy-combustion can be accomplished with reduced gas recirculation (*i.e.*, higher oxygen concentration in the oxidant streams) compared to PC units. This results in a reduced volume flow of the flue gas, which in turn results in savings on unit size and power consumption.

[0004] A typical air-fired CFB furnace utilizes two air streams: primary air and secondary air. Primary air, supplied through the furnace floor, provides fluidization of the bed material and supports combustion in the lower part of the furnace. Secondary air is typically supplied through rows of nozzles located opposite to each other at a certain elevation (in most cases between 10 and 20 feet) above the furnace floor. In the

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case of oxy-combustion, which typically implies using instead of air an oxidizing agent with increased oxygen concentration, typically comprised predominantly of oxygen and recycled flue gas, the terms "primary air" and "secondary air" should correspondingly be substituted with the terms "primary oxidant" and "secondary oxidant."

[0005] Along with its advantages, oxy-combustion in a CFB presents certain safety issues resulting from a combination of hot solids (potentially backsifting into the furnace windbox) and the high-oxygen stream fed through the windbox. Since starting up and shutting down an oxy-combustion CFB must be done in the conventional (i.e. air combustion) mode, transferring between air-combustion and oxy-combustion firing modes must be addressed.

SUMMARY OF THE INVENTION

[0006] The present invention minimizes safety issues resulting from a combination of hot solids and high-oxygen stream and addresses transferring between air-combustion and oxy-combustion firing modes for an oxy-fired CFB boiler.

[0007] Accordingly, one aspect of the present invention is drawn to a system for feeding a primary oxidant to an oxy-fired CFB boiler comprising: a plurality of bubble cap assemblies, each bubble cap assembly including a bubble cap, a stem, at least one exit hole, and an inner and outer surface; at least one windbox, wherein the at least one windbox has its own controlled oxidant feed and is connected to each of the stems of the plurality of bubble cap assemblies, and wherein the at least one windbox further comprises at least one manifold; a plurality of pipes, each pipe being located within one of the plurality of bubble cap assemblies, each pipe having an open end that is located at, or below, the at least one exit hole of each of the plurality of bubble cap assemblies and each pipe being connected at an opposite end to the at least one manifold contained within its respective windbox; a first controlled oxidant feed delivered independently to the at least one windbox, through the stem of each bubble cap assembly and through the at least one exit hole of each bubble cap assembly into the CFB and having a concentration of oxygen by volume not exceeding the limit specified in the current standard as set forth by the Compressed Gas Association, Inc.; and a

second controlled oxidant feed delivered independently through the at least one manifold, to the plurality of pipes and into the plurality of bubble cap assemblies wherein it mixes with the first controlled oxidant feed and exits through the at least one exit hole of the bubble cap and having a concentration of oxygen by volume of at least the limit specified in the current standard as set forth by the Compressed Gas Association, Inc.

[0008] Another aspect of the present invention is drawn to a system for feeding a primary oxidant to an oxy-fired CFB boiler comprising: a plurality of bubble cap assemblies, each bubble cap assembly including a bubble cap, a stem, at least one exit hole, and an inner and outer surface; at least one windbox, wherein the at least one windbox has its own controlled oxidant feed and is connected to each of the stems of the plurality of bubble cap assemblies, and wherein the at least one windbox further comprises at least one manifold; a plurality of pipes, each pipe being located within one of the plurality of bubble cap assemblies, each pipe having an open end that is located at, or above, the at least one exit hole of each of the plurality of bubble cap assemblies and each pipe being connected at an opposite end to the at least one manifold contained within its respective windbox; a first controlled oxidant feed delivered independently to the at least one windbox, through the stem of each bubble cap assembly and through the at least one exit hole of each bubble cap assembly into the CFB and having a concentration of oxygen by volume not exceeding the limit specified in the current standard as set forth by the Compressed Gas Association, Inc.; and a second controlled oxidant feed delivered independently through the at least one manifold, to the plurality of pipes and into the plurality of bubble cap assemblies wherein it mixes with the first controlled oxidant feed and exits through the at least one exit hole of the bubble cap and having a concentration of oxygen by volume of at least the limit specified in the current standard as set forth by the Compressed Gas Association, Inc.

[0009] Yet another aspect of the present invention is drawn to a system for feeding a primary oxidant to an oxy-fired CFB boiler comprising: a plurality of bubble cap assemblies, each bubble cap assembly including a bubble cap, a stem, at least one exit hole, and an inner and outer surface; at least one windbox, wherein the at least one windbox has its own controlled oxidant feed and is connected to each of the stems of

the plurality of bubble cap assemblies, and wherein the at least one windbox further comprises at least one manifold; a plurality of pipes, each pipe being located within one of the plurality of bubble cap assemblies, each pipe having an open end that is located at, or below, the at least one exit hole of each of the plurality of bubble cap assemblies and each pipe being connected at an opposite end to the at least one manifold contained within its respective windbox; an insulating gap designed to reduce thermal conductance between the inner and outer surfaces of each of the plurality of bubble caps, the insulating gap located within each of the bubble caps proper; a first controlled oxidant feed delivered independently to the at least one windbox, through the stem of each bubble cap assembly and through the at least one exit hole of each bubble cap assembly into the CFB and having a concentration of oxygen by volume not exceeding the limit specified in the current standard as set forth by the Compressed Gas Association, Inc.; and a second controlled oxidant feed delivered independently through the at least one manifold, to the plurality of pipes and into the plurality of bubble cap assemblies wherein it mixes with the first controlled oxidant feed and exits through the at least one exit hole of the bubble cap and having a concentration of oxygen by volume of at least the limit specified in the current standard as set forth by the Compressed Gas Association, Inc.

[0010] Yet still another aspect of the present invention is drawn to a system for feeding a primary oxidant to an oxy-fired CFB boiler comprising: a plurality of bubble cap assemblies, each bubble cap assembly including a bubble cap, a stem, at least one exit hole, and an inner and outer surface; at least one windbox, wherein the at least one windbox has its own controlled oxidant feed and is connected to each of the stems of the plurality of bubble cap assemblies, and wherein the at least one windbox further comprises at least one manifold; a plurality of pipes, each pipe being located within one of the plurality of bubble cap assemblies, each pipe having an open end that is located at, or above, the at least one exit hole of each of the plurality of bubble cap assemblies and each pipe being connected at an opposite end to the at least one manifold contained within its respective windbox; an insulating gap designed to reduce thermal conductance between the inner and outer surfaces of each of the plurality of bubble

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caps, the insulating gap located within each of the bubble caps proper; a first controlled oxidant feed delivered independently to the at least one windbox, through the stem of each bubble cap assembly and through the at least one exit hole of each bubble cap assembly into the CFB and having a concentration of oxygen by volume not exceeding the limit specified in the current standard as set forth by the Compressed Gas Association, Inc.; and a second controlled oxidant feed delivered independently through the at least one manifold, to the plurality of pipes and into the plurality of bubble cap assemblies wherein it mixes with the first controlled oxidant feed and exits through the at least one exit hole of the bubble cap and having a concentration of oxygen by volume of at least the limit specified in the current standard as set forth by the Compressed Gas Association, Inc.

[0011] A still further aspect of the present invention is drawn to a method of operating a system for feeding a primary oxidant to an oxy-fired circulating fluidized bed (CFB) boiler, the method comprising the steps of: providing a plurality of bubble cap assemblies, each bubble cap assembly including a bubble cap, a stem, at least one exit hole, and an inner and outer surface; providing at least one windbox, wherein the at least one windbox has its own controlled oxidant feed and is connected to each of the stems of the plurality of bubble cap assemblies, and wherein the at least one windbox further comprises at least one manifold; providing a plurality of pipes, each pipe being located within one of the plurality of bubble cap assemblies, each pipe having an open end that is located at, above, or below, the at least one exit hole of each of the plurality of bubble cap assemblies and each pipe being connected at an opposite end to the at least one manifold contained within its respective windbox; providing a first controlled oxidant feed delivered independently to the at least one windbox, through the stem of each bubble cap assembly and through the at least one exit hole of each bubble cap assembly into the CFB and having a concentration of oxygen by volume not exceeding the limit specified in the current standard as set forth by the Compressed Gas Association, Inc.; and providing a second controlled oxidant feed delivered independently through the at least one manifold, to the plurality of pipes and into the plurality of bubble cap assemblies wherein it mixes with the first controlled oxidant feed

and exits through the at least one exit hole of the bubble cap and having a concentration of oxygen by volume of at least the limit specified in the current standard as set forth by the Compressed Gas Association, Inc., wherein during start-up, shut-down and low-load operation of the CFB boiler, only the first controlled oxidant feed is supplied and the second controlled oxidant feed is not supplied, and wherein during high-load operation both the first and second controlled oxidant feeds are supplied.

[0012] The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and specific benefits attained by its uses, reference is made to the accompanying drawings and descriptive matter in which exemplary embodiments of the invention are illustrated.

BRIEF DESCRIPTION OF THE DRAWINGS

- [0013]** Fig. 1 is a sectional side elevational view of a lower portion of a CFB boiler according to the invention illustrating the primary oxidants;
- [0014]** Fig. 2 is a cross-sectional view of a bubble cap according to a first embodiment of the invention;
- [0015]** Fig. 3 is a cross-sectional view of a bubble cap according to a second embodiment of the invention; and
- [0016]** Fig. 4 is a cross-sectional view of a bubble cap according to a third embodiment of the invention.

DESCRIPTION OF THE INVENTION

[0017] The present invention relates generally to the field of circulating fluidized bed (CFB) reactors or boilers such as those used in electric power generation facilities and, in particular, to a primary oxidant feed to an oxy-fired CFB.

[0018] As used herein, the term CFB boiler will be used to refer to CFB reactors or combustors wherein a combustion process takes place. While the present invention is directed particularly to boilers or steam generators which employ CFB combustors as the means by which the heat is produced, it is understood that the present invention can

readily be employed in a different kind of CFB reactor. For example, the invention could be applied in a reactor that is employed for chemical reactions other than a combustion process, or where a gas/solids mixture from a combustion process occurring elsewhere is provided to the reactor for further processing.

[0019] Referring now to the drawings, wherein like reference numerals designate the same or functionally similar elements throughout the several drawings and to Fig. 1 in particular, a cross-sectional view of a lower portion of a CFB boiler is shown comprising an array of bubble caps 1 connected via stems 2 (together comprising and referred to herein as a bubble cap assembly) to a windbox 3. Each bubble cap 1 has at least one exit hole 4. In the oxy-combustion mode of operation, recycle gas 5 is supplied in a controlled manner to the windbox 3 and further through the stems 2 and bubble caps 1 into CFB 6. Oxygen 7 is supplied in a controlled manner through a manifold 8 and further through pipes 9 located inside each stem 2 associated with a corresponding bubble cap 1. Several parallel manifolds 8 can be located in a given windbox 3, each manifold feeding a number of pipes 9. Oxygen exits the pipe 9 provided within the bubble cap assembly, mixes there with the recycle gas 5 and exits into the CFB 6.

[0020] Certain oxygen concentrations should be observed in the practice of the present invention. In particular, it is desirable to provide oxygen 7 to the windbox 3 having a concentration of oxygen by volume not exceeding the limit specified in the current standard as set forth by the Compressed Gas Association, Inc. Also, it is desirable to provide oxygen 7 to the manifold 8 having a concentration of oxygen by volume of at least the limit specified in the current standard as set forth by the Compressed Gas Association, Inc. (CGA). The current standard is a concentration of oxygen by volume of 28 percent, per CGA G-4.4-2003 (EIGA Doc. 13/02) Oxygen Pipeline Systems, Fourth Edition.

[0021] In the air-combustion mode of operation, air 10 is supplied in a controlled manner to the windbox 3 and follows the same route as the recycle gas 5 during the oxy-combustion mode of operation. The recycle gas 5 in some cases can still be supplied to the windbox 3 in limited amounts during the air-combustion mode of

operation. However, typically only air 10 will be fed during the air-combustion mode of operation; oxygen 7 will not be fed through the manifold 8 during the air-combustion mode of operation.

[0022] The windbox 3 can be made as a single chamber extending under the entire CFB 6. It can also occupy only a part of the plan area of the CFB 6. In this case, several windboxes 3, each with its own controlled feed of recycle gas and/or air, will be employed. Correspondingly, in this case each windbox 3 is equipped with its own manifolds 8 for supplying oxygen 7 to the pipes 9.

[0023] The floor of the CFB furnace can be made of a gas-tight membrane, which would typically be a water-cooled membrane panel separating the furnace containing the CFB 6 from the windbox 3. It could also be a surface of the stagnant bed material below the exit holes of the bubble caps, the material being held by hoppers (not shown) located beneath the furnace. In such a case, the windbox 3 (or windboxes 3) would be a large diameter (typically from 18 to 36 inches) pipe (not shown) or a number of parallel large diameter pipes (also not shown) supplying recycle gas 5 or air 10 or a mix thereof to the bubble caps 1. The pipes will be located within the stagnant bed material inside the hoppers. Each pipe will be equipped with at least one manifold 8 for supplying oxygen 7 to the pipes 9. The flow of recycle gas/air to the pipes can be controlled separately for each pipe or as a total flow to all parallel pipes provided that uniform distribution between the pipes is achieved. The same options exist for controlling the flow of oxygen to manifolds 8, *i.e.*, separately for each manifold or as a total flow.

[0024] Each windbox 3, whether made as a chamber separated from the furnace by a gas-tight membrane or as a pipe immersed into a bed material in a hopper, is equipped with an oxygen measurement probe 20.

[0025] Separate embodiments for a bubble cap and stem assembly are shown in Figs. 2 through 4, where the numbers designating specific parts correspond to the numbers for the same parts in Fig. 1.

[0026] The end of the pipe 9 may be located anywhere within the bubble cap assembly, *i.e.*, within the stem 2 or the bubble cap 1, above, at or below the exit holes

4. The downward direction of the exit opening for oxygen 7 into the bubble cap assembly reduces the possibility of accidental introduction of hot particles into the pipe 9. As used herein, the term downward is defined to mean having an angle of deflection of at least about 5 degrees from horizontal, or at least about 10 degrees, or at least about 15 degrees, or even at least about 20 degrees. If particles of bed material enter the bubble cap assembly through the exit holes 4, which may happen due to pulsations in the CFB 6, they will tend to fall down along the stem 2. The downward direction of the exit opening for oxygen 7 can be accomplished by a variety of means including, but not limited to, providing a debris shield 25 attached via any suitable means (e.g., welded, screwed, pressed-fitted, etc.) to the top of the pipe 9, to the top of the stem 2 or by bending the pipe downward (not shown). The debris shield 25 may advantageously comprise metal fins in a louvered arrangement. Other options known to those skilled in the art can also be utilized for preventing hot particles from entering the pipe 9.

[0027] In order to reduce the potential for a chemical reaction (corrosion or even burning) between the oxygen and the material of the bubble cap 1, the latter can feature an insulating gap 30. The insulating gap 30 is located within the bubble cap 1 proper. The insulating gap 30 will reduce thermal conductance between the bubble cap's 1's outer surface 35 that is exposed to the hot bed material and its inner surface 40 in which is in contact with oxygen 7. The resulting reduction of the inner surface temperature of the bubble cap 1 will assist in preventing a chemical reaction between the bubble cap 1 material and the oxygen 7. Utilizing high grade stainless steel or non-metallic materials for the bubble cap 1 and/or stem 2 (whether the entire body or inner lining) can also be used. Materials with a low tendency to have a chemical reaction with oxygen (stainless steel, ceramics, etc.) can also be utilized for construction or lining of the windbox and oxygen manifold piping 8.

[0028] During the boiler start up and low load operation, only air 10 is fed to the bed through the windbox 3 followed by the stems 2 and bubble caps 1. At about 40 percent of full load, oxygen feed starts through the manifold 8 and pipes 9 along with recycle gas 5 replacing air 10. Oxygen 7 exits the pipes 9, mixes with recycle gas 5 within the bubble cap assemblies of bubble caps 1 and stems 2, and the mix enters the

CFB 6 through the exit holes 4. For the boiler load reduction and shut-down, the sequence is reversed.

[0029] Changing oxygen volume concentration in the medium flowing through the holes 4 from about 21 percent during air-combustion mode of operation during low-load operation to about 50-60 percent during oxy-combustion mode of operation at high-load operation allows maintaining the fluidizing medium flow rate in a relatively narrow range. This in turn allows maintaining a velocity in the exit holes 4 close to the optimum value at all loads. The optimum velocity is one which does not result in high pressure drop across the exit holes 4, thereby reducing power consumption, and one which avoids an excessively low velocity, thereby substantially reducing the potential for backsifting of hot material into the bubble cap assemblies and improving safety and reliability.

[0030] If exit holes 4 in a bubble cap 1 become plugged with bed material and oxygen 7 flows to the windbox 3, the increase of oxygen concentration there will be sensed by the probe 20 and a corresponding action will be taken (alarm, oxygen flow reduction, etc.). If oxygen concentration in the windbox 3 exceeds a preset level, its flow to a corresponding manifold 8 is shut off.

[0031] While specific embodiments of the present invention have been shown and described in detail to illustrate the application and principles of the invention, it will be understood that it is not intended that the present invention be limited thereto and that the invention may be embodied otherwise without departing from such principles. In some embodiments of the invention, certain features of the invention may sometimes be used to advantage without a corresponding use of the other features. Accordingly, all such changes and embodiments properly fall within the scope of the following claims.

CLAIMS

What is claimed is:

1. A system for feeding a primary oxidant to an oxy-fired circulating fluidized bed (CFB) boiler comprising:

a plurality of bubble cap assemblies, each bubble cap assembly including a bubble cap, a stem, at least one exit hole, and an inner and outer surface;

at least one windbox, wherein the at least one windbox has its own controlled oxidant feed and is connected to each of the stems of the plurality of bubble cap assemblies, and wherein the at least one windbox further comprises at least one manifold;

a plurality of pipes, each pipe being located within one of the plurality of bubble cap assemblies, each pipe having an open end that is located at, or below, the at least one exit hole of each of the plurality of bubble cap assemblies and each pipe being connected at an opposite end to the at least one manifold contained within its respective windbox;

a first controlled oxidant feed delivered independently to the at least one windbox, through the stem of each bubble cap assembly and through the at least one exit hole of each bubble cap assembly into the CFB and having a concentration of oxygen by volume not exceeding the limit specified in the current standard as set forth by the Compressed Gas Association, Inc.; and

a second controlled oxidant feed delivered independently through the at least one manifold, to the plurality of pipes and into the plurality of bubble cap assemblies wherein it mixes with the first controlled oxidant feed and exits through the at least one exit hole of the bubble cap and having a concentration of oxygen by volume of at least the limit specified in the current standard as set forth by the Compressed Gas Association, Inc.

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2. The system according to claim 1, wherein the direction of the exit of the second controlled oxidant feed from the open end of each of the plurality of pipes in each of the plurality of bubble cap assemblies is oriented in a downward direction.

3. The system according to claim 1, wherein each windbox is equipped with an oxygen measurement probe.

4. The system according to claim 1, wherein at least an inner surface of the plurality of the bubble caps and stems are coated with, or made from, high grade stainless steel.

5. The system according to claim 1, wherein at least an inner surface of the plurality of the bubble caps and stems are coated with, or made from, one or more non-metallic materials.

6. The system according to claim 1, wherein the at least one windbox and the plurality of pipes are made from, or lined with, stainless steel.

7. The system according to claim 1, wherein the at least one windbox and the plurality of pipes are made from, or lined with, one or more non-metallic materials.

8. A system for feeding a primary oxidant to an oxy-fired circulating fluidized bed (CFB) boiler comprising:

a plurality of bubble cap assemblies, each bubble cap assembly including a bubble cap, a stem, at least one exit hole, and an inner and outer surface;

at least one windbox, wherein the at least one windbox has its own controlled oxidant feed and is connected to each of the stems of the plurality of bubble cap assemblies, and wherein the at least one windbox further comprises at least one manifold;

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a plurality of pipes, each pipe being located within one of the plurality of bubble cap assemblies, each pipe having an open end that is located at, or above, the at least one exit hole of each of the plurality of bubble cap assemblies and each pipe being connected at an opposite end to the at least one manifold contained within its respective windbox;

a first controlled oxidant feed delivered independently to the at least one windbox, through the stem of each bubble cap assembly and through the at least one exit hole of each bubble cap assembly into the CFB and having a concentration of oxygen by volume not exceeding the limit specified in the current standard as set forth by the Compressed Gas Association, Inc.; and

a second controlled oxidant feed delivered independently through the at least one manifold, to the plurality of pipes and into the plurality of bubble cap assemblies wherein it mixes with the first controlled oxidant feed and exits through the at least one exit hole of the bubble cap and having a concentration of oxygen by volume of at least the limit specified in the current standard as set forth by the Compressed Gas Association, Inc.

9. The system according to claim 8, wherein the direction of the exit of the second controlled oxidant feed from the open end of each of the plurality of pipes in each of the plurality of bubble cap assemblies is oriented in a downward direction.

10. The system according to claim 8, wherein each windbox is equipped with an oxygen measurement probe.

11. The system according to claim 8, wherein at least an inner surface of the plurality of the bubble caps and stems are coated with, or made from, high grade stainless steel.

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12. The system according to claim 8, wherein at least an inner surface of the plurality of the bubble caps and stems are coated with, or made from, one or more non-metallic materials.

13. The system according to claim 8, wherein the at least one windbox and the plurality of pipes are made from, or lined with, stainless steel.

14. The system according to claim 8, wherein the at least one windbox and the plurality of pipes are made from, or lined with, one or more non-metallic materials.

15. A system for feeding a primary oxidant to an oxy-fired circulating fluidized bed (CFB) boiler comprising:

- a plurality of bubble cap assemblies, each bubble cap assembly including a bubble cap, a stem, at least one exit hole, and an inner and outer surface;

- at least one windbox, wherein the at least one windbox has its own controlled oxidant feed and is connected to each of the stems of the plurality of bubble cap assemblies, and wherein the at least one windbox further comprises at least one manifold;

- a plurality of pipes, each pipe being located within one of the plurality of bubble cap assemblies, each pipe having an open end that is located at, or below, the at least one exit hole of each of the plurality of bubble cap assemblies and each pipe being connected at an opposite end to the at least one manifold contained within its respective windbox;

- an insulating gap designed to reduce thermal conductance between the inner and outer surfaces of each of the plurality of bubble caps, the insulating gap located within each of the bubble caps proper;

- a first controlled oxidant feed delivered independently to the at least one windbox, through the stem of each bubble cap assembly and through the at least one exit hole of each bubble cap assembly into the CFB and having a concentration of

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oxygen by volume not exceeding the limit specified in the current standard as set forth by the Compressed Gas Association, Inc.; and

a second controlled oxidant feed delivered independently through the at least one manifold, to the plurality of pipes and into the plurality of bubble cap assemblies wherein it mixes with the first controlled oxidant feed and exits through the at least one exit hole of the bubble cap and having a concentration of oxygen by volume of at least the limit specified in the current standard as set forth by the Compressed Gas Association, Inc.

16. The system according to claim 15, wherein the direction of the exit of the second controlled oxidant feed from the open end of each of the plurality of pipes in each of the plurality of bubble cap assemblies is oriented in a downward direction.

17. The system according to claim 15, wherein each windbox is equipped with an oxygen measurement probe.

18. The system according to claim 15, wherein at least an inner surface of the plurality of the bubble caps and stems are coated with, or made from, high grade stainless steel.

19. The system according to claim 15, wherein at least an inner surface of the plurality of the bubble caps and stems are coated with, or made from, one or more non-metallic materials.

20. The system according to claim 15, wherein the at least one windbox and the plurality of pipes are made from, or lined with, stainless steel.

21. The system according to claim 15, wherein the at least one windbox and the plurality of pipes are made from, or lined with, one or more non-metallic materials.

22. A system for feeding a primary oxidant to an oxy-fired circulating fluidized bed (CFB) boiler comprising:

a plurality of bubble cap assemblies, each bubble cap assembly including a bubble cap, a stem, at least one exit hole, and an inner and outer surface;

at least one windbox, wherein the at least one windbox has its own controlled oxidant feed and is connected to each of the stems of the plurality of bubble cap assemblies, and wherein the at least one windbox further comprises at least one manifold;

a plurality of pipes, each pipe being located within one of the plurality of bubble cap assemblies, each pipe having an open end that is located at, or above, the at least one exit hole of each of the plurality of bubble cap assemblies and each pipe being connected at an opposite end to the at least one manifold contained within its respective windbox;

an insulating gap designed to reduce thermal conductance between the inner and outer surfaces of each of the plurality of bubble caps, the insulating gap located within each of the bubble caps proper;

a first controlled oxidant feed delivered independently to the at least one windbox, through the stem of each bubble cap assembly and through the at least one exit hole of each bubble cap assembly into the CFB and having a concentration of oxygen by volume not exceeding the limit specified in the current standard as set forth by the Compressed Gas Association, Inc.; and

a second controlled oxidant feed delivered independently through the at least one manifold, to the plurality of pipes and into the plurality of bubble cap assemblies wherein it mixes with the first controlled oxidant feed and exits through the at least one exit hole of the bubble cap and having a concentration of oxygen by volume of at least the limit specified in the current standard as set forth by the Compressed Gas Association, Inc.

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23. The system according to claim 22, wherein the direction of the exit of the second controlled oxidant feed from the open end of each of the plurality of pipes in each of the plurality of bubble cap assemblies is oriented in a downward direction.

24. The system according to claim 22, wherein each windbox is equipped with an oxygen measurement probe.

25. The system according to claim 22, wherein at least an inner surface of the plurality of the bubble caps and stems are coated with, or made from, high grade stainless steel.

26. The system according to claim 22, wherein at least an inner surface of the plurality of the bubble caps and stems are coated with, or made from, one or more non-metallic materials.

27. The system according to claim 22, wherein the at least one windbox and the plurality of pipes are made from, or lined with, stainless steel.

28. The system according to claim 22, wherein the at least one windbox and the plurality of pipes are made from, or lined with, one or more non-metallic materials.

29. A method of operating a system for feeding a primary oxidant to an oxy-fired circulating fluidized bed (CFB) boiler, the method comprising the steps of:

providing a plurality of bubble cap assemblies, each bubble cap assembly including a bubble cap, a stem, at least one exit hole, and an inner and outer surface;

providing at least one windbox, wherein the at least one windbox has its own controlled oxidant feed and is connected to each of the stems of the plurality of bubble cap assemblies, and wherein the at least one windbox further comprises at least one manifold;

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providing a plurality of pipes, each pipe being located within one of the plurality of bubble cap assemblies, each pipe having an open end that is located at, above, or below, the at least one exit hole of each of the plurality of bubble cap assemblies and each pipe being connected at an opposite end to the at least one manifold contained within its respective windbox;

providing a first controlled oxidant feed delivered independently to the at least one windbox, through the stem of each bubble cap assembly and through the at least one exit hole of each bubble cap assembly into the CFB and having a concentration of oxygen by volume not exceeding the limit specified in the current standard as set forth by the Compressed Gas Association, Inc.; and

providing a second controlled oxidant feed delivered independently through the at least one manifold, to the plurality of pipes and into the plurality of bubble cap assemblies wherein it mixes with the first controlled feed and exits through the at least one exit hole of the bubble cap and having a concentration of oxygen by volume of at least the limit specified in the current standard as set forth by the Compressed Gas Association, Inc.,

wherein during start-up, shut-down and low-load operation of the CFB boiler, only the first controlled oxidant feed is supplied and the second controlled oxidant feed is not supplied, and wherein during high-load operation both the first and second controlled oxidant feeds are supplied.

30. The method of claim 29, wherein the method further comprises providing an insulating gap designed to reduce thermal conductance between the inner and outer surfaces of each of the plurality of bubble caps, the insulating gap located within each of the bubble caps proper.

ABSTRACT

A system for feeding a primary oxidant to an oxy-fired circulating fluidized bed (CFB) boiler. The system includes a plurality of bubble cap assemblies each comprising a stem and a bubble cap with at least one exit hole, each bubble cap connected via a stem to at least one windbox, the windbox containing at least one manifold. A plurality of pipes are provided, each pipe located within a bubble cap assembly with an open end located either at, above or below the exit holes of the bubble caps and an opposite end connected to the manifold located inside each windbox. Recycle gas is piped into the windbox, to the stem, and exiting from the exit holes located in the bubble cap into the CFB. Oxygen is piped into the manifold, through the pipes and exiting through the exit holes located in the bubble cap. The pipe may further contain means placed at its open end, to prevent accidental inlet of hot particles into the pipe, such as a debris shield placed above and proximate to the open end of the pipe or by having the open end oriented in a downward direction. An insulating gap may also be placed inside the bubble cap to reduce thermal conductance between the bubble cap outer surface that is exposed to hot bed material and the inner surface of the bubble cap, being in contact with oxygen.

DECLARATION FOR PATENT APPLICATION

Docket No. 7283

As below named inventor, I hereby declare that: My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject **PRIMARY OXIDANT FEED TO OXY-FIRED CIRCULATING FLUIDIZED BED (CFB)**, the specification of which:

(check) one ☒ is attached hereto

☐ was filed on _____ as United States or PCT International application Serial No. _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with 37 CFR §1.56.

I hereby claim foreign priority benefits under 35 USC §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or under §365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below any foreign application for patent or inventor's certificate, or PCT International application, having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

Priority Claimed

Yes ☐ No ☐

(Number)

(Country)

(Day/Month/Year Filed)

I hereby claim the benefit under 35 USC §119(e) of any United States provisional application(s) listed below.

(Application Serial No.)

(Day/Month/Year Filed)

I hereby claim the benefit under 35 USC §120 of any United States application(s), or under §365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 USC §112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR §1.56 which become available between the filing date of the prior application and the national or PCT International filing date of this application.

(Application Serial No.)

(Filing Date)

(Status--patented, pending, abandoned)

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: (1) Eric Marich, Reg. No. 32,265; (2) D. Neil LaHaye, Reg. No. 30,767; and (3) Michael J. Seymour, Reg. No. 54,436.

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PATENT TRADEMARK OFFICE

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 §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.

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105

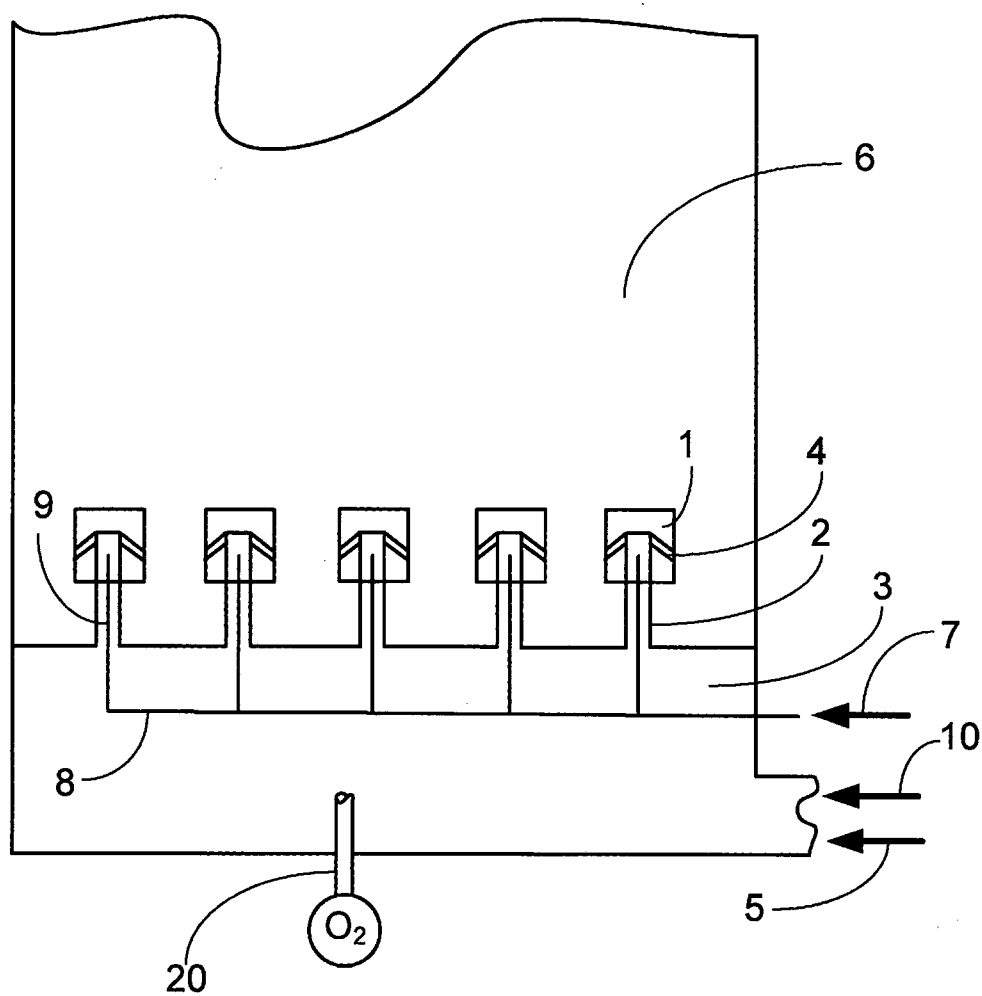


FIG. 1

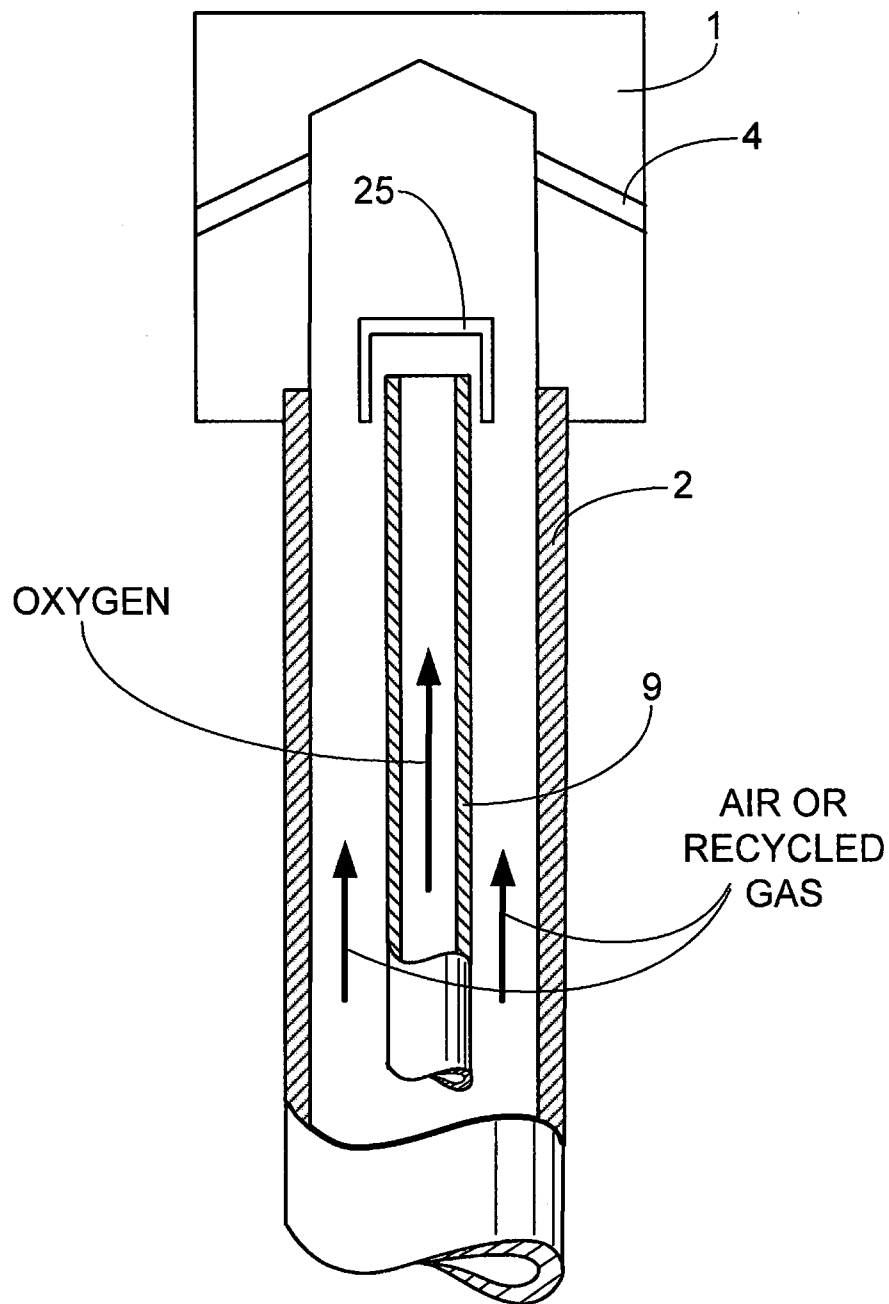


FIG. 2

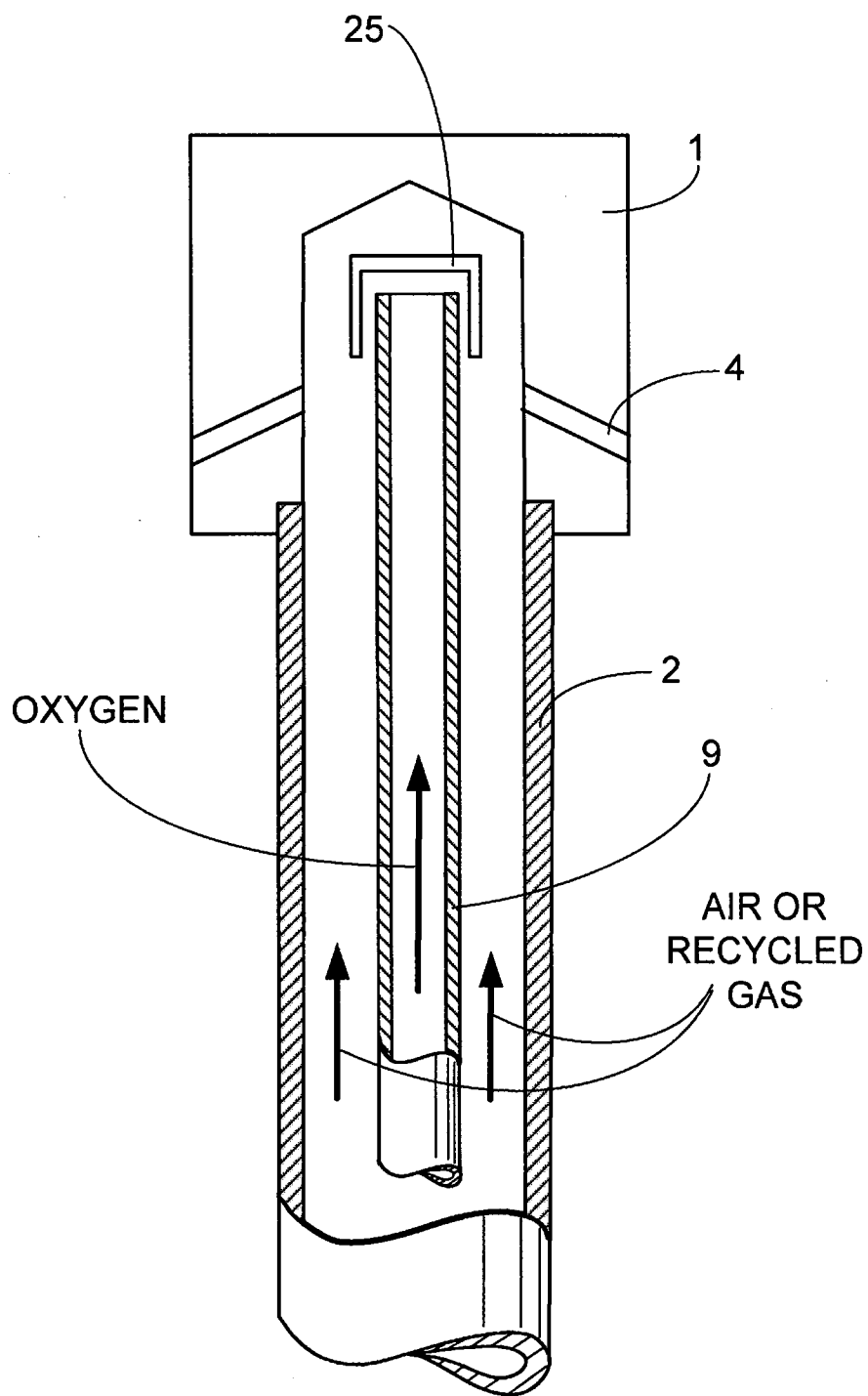


FIG. 3

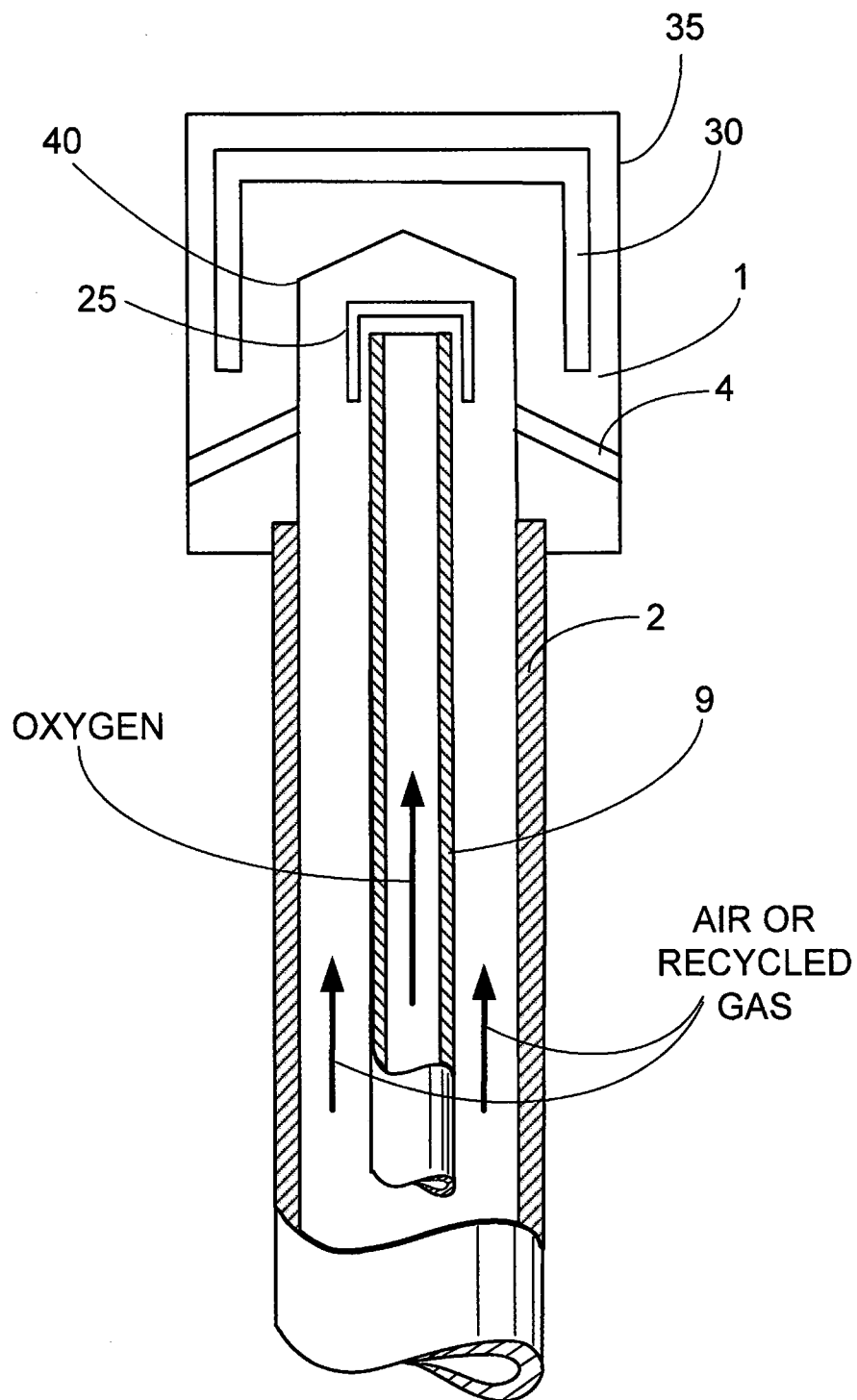


FIG. 4

REIVIINDICACIONES

Lo que se reivindica es lo siguiente:

1. Un sistema para alimentación primaria de un oxidante en una caldera de lecho fluidizado circulante oxi-incinerado (LFC) que contiene:

Varios montajes de tapas de burbuja, cada uno con su tapa de burbuja, un vástago y al menos un orificio de salida, y una superficie externa e interna;

Al menos una caja de viento en donde al menos una caja de ellas tiene su propio sistema de alimentación controlada de oxidante y está conectada a cada uno de los vástagos de la pluralidad montajes de tapas de burbuja, y donde al menos una de las cajas de viento además contiene un sistema de distribución;

Una pluralidad de tuberías, cada una localizada dentro de una pluralidad de montajes de tapa burbuja, cada una tiene un extremo abierto que está localizado en, o por debajo de al menos un orificio de salida de cada uno de los montajes de tapa de burbuja y cada tubería está conectada en el extremo opuesto con al menos uno de los sistemas de distribución contenidos dentro de su respectiva caja de viento;

Una alimentación primaria controlada que entrega en forma independiente hacia al menos una caja de viento a través del vástago de cada montaje de tapa de burbuja y a través de al menos un orificio de salida de cada montaje de tapa de burbuja hacia el LFC y tiene una concentración de oxígeno en volumen que no excede el límite especificado en las normas actuales establecidas por la Asociación de Gas Comprimido; y

Una alimentación secundaria de oxidante que se entrega en forma independiente a través de al menos un sistema distribuidor hacia la pluralidad de tuberías y dentro de la pluralidad de montajes de tapas de burbuja en donde se mezcla con la alimentación primaria de oxidante y sale a través de al menos un orificio de salida de la tapa de burbuja y tiene una concentración de oxígeno en volumen de al menos el límite especificado en las normas actuales establecidas por la Asociación de Gas Comprimido

2. El sistema de acuerdo con la reivindicación 1, establece que la dirección de salida de la alimentación secundaria controlada del oxidante desde el extremo abierto de la pluralidad de tuberías en cada uno de los montajes de la pluralidad de tapas de burbuja está orientado hacia abajo.
3. El sistema de acuerdo con la reivindicación 1, establece que cada caja de viento está equipada con una sonda de medición de oxígeno
4. El sistema de acuerdo con la reivindicación 1, establece que al menos una superficie interior de la pluralidad de tapas de burbuja y los vástagos están cubiertos con, o hechos de acero inoxidable de alto grado.
5. El sistema de acuerdo con la reivindicación 1, establece que al menos la superficie interior de la pluralidad de tapas de burbuja y vástagos están cubiertos o hechos de uno o más materiales no metálicos.
6. El sistema de acuerdo a la reivindicación 1, establece que al menos una de las cajas de viento y la pluralidad de tuberías están hechas de, o alineadas con acero inoxidable.
7. El sistema de acuerdo con la reivindicación 1 establece que al menos una de las cajas de viento y la pluralidad de las tuberías están hechas de, o alineadas con, uno o más materiales no metálicos.
8. Un sistema de alimentación de oxidante primario hacia una caldera de lecho fluidizado circulante (LFC) que comprende:

Una pluralidad de montajes de tapa de burbuja, cada uno incluye una tapa de burbuja, un tallo, y al menos un orificio de salida y una superficie externa y otra interna;

Al menos una caja de viento donde al menos una de ellas tiene su propio sistema de alimentación controlada de oxidante y está conectada con cada uno de los vástagos de la pluralidad de montajes de tapas de burbuja, y donde al menos una de las cajas de viento comprende al menos un sistema de distribución;

Una pluralidad de tuberías, cada una está localizada dentro de una pluralidad de montajes de tapas de burbuja, cada tubería tiene un extremo abierto que está localizado en, por encima o por debajo de al menos uno de los orificios de salida de cada uno de los montajes de tapa de burbuja y cada tubería está conectada en el extremo opuesto con al menos uno de los sistemas de distribución contenidos dentro de su respectiva caja de viento;

Un sistema de alimentación primaria de oxidante que se entrega en forma independiente hacia al menos una de las cajas de viento a través del vástago de cada montaje de tapa de burbuja y a través de al menos un orificio de salida de cada montaje de tapa de burbuja hacia dentro del LFC y tiene una concentración de oxígeno en volumen que no excede el límite especificado en las normas actuales establecidas por la Asociación de Gas Comprimido; y

Una alimentación secundaria controlada de oxidante que se entrega en forma independiente a través de al menos un sistema de distribución hacia la pluralidad de tuberías y hacia dentro de la pluralidad de montajes de tapa de burbuja en donde se mezcla con la alimentación primaria de oxidante y sale a través de al menos uno de los orificios de salida de la tapa de burbuja y tiene una concentración de oxígeno en volumen con al menos el límite especificado en las normas actuales establecidas por la Asociación de Gas Comprimido

9. El sistema de acuerdo con la reivindicación 8, establece que la dirección de salida de la alimentación secundaria de oxidante desde el extremo abierto de cada una de la pluralidad de tuberías en cada uno de la pluralidad de montajes de tapa de burbuja está orientada hacia abajo.
10. El sistema de acuerdo con la reivindicación 8, establece que cada caja de viento esté equipada con una sonda de medición de oxígeno.
11. El sistema de acuerdo con la reivindicación 8, establece que al menos la superficie interna de la pluralidad de tapas de burbuja y vástagos están cubiertos o hechos de acero inoxidable de alto grado.
12. El sistema de acuerdo con la reivindicación 8, establece que al menos la superficie interna de la pluralidad de las tapas de burbuja y los vástagos estén cubiertos con, o hechos de uno o más materiales no metálicos.
13. El sistema de acuerdo con la reivindicación 8, establece que al menos una de las cajas de viento y la pluralidad de las tuberías estén hechas de o alineadas con acero inoxidable.
14. El sistema de acuerdo con la reivindicación 8, establece que al menos una caja de viento y la pluralidad de las tuberías estén hechas de o alineadas con uno o más materiales no metálicos.
15. Un sistema de alimentación primaria de oxidante hacia una caldera de lecho fluidizado circulante oxi-incinerado (LFC) que contiene:

Una pluralidad de montajes de tapa de burbuja, cada montaje de esos incluye la tapa de burbuja, un vástago y al menos un orificio de salida y una superficie interna y otra externa;

Al menos una caja de viento, en donde al menos una de las cajas de viento tiene su propia alimentación controlada de oxidante y está conectada a cada uno de los vástagos de la pluralidad de montajes de tapas de burbuja, y donde al menos una de las cajas de viento además contiene al menos un sistema de distribución;

Una pluralidad de tuberías, cada una localizada dentro de una de las pluralidades de montajes de tapas de burbuja, cada tubería tiene un extremo abierto que está localizado en, por encima o por debajo de al menos un orificio de salida de cada uno de los montajes de tapa de burbuja y cada tubería está conectada en el extremo opuesto al menos a uno de los sistemas de distribución contenido dentro de su respectiva caja de viento;

Un espacio de aislamiento diseñado para reducir la conductancia térmica entre las superficies interna y externa dentro de cada una de la pluralidad de tapas de burbuja, el espacio aislante está localizado dentro de cada una de las estructuras de las tapas de burbuja;

Una alimentación primaria controlada de oxidante que se entrega en forma independiente hacia al menos una de las cajas de viento a través del vástago de cada montaje de tapa de burbuja y a través de al menos un orificio de salida de cada montaje de tapa de burbuja hacia el LFC y tiene una concentración de oxígeno en volumen que no excede el límite especificado en la norma actual establecida por la Asociación de Gas Comprimido; y

Una alimentación secundaria de oxidante entregada en forma independiente a través de al menos uno de los sistemas de distribución hacia la pluralidad de tuberías y hacia dentro de la pluralidad de los montajes de tapas de burbuja en donde se mezcla con la alimentación primaria de oxidante y sale a través de al menos uno de los orificios de salida de la tapa de burbuja y tiene una concentración de oxígeno en volumen de al menos el límite especificado en las normas actuales establecidas por la Asociación de Gas Comprimido.

16. El sistema de acuerdo con la reivindicación 15, establece que la dirección de salida de la alimentación secundaria controlada de oxidante desde el extremo abierto de cada una de la pluralidad de tuberías en cada uno de la pluralidad de montajes de tapas de burbuja está orientada en dirección hacia abajo.
17. El sistema de acuerdo con la reivindicación 15, establece que cada caja de viento esté equipada con una sonda de medición de oxígeno.
18. El sistema de acuerdo con la reivindicación 15, establece que al menos una superficie interna de la pluralidad de tapas de burbuja y los vástagos estén cubiertos con, o hechos de acero inoxidable de alto grado.
19. El sistema de acuerdo con la reivindicación 15, establece que al menos la superficie interna de la pluralidad de las tapas de burbuja y los vástagos estén cubiertos con, o hechos de uno o más materiales no metálicos.
20. El sistema de acuerdo con la reivindicación 15, establece que al menos una de las cajas de viento y la pluralidad de tuberías estén hechas de, o alineadas con acero inoxidable.
21. El sistema de acuerdo con la reivindicación 15, establece que al menos una de las cajas de viento y la pluralidad de tuberías estén hechas de, o alineadas con uno o más materiales no metálicos.
22. Un sistema de alimentación primaria de oxidante hacia una caldera de lecho fluidizado circulante (LFC) oxi-incinerado comprende:

Una pluralidad de montajes de tapas de burbuja, cada uno de los cuales incluye la tapa de burbuja, un vástago y al menos un orificio de salida y una superficie interna y otra externa;

Al menos una caja de viento, en donde al menos una de las cajas de viento tiene su propia alimentación controlada de oxidante y está conectada a cada uno de los vástagos de la pluralidad de montajes de tapas de burbuja, y donde al menos una de dichas cajas además tiene un sistema de distribución;

Una pluralidad de tuberías, cada una de ellas localizada dentro de una de las pluralidades de montajes de tapas de burbuja, cada tubería tiene un extremo abierto que está localizado en, por encima o por debajo de al menos un orificio de salida de cada una de las pluralidades de montajes de tapas de burbuja y cada tubería está conectada por el otro extremo con al menos uno de los sistemas de distribución contenidos dentro de su respectiva caja de viento;

Un espacio aislante diseñado para reducir la conductancia térmica entre las superficies interna y externa de cada una de la pluralidad de tapas de burbuja, el espacio aislante localizado dentro de cada una de las estructuras de las tapas de burbuja;

Una alimentación primaria controlada de oxidante que se entrega en forma independiente hacia al menos una caja de viento a través del vástago de cada montaje de tapa de burbuja y a través de al menos un orificio de salida de cada montaje de tapa de burbuja hacia el LFC y que tiene una concentración de oxígeno en volumen que no excede el límite especificado en la norma actual establecida por la Asociación de Gas Comprimido; y

Una alimentación secundaria controlada de oxidante que se entrega en forma independiente a través de al menos uno de los sistemas de distribución hacia la pluralidad de tuberías y dentro de la pluralidad de montajes de tapas de burbuja en los cuales se mezcla con la alimentación primaria de oxidante y sale a través de al menos uno de los orificios de salida de la tapa de burbuja y tiene una concentración de oxígeno en volumen de al menos el límite especificado en la norma actual establecida por la Asociación de Gas Comprimido;

23. El sistema de acuerdo con la reivindicación 22, establece que la dirección de salida de la alimentación secundaria controlada de oxidante desde el extremo abierto de cada una de la pluralidad de tuberías en cada uno de la pluralidad de montajes de tapas de burbuja está orientada en dirección hacia abajo.
24. El sistema de acuerdo con la reivindicación 22, establece que cada caja de viento esté equipada con una sonda de medición de oxígeno.
25. El sistema de acuerdo con la reivindicación 22, establece que al menos una superficie interna de la pluralidad de tapas de burbuja y los vástagos estén cubiertos con, o hechos de acero inoxidable de alto grado.
26. El sistema de acuerdo con la reivindicación 22, establece que al menos la superficie interna de la pluralidad de las tapas de burbuja y los vástagos estén cubiertos con, o hechos de uno o más materiales no metálicos.
27. El sistema de acuerdo con la reivindicación 22, establece que al menos una de las cajas de viento y la pluralidad de tuberías estén hechas de, o alineadas con acero inoxidable.
28. El sistema de acuerdo con la reivindicación 22, establece que al menos una de las cajas de viento y la pluralidad de tuberías estén hechas de, o alineadas con uno o más materiales no metálicos.
29. Un método para operación de un sistema para alimentar el oxidante primario hacia una caldera de lecho fluidizado circulante (LFC) oxi-incinerado, el método comprende las etapas de:

Suministrar una pluralidad de montajes de tapas de burbuja, cada uno de los cuales incluye una tapa de burbuja, un vástago y al menos un orificio de salida y una superficie externa y otra interna;

Suministrar al menos una caja de viento, en la cual al menos una caja de viento tenga su propia alimentación controlada de oxidante y esté conectada a cada uno de los vástagos de la pluralidad de montajes de tapas de burbuja, y donde al menos una de las cajas de viento además contenga un sistema de distribución;

Suministrar una pluralidad de tuberías, cada una de las cuales está localizada dentro de una de las pluralidades de montajes de tapas de burbuja, cada una tiene un extremo abierto que está localizado en, por encima o por debajo de al menos uno de los orificios de salida de cada una de las pluralidades de los montajes de tapas de burbuja y cada tubería está conectada por el extremo opuesto con al menos un sistema de distribución contenido dentro de su respectiva caja de viento;

Brindar una alimentación primaria controlada de oxidante que se entrega en forma independiente hacia al menos una caja de viento a través del vástago de cada montaje de tapa de burbuja y a través de al menos uno de los orificios de salida de cada montaje de tapa de burbuja hacia el LFC, y que tiene una concentración de oxígeno en volumen que no excede los límites especificados en la norma actual establecida por la Asociación de Gas Comprimido; y

Suministrar una alimentación secundaria controlada de oxidante que se entrega en forma independiente a través de al menos un sistema distribuidor hacia la pluralidad de tuberías y dentro de la pluralidad de montajes de tapas de burbuja, en donde se mezcla con la alimentación primaria controlada de oxidante y sale a través de al menos uno de los orificios de salida de la tapa de burbuja y tiene una concentración de oxígeno en volumen que tiene al menos el límite especificado en la norma actual establecida por la Asociación de Gas Comprimido;

Durante el inicio, apagado y operación en carga baja de la caldera LFC, solo se suministra la alimentación primaria controlada de oxidante y la alimentación secundaria controlada de oxidante NO se suministra, y cuando se ejecute la operación a carga alta, Sí se suministran tanto la alimentación primaria y la secundaria controladas de oxidante.

30. El método de la reivindicación 29, donde dicho método además establece que se debe proveer un espacio aislante diseñado para reducir la conductancia térmica entre las superficies interna y externa de cada una de la pluralidad de las tapas de burbuja, el espacio aislante localizado dentro de la estructura de cada una de las tapas de burbuja.

TRADUCCIÓN OFICIAL No. 10.22/10b realizada por Diego Vargas, Traductor Oficial, Resolución No. 0001 de 1999 del Ministerio de Justicia, registrado ante el Ministerio de Relaciones Exteriores de Colombia.

LOS ESTADOS UNIDOS DE AMÉRICA

A TODOS A QUIENES ESTOS PRESENTES LLEGAREN:

DEPARTAMENTO DE COMERCIO DE LOS ESTADOS UNIDOS

Oficina de Marcas y Patentes de los Estados Unidos

14 de septiembre de 2010

EL PRESENTE ES PARA CERTIFICAR QUE LA ADJUNTA ES UNA COPIA FIEL DE LOS REGISTROS DE LA OFICINA DE MARCAS Y PATENTES DE LOS ESTADOS UNIDOS DE LOS DOCUMENTOS DE LA SOLICITUD DE PATENTE IDENTIFICADA A CONTINUACIÓN QUE HAN CUMPLIDO CON LOS REQUISITOS PARA QUE SE LES OTORQUE UNA FECHA DE PRESENTACIÓN DE CONFORMIDAD CON EL ARTÍCULO 111 DEL TÍTULO 35 DEL CÓDIGO DE LOS ESTADOS UNIDOS.

NÚMERO DE SOLICITUD: 12/571,187

FECHA DE PRESENTACIÓN: 30 de septiembre de 2009

EL CÓDIGO DE PAÍS Y NÚMERO DE SU SOLICITUD PRIORITARIA, PARA USO EN SOLICITUDES EXTRANJERAS DE CONFORMIDAD CON LA CONVENCIÓN DE PARÍS, ES US12/571,187

Por autorización del Subsecretario de Comercio para la Propiedad Intelectual y Director de la Oficina de Marcas y Patentes de los Estados Unidos



Firma ilegible

P. SWAIN

Funcionario de Autenticaciones

Es traducción fiel de la cual se deja copia en esta oficina para su confrontación.

DVZ\DVZ\ID-180946\WPCL002H\COLO 16645-801-005-4

CP: 217 TMIN: 45

Diego F. Vargas
DIEGO F. VARGAS Z.

TRADUCTOR E INTERPRETE OFICIAL
ESPAÑOL - INGLÉS - INGLÉS - ESPAÑOL

RES. 0001 DE ENERO 4 DE 1999

MINISTERIO DE JUSTICIA

2020
Bogotá D.C.,

Doctor(a)
SUAREZ DE PAEZ LUZ CLEMENCIA
Apoderado(a) y/o Representante de
BABCOCK & WILCOX POWER GENERATION GROUP, INC

REFERENCIA	Radicación No. 10 121086
	Trámite 2
	Evento 1
	Actuación 416
	Oficio No. 13321
	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 los artículos 26 y 27 de la Decisión 486 de la Comisión de la Comunidad Andina, y en las demás disposiciones vigentes sobre la materia, se envía el extracto de la solicitud a la Oficina de Comunicaciones para efecto de su publicación en la Gaceta de Propiedad Industrial.

De acuerdo con lo previsto por el artículo 40 de la Decisión 486/00, la publicación en este caso se hará a partir del día 30 del mes de Marzo de 2012.

Cúmplase
Dado en Bogotá DC,

29 JUN. 2011



JOSE LUIS SALAZAR LOPEZ
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