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SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

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



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Evento : 001
Actuación : 444

Referencia : Expediente No. 10.121.109
Asunto : Solicitud de patente para **CAMA DE FLUIDEZ CIRCULANTE (CFB) CON BOQUILLAS DE AIRE SECUNDARIO EN-CALDERA**
Solicitante : **BABCOCK & WILCOX POWER GENERATION GROUP, INC**
Clase : B01J 008/000
Fecha de Solicitud : 30 de septiembre de 2010

CONTESTACION OFICIO No. 13996

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 prórroga solicitada al requerimiento efectuado por este Despacho mediante Oficio No. **13996** 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.

2. **Prioridad:** Adicionalmente, presento con este escrito copia certificada de la solicitud de patente No. 12/571,279 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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3. 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,

Luiz Clemencia De Paéz
LUZ CLEMENCIA DE PAEZ
C.C. 35.456.344 de Usaquén
T.P.A. No. 23.555

COLO-16645-801-006-2
SDC\SCT\ID-182996\WPC16645
No. M-2010-182996\SDC

KS

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APOSTILLE

(Convention de La Haye du 5 octobre 1961)

1. Country: United States of America

This public document

2. has been signed by M.K. Carter

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.

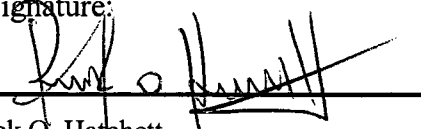
6. the twelfth of October, 2010

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

8. No: 11001136-3

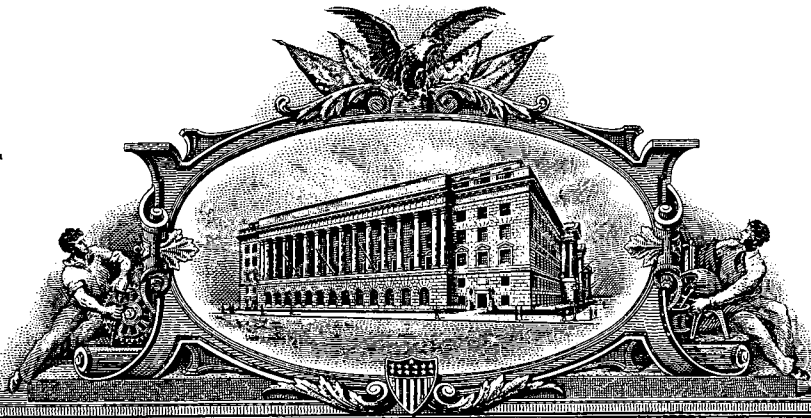
9. Seal/Stamp:

10. Signature:



Patrick O. Hatchett

A 7259675



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 23, 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

M. K. CARTER
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>Kiplin C. Alexander</td><td>10/07/2009</td></tr><tr><td>Mark C. Godden</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	Kiplin C. Alexander	10/07/2009	Mark C. Godden	10/07/2009	David L. Kraft	10/07/2009	
Name	Execution Date										
Mikhail Maryamchik	10/07/2009										
Kiplin C. Alexander	10/07/2009										
Mark C. Godden	10/07/2009										
David L. Kraft	10/07/2009										
RECEIVING PARTY DATA											
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Street Address:	20 S. Van Buren Avenue										
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State/Country:	OHIO										
Postal Code:	44203										
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>12571279</td></tr></tbody></table>	Property Type	Number	Application Number:	12571279							
Property Type	Number										
Application Number:	12571279										
CORRESPONDENCE DATA											
Fax Number:	(330)860-6609										
<i>Correspondence will be sent via US Mail when the fax attempt is unsuccessful.</i>											
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Address Line 4:	BARBERTON, OHIO 44203										
ATTORNEY DOCKET NUMBER:	7284										
NAME OF SUBMITTER:	Carolyn Mahoney										
Total Attachments: 3											

500997242

PATENT
REEL: 023420 FRAME: 0821

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PATENT
REEL: 023420 FRAME: 0822

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

**CIRCULATING FLUIDIZED BED (CFB) WITH
IN-FURNACE SECONDARY AIR NOZZLES**

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

99

ASSIGNMENT TO BABCOCK & WILCOX POWER GENERATION GROUP, INC.

CASE 7284

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 7284

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. Saus

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 SAUS
Notary Public, State of Ohio
Stark County
My Commission Expires Dec. 19, 2010

Page 3 of 3

RECORDED: 10/26/2009

PATENT
REEL: 023420 FRAME: 0825

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 23, 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: *12/571,279*

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 *US12/571,279*

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

Electronic Acknowledgement Receipt

EFS ID:	6181678
Application Number:	12571279
International Application Number:	
Confirmation Number:	1696
Title of Invention:	CIRCULATING FLUIDIZED BED (CFB) WITH IN-FURNACE SECONDARY AIR NOZZLES
First Named Inventor/Applicant Name:	MIKHAIL MARYAMCHIK
Customer Number:	41669
Filer:	Eric Marich
Filer Authorized By:	
Attorney Docket Number:	7284
Receipt Date:	30-SEP-2009
Filing Date:	
Time Stamp:	20:18:45
Application Type:	Utility under 35 USC 111(a)

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Payment was successfully received in RAM	\$1090
RAM confirmation Number	11822
Deposit Account	501813
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

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Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

13

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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Multipart Description/PDF files in .zip description					
	Document Description		Start	End	
	Specification		1	5	
	Claims		6	7	
	Abstract		8	8	
Warnings:					
Information:					
2	Drawings-only black and white line drawings	7284_Figs_3shts.pdf	1277430 351f79c80c1d5b15e6ea3f0291a33f1429b7c125	no	3
Warnings:					
Information:					
3	Oath or Declaration filed	DECLARATION.pdf	97246 d73ea31dac39cd3367ed5a9f69696250adb1eb8a	no	1
Warnings:					
Information:					
4	Fee Worksheet (PTO-875)	fee-info.pdf	33082 2ff66a016f1f32e854195394f511d6420600758d	no	2
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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

CIRCULATING FLUIDIZED BED (CFB) WITH IN-FURNACE SECONDARY AIR NOZZLES

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 in-furnace secondary air nozzles designed to prevent deflection of solids falling onto a bubbling fluidized bed (BFB) from the CFB by secondary air jets.

2. Description of the Related Art

[0002] United States Patent No. 6,543,905 to Belin et al. describes a CFB boiler with controllable in-bed heat exchanger (IBHX). The boiler comprises a CFB reaction chamber as well as a BFB heat exchanger located inside the reaction chamber. Heat transfer in the heat exchanger is controlled by means of controlling the rate of solids discharge from the lower part of the BFB into the reaction chamber. The overall heat transfer capacity of the IBHX depends on the solids downflow on the top of the bubbling bed in the IBHX from the CFB furnace. A higher downflow rate results in a higher heat transfer capacity. Secondary air is typically supplied to a CFB furnace via nozzles located at the front and rear furnace walls. The nozzles are located outside the furnace enclosure and their exit openings are flush with those walls. Because the IBHX is located adjacent to the wall(s) containing the nozzles, jets from the nozzles will deflect part of the solids downflow from the IBHX thus reducing its heat transfer capacity.

[0003] United States Patent No. 5,836,257 to Belin et al. describes a CFB furnace with an integral secondary air plenum. Such a plenum allows placing secondary air nozzles inside the furnace thus preventing interference of their jets with the solids downflow to the IBHX. However, the supporting structure and/or air supply means of the plenum may interfere with the gas and/or solids movement in the furnace,

and accommodating nozzles of the size sufficient to allow adequate jet penetration into a large CFB requires plenum which is larger than desirable.

SUMMARY OF THE INVENTION

[0004] The present invention prevents deflection of the solids falling onto the BFB from the CFB by secondary air jets while avoiding a complicated structure that would interfere with the gas and/or solids movement in the furnace.

[0005] Accordingly, one aspect of the present invention is drawn to a circulating fluidized bed (CFB) boiler comprising: a CFB reaction chamber having side walls and a grid defining a floor at a lower end of the CFB reaction chamber for providing fluidizing gas into the CFB reaction chamber; a bubbling fluidized bed (BFB) located within a lower portion of the CFB reaction chamber and being bound by outer wall(s) of the CFB reaction chamber, the floor of the CFB reaction chamber and enclosure wall(s) formed by cooled tubes that extend upward from the floor of the CFB to the height of the BFB; at least one controllable in-bed heat exchanger (IBHX), the IBHX comprising a heating surface and occupying part of the CFB reaction chamber floor and being surrounded by the enclosure walls of the BFB; and at least one in-furnace secondary air nozzle formed by the cooled tubes of the BFB enclosure wall that are formed into at least one group that extends from the top of the BFB enclosure wall across the width of the BFB until reaching the outer wall of the CFB.

[0006] The tubes forming the at least one in-furnace secondary air nozzle may become part of the outer wall when they reach the outer wall of the CFB. Additionally, the exit opening of the least one in-furnace secondary air nozzle is flush, or almost flush, with the enclosure wall of the BFB.

[0007] The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming 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

- [0008] Fig. 1 is a sectional side elevational view of a CFB boiler according to the invention illustrating the secondary air nozzles;
- [0009] Fig. 2 is a sectional plan view of the CFB boiler of Fig. 1, viewed in the direction of arrows 2-2 of Fig. 1;
- [0010] Fig. 3 is a schematic perspective view of the BFB enclosure, where tubes forming the in-furnace secondary air nozzles are represented as single lines;
- [0011] Fig. 4 is a sectional side elevational view of a CFB boiler according to another embodiment of the invention; and
- [0012] Fig. 5 is a sectional plan view of the CFB boiler of Fig. 4, viewed in the direction of arrows 5-5 of Fig. 4.

DESCRIPTION OF THE INVENTION

- [0013] 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 in-furnace secondary air nozzles designed to prevent the deflection of solids falling into the BFB from the CFB by secondary air jets.
- [0014] 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.
- [0015] 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 sectional side elevational view of a CFB furnace 1 is shown comprising walls 2 and an IBHX 3 immersed in a BFB 4. The CFB is predominantly comprised of

solids made up of the ash from the combustion of the fuel 5, sulfated sorbent 6 and, in some cases, external inert material 7 fed through at least one of the walls 2 and fluidized by the primary air 8 supplied through a distribution grid 9. Some solids are entrained by gases resulting from the fuel combustion and move upward 15 eventually reaching a particle separator 16 at the furnace exit. While some of the solids 17 pass the separator, the bulk of them 18 are captured and recycled back to the furnace. Those solids along with others 19, falling out of the upflow solids stream 15, feed the BFB 4 that is being fluidized by the fluidizing medium 25 fed through a distribution grid 26. Means for removing solids from CFB and BFB (27 and 28 respectively) are provided in the pertinent areas of the furnace floor.

[0016] The BFB is separated from the CFB by an enclosure 30. Rate of solids recycle 35 back to the CFB through a valve 40 is controlled by controlling streams of fluidizing medium 45 and 46. The enclosure is made of tubes 50 that are typically cooled by water or steam. The tubes are usually protected from the erosion and/or corrosion by a protective layer, commonly formed by a refractory held by studs welded to the tubes. The tubes forming the enclosure extend upward to the elevation allowing the required BFB 4 height within the CFB furnace 1. Above the required height, the tubes 50 group into forming secondary air nozzles 55. Air 60 fed to these nozzles is injected into the CFB beyond the BFB 4, thus its jets 65 do not deflect streams of solids 18 and 19 from falling onto the BFB 4. Grouping the tubes 50 allows forming the openings 70 through which the solids streams 18 and 19 fall onto the BFB 4. After reaching the wall 2b, the tubes 50 can become part of this wall. Secondary air nozzles 75 on the opposite wall 2d are located externally to the CFB furnace 1. Since no IBHX is placed below the nozzles 75, their jets 80 do not cause any undesired effect.

[0017] Fig. 3 illustrates one possible construction of the in-furnace secondary air nozzles 55 formed by tubes 50. In Fig. 3, the tubes 50 forming the in-furnace secondary air nozzles 55 are schematically represented as single lines.

[0018] In an alternative embodiment, illustrated in Figs. 4 and 5, BFB 4 with immersed IBHX 3 is located on both of opposite furnace walls 2b and 2d. Tubes 50 of enclosure 30 on both sides of the furnace group to form secondary air nozzles 55. In

order to feed fuel, limestone and other solids streams directly into the CFB, the BFB on at least one furnace wall (the 2d wall in this embodiment of Figs. 4 and 5) is broken into several compartments 80. Each compartment 80 is formed by a furnace wall 2d, enclosure 30 and two side walls 85 (or one side wall 85 and a furnace wall 2a or 2c). The compartments are separated from each other by gaps 90 where the fuel, limestone, etc. is fed.

[0019] 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.

- 6 -

CLAIMS

What is claimed is:

1. A circulating fluidized bed (CFB) boiler comprising:
 - a CFB reaction chamber having side walls and a grid defining a floor at a lower end of the CFB reaction chamber for providing fluidizing gas into the CFB reaction chamber;
 - a bubbling fluidized bed (BFB) located within a lower portion of the CFB reaction chamber and being bound by outer wall(s) of the CFB reaction chamber, the floor of the CFB reaction chamber and enclosure wall(s) formed by cooled tubes that extend upward from the floor of the CFB to the height of the BFB;
 - at least one controllable in-bed heat exchanger (IBHX), the IBHX comprising a heating surface and occupying part of the CFB reaction chamber floor and being surrounded by the enclosure walls of the BFB; and
 - at least one in-furnace secondary air nozzle formed by the cooled tubes of the BFB enclosure wall that are formed into at least one group that extends from the top of the BFB enclosure wall across the width of the BFB until reaching the outer wall of the CFB.
2. The CFB boiler according to claim 1, wherein when the tubes forming the at least one in-furnace secondary air nozzle reach the outer wall of the CFB, the tubes become part of the outer wall.
3. The CFB boiler according to claim 1, wherein the exit opening of the least one in-furnace secondary air nozzle is flush, or almost flush, with the enclosure wall of the BFB.
4. The CFB boiler according to claim 1, wherein the tubes comprising the BFB enclosure wall are covered with a protective layer.

- 7 -

5. The CFB boiler according to claim 4, wherein the protective layer is formed by a refractory held by studs welded to the tubes.

6. The CFB boiler according to claim 1, wherein the tubes forming the in-furnace secondary air nozzles are covered with a protective layer.

7. The CFB boiler according to claim 6, wherein the protective layer is formed by a refractory held by studs welded to the tubes.

- 8 -

ABSTRACT

A circulating fluidized bed (CFB) boiler includes a reaction chamber, where a bubbling fluidized bed (BFB) is contained within an enclosure within the lower portion of the reaction chamber and contains an in-bed heat exchanger (IBHX) that occupies part of the reaction chamber floor. A plurality of in-bed secondary air nozzles comprise a plurality of tubes which are grouped together and run across the width of the BFB between the BFB enclosure wall and an outside wall of the CFB. The nozzles are positioned to prevent the deflection of solids falling onto the BFB from the CFB by the secondary air jets while avoiding a complicated structure that would interfere with gas and/or solids movement in the furnace. The nozzles' exit openings are flush, or almost flush, with the BFB enclosure wall.

DECLARATION FOR PATENT APPLICATION

Docket No. 7284

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 **CIRCULATING FLUIDIZED BED (CFB) WITH IN-FURNACE SECONDARY AIR NOZZLES**, 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.

Address all telephone calls to
Address all correspondence to

Eric Marich at telephone no. **(330) 860-6605**
Babcock & Wilcox Power Generation Group, Inc.
Patent Department - BVCB2K
20 South Van Buren Avenue
Barberton, OH 44203-0351

41669

41669

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.

Full name of sole or first inventor **MIKHAIL MARYAMCHIK**

Inventor's signature _____

Date _____ Citizenship US

Residence Fairlawn, Ohio
Post office address 3800 Rosemont Blvd. #113D
Fairlawn, Ohio 44333

Full name of second inventor, if any **KIPLIN C. ALEXANDER**

Inventor's signature _____

Date _____ Citizenship US

Residence Wadsworth, Ohio
Post office address 476 Rolling Hills Drive
Wadsworth, Ohio 44281

Full name of third inventor, if any **MARK C. GODDEN**

Inventor's signature _____

Date _____ Citizenship US

Residence Mogadore, Ohio
Post office address 2359 Sesame Street NW
Mogadore, Ohio 44260

Full name of fourth inventor, if any **DAVID L. KRAFT**

Inventor's signature _____

Date _____ Citizenship US

Residence Massillon, Ohio
Post office address 5882 Great Court Circle NW
Massillon, Ohio 44646

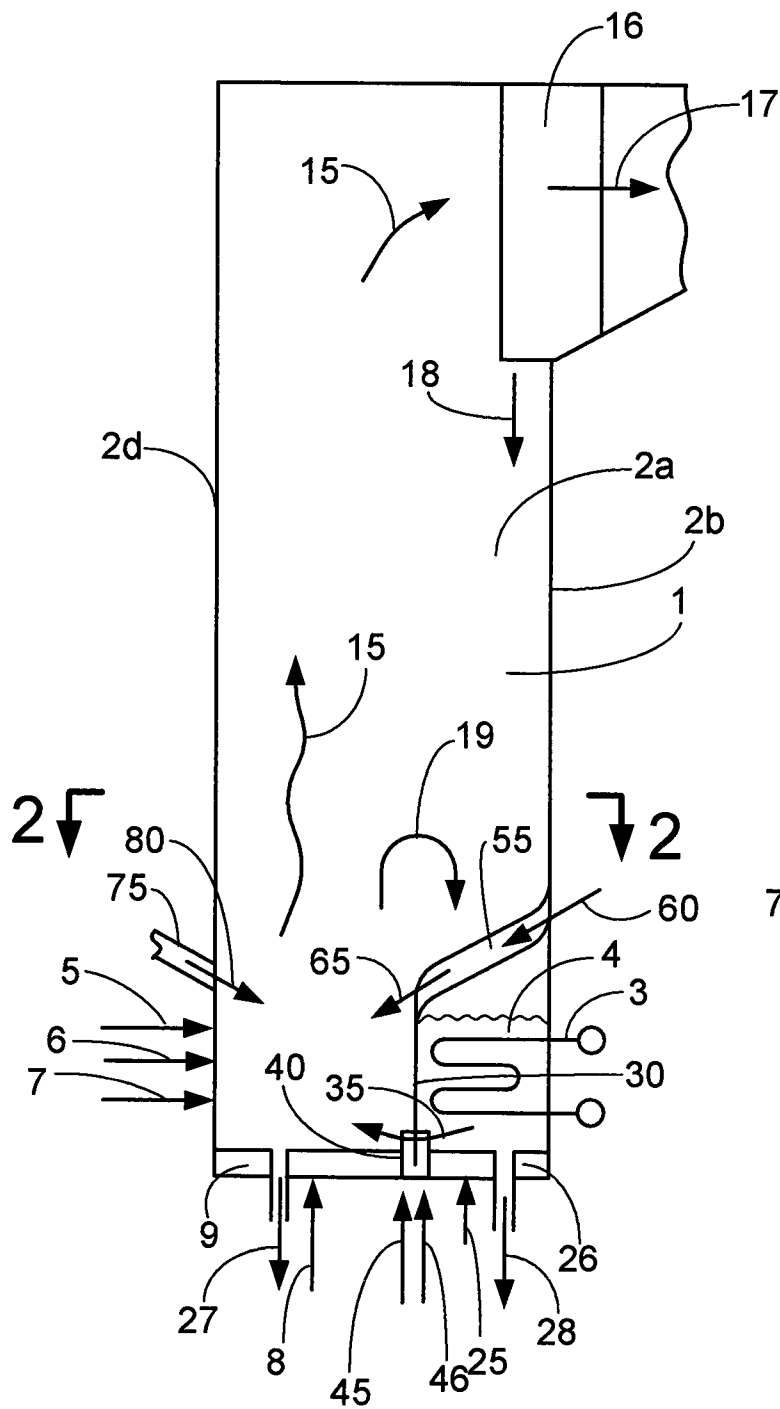


FIG. 1

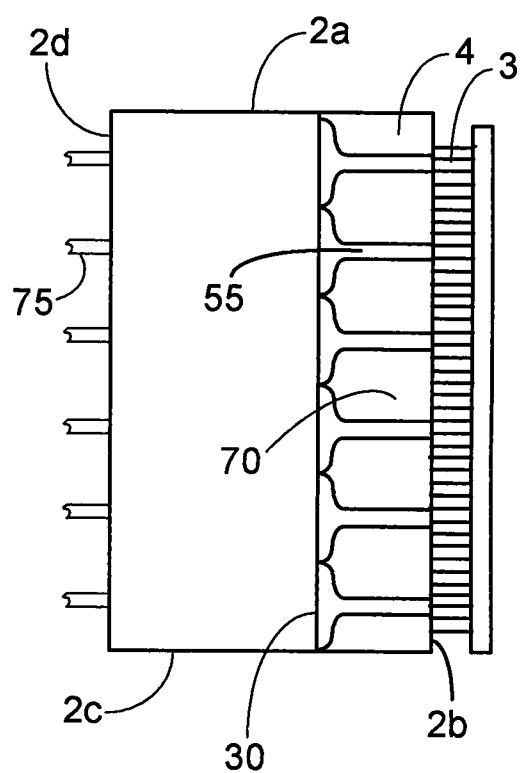


FIG. 2

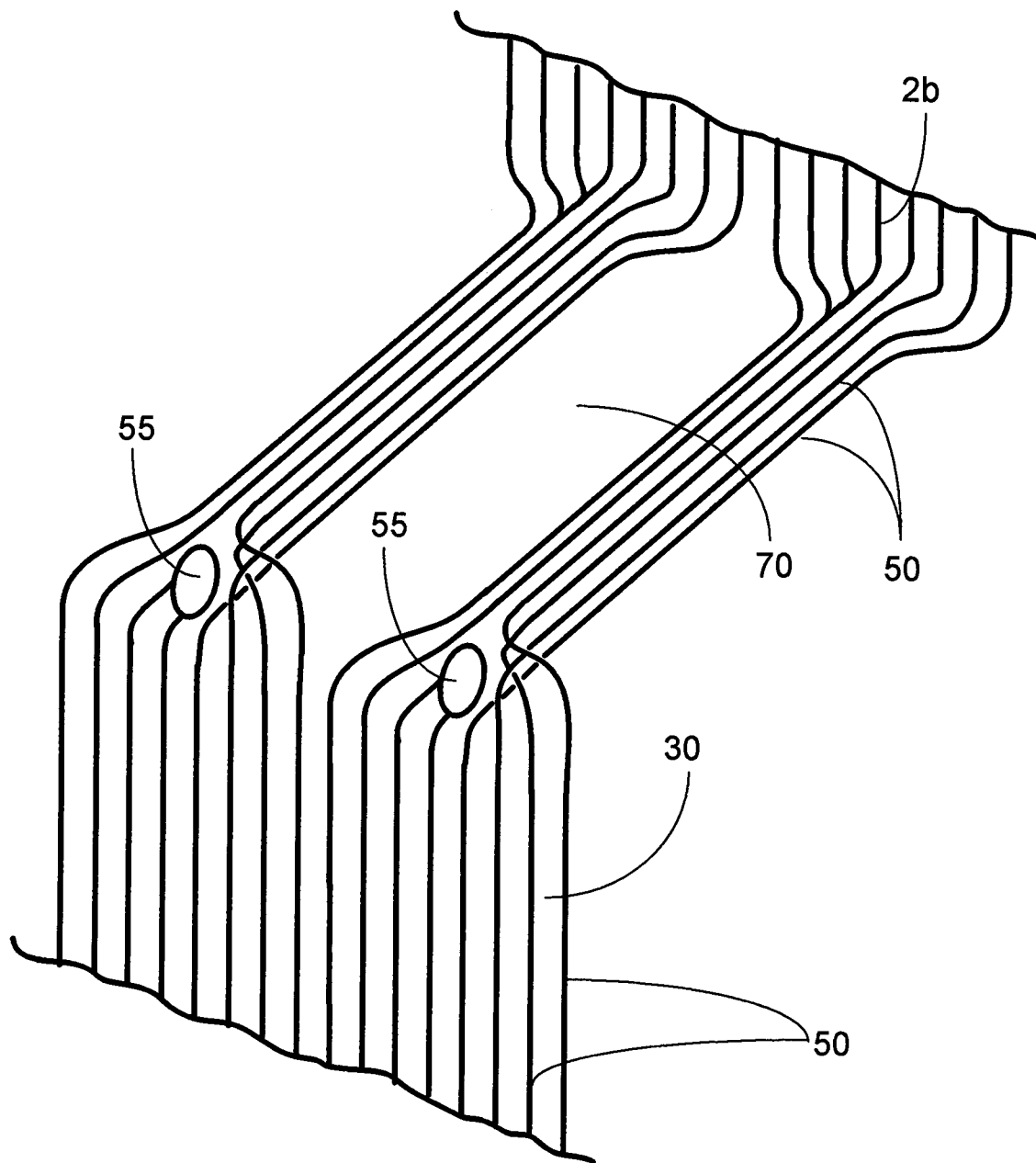


FIG. 3

FIG. 4

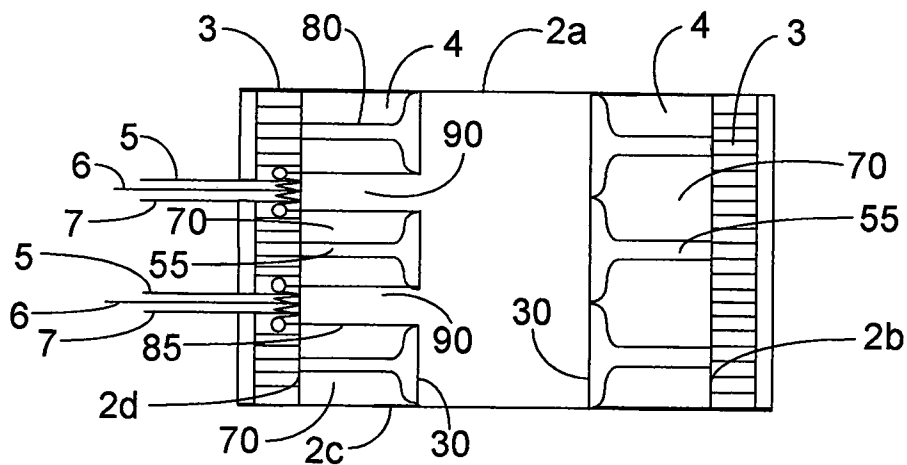
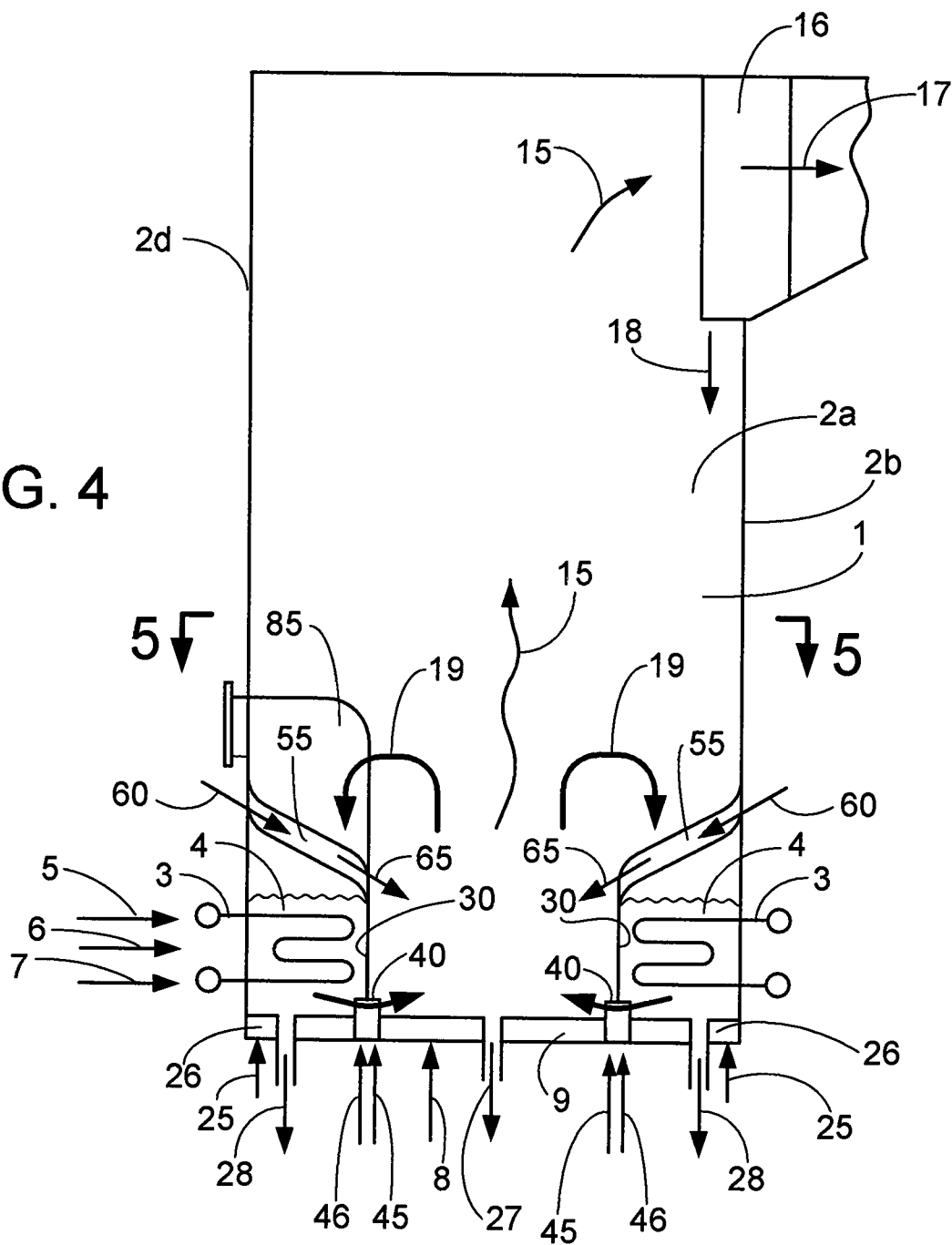


FIG. 5

REIVINDICACIONES

5 Lo que se reivindica es:

1. Una caldera de cama de fluidez circulante (CFB) que comprende:

Una cámara de reacción CFB que tiene paredes laterales y una
rejilla que define un piso en una parte baja de la cámara de reacción CFB para
10 proveer gas de fluidez dentro de la cámara de reacción CFB;

una cama de fluidez de burbujas (BFB) ubicada dentro de una
porción baja de la cámara de reacción CFB y estando unida a la(s) pared(es)
externa(s) de la cámara de reacción CFB, el piso de la cámara de reacción CFB y
la(s) pared(s) de cerramiento formada(s) por tubos de enfriamiento que se
15 extienden hacia arriba desde el piso de la CFB a la altura de la BFB;

por lo menos un intercambiador de calor en-cama (IBHX)
controlable, el IBHX comprendiendo una superficie de calentamiento y ocupando
parte del piso de la cámara de reacción CFB y estando rodeado por las paredes
de cerramiento de la BFB; y

20 por lo menos una boquilla de aire secundario en-caldera formado
por los tubos de enfriamiento de la pared de cerramiento de la BFB que están
formados en por lo menos un grupo que se extiende hacia la parte superior de la
pared de cerramiento de la BFB a través del ancho de la BFB hasta que alcanza
la pared externa de la CFB.

25 2. La caldera CFB de acuerdo con la reivindicación, en donde, cuando
los tubos forman por lo menos una boquilla de aire secundario en-caldera

20

alcanzan la pared externa de la CFB, los tubos se convierten en parte de la pared externa.

3. La caldera CFB de acuerdo con la reivindicación 1, en donde la
5 abertura de salida de por lo menos una boquilla de aire secundario en-caldera está alineada, o casi alineada, con la pared de cerramiento de la BFB.

4. La caldera CFB de acuerdo con la reivindicación 1, en donde los
tubos que comprenden la pared de cerramiento de la BFB están cubiertos con
10 una capa protectora.

5. La caldera CFB de acuerdo con la reivindicación 4, en donde la capa
protectora está formada por un material refractario sostenido por tacos soldados a
los tubos.

6. La caldera CFB de acuerdo con la reivindicación 1, en donde los
tubos que forman las boquillas de aire secundario en-caldera están cubiertos con
una capa protectora.

7. La caldera CFB de acuerdo con la reivindicación 6, en donde la capa
protectora está formada por un material refractario sostenida por tacos soldados a
los tubos.

TRADUCCION OFICIAL 311/2010 DE UN DOCUMENTO EN IDIOMA INGLÉS
REALIZADA POR EDUARDO CALADO NOGUERA, TRADUCTOR OFICIAL
AUTORIZADO POR RESOLUCIÓN 541 DEL 27 DE FEBRERO DE 1976 POR
EL MINISTERIO DE JUSTICIA Y DEBIDAMENTE REGISTRADO ANTE EL
MINISTERIO DE RELACIONES EXTERIORES DE COLOMBIA

ESTADOS UNIDOS DE AMÉRICA

A quien corresponda:

DEPARTAMENTO DE COMERCIO DE ESTADOS UNIDOS

OFICINA DE MARCAS Y PATENTES DE ESTADOS UNIDOS

23 de septiembre de 2010

POR LA PRESENTE SE CERTIFICA QUE LA ADJUNTA ES UNA COPIA
VERÍDICA TOMADA DE LOS REGISTROS DE LA OFICINA DE MARCAS Y
PATENTES DE ESTADOS UNIDOS SOBRE LOS DOCUMENTOS DE LA
SOLICITUD DE PATENTE ABAJO IDENTIFICADA Y QUE CUMPLIERON CON
LOS REQUISITOS PARA TENER UNA FECHA DE RADICACIÓN DE
CONFORMIDAD CON LA DISPOSICIÓN 35 USC 111.

NÚMERO DE SOLICITUD: 12/571,279

FECHA DE RADICACIÓN: 30 de septiembre de 2009.

EL CÓDIGO DE PAIS Y EL NÚMERO DE SU SOLICITUD DE PRIORIDAD,
PARA USARLOS PARA RADICACIÓN EN EL EXTRANJERO DE ACUERDO CON
LA CONVENCIÓN DE PARIS ES US12/571,279

POR AUTORIZACIÓN DEL SUBSECRETARIO DE COMERCIO PARA PROPIEDAD
INTELECTUAL Y DIRECTOR DE LA OFICINA DE MARCAS Y PATENTES DE
ESTADOS UNIDOS. FIRMADO: P. SWAIN, FUNCIONARIO CERTIFICADOR
SELLO REALZADO FIJADO SOBRE ESTRELLA DE PAPEL DORADO
BRILLANTE, CON LA LEYENDA: OFICINA DE MARCAS Y PATENTES DE
ESTADOS UNIDOS, DEPARTAMENTO DE COMERCIO.


Eduardo Calado Noguera
TRADUCTOR OFICIAL
Inglés - Español - Inglés
Res. 541 Febrero de 1976

15 MINUTOS, 225 PALABRAS

COLO-16645-801-006-2

ECN\ECN\ID-180984\WPCL002G

Bogotá, 22 de octubre de 2010.

Eduardo Calade n.
Eduardo Calade Noguera
TRADUCTOR OFICIAL
Inglés - Español - Inglés
Rcs. 541 Febrero de 1976

27

ESTADOS UNIDOS DE AMERICA

A TODOS QUIENES ESTO PUEDA INTERESAR

DEPARTAMENTO DE COMERCIO DE LOS ESTADOS UNIDOS

Oficina de Patentes y Marcas Registradas de los Estados Unidos

23 de Septiembre de 2010

ESTO ES PARA CERTIFICAR QUE LO ANEXO ES UNA COPIA FIEL DE LOS REGISTROS
DE ESTA OFICINA DE UN DOCUMENTO REGISTRADO EL 26 DE OCTUBRE DE 2009

Por la autoridad de

Bajo la Secretaría de Comercio para la propiedad intelectual

Y el Director de la oficina de patentes y Marcas Registradas de los Estados Unidos

SELLO DE LA OFICINA DE PATENTES Y MARCAS REGISTRADAS DE DEPARTAMENTO
DE COMERCIO

FIRMA ILEGIBLE

M.K. CARTER

Oficial Certificador

Resolución
5694/78
Minjusticia
Clemencia Paredes Tejada
TRADUCTORA OFICIAL
ENGLISH - FRENCH - SPANISH
ANGLAIS - FRANÇAIS - ESPAGNOL

25

33

ASIGNACION DE PATENTE

Electronic versión v1.1

Estilo de hoja Versión v1.1

Tipo de remisión: Asignación nueva

Naturaleza del traspaso: Asignación

Datos de partes del traspaso

Nombre	Fecha de ejecución
Nikhail Maryamchil	10/07/2009
Kiplin C. Alexander	10/07/2009
Mark C. Godden	10/07/2009
David L. Kraft	10/07/2009

Datos de parte receptora

Nombre	Babcock & Wilcox power Generation Group, Inc
Dirección	20 S. Van Buren Ave
Ciudad	Barberton
Estado / Condado	OHIO
Código Postal	44203

NUMEROS DE PROPIEDAD Total: 1

Tipo de Propiedad	Número
Número de aplicación	12571279

DATOS DE CORRESPONDENCIA

Número de fax: (330) 860 – 6609

La correspondencia será enviada via correo de los Estados Unidos cuando el intento de fax sea infructuoso.

Teléfono: 330-860-6605

Email: cmahoney@babcock.com



NOMBRE CORRESPONDIENTE: BABCOCK & WILCOX POWER GENERATION
GENERATION GROUP

LINEA DE DIRECCIÓN 1 DEPARTAMENTO DE PATENTES

26

29

LINEA DE DIRECCIÓN 2 20 SOUTH VAB BUREN AVENUE	
LINEA DE DIRECCIÓN 3 BARBERTON, OH 44203	
EXPEDIENTE DE ABOGADO NÚMERO:	7284
Nombre de quien presenta	Carolyn Mahoney
Total Adjuntos	PATENT
500997242	ROLLO: 023420 MARCO: 0821

CESIÓN A BABCOCK & WILCOX POWER GENERATION GROUP, INC.

CASO 7284

Esta cesión hecha el día 7 de octubre de 2009 por MIKHAIL MARYAMCHIC, residente de 3899 Rosemount Blvd. #113D, Fairlawn, Ohio 44333, y por KIPLIN C. ALEXANDER, residente de 476 Rolling Hills Drive, Wadsworth, Ohio 44281; y MARK C. GODDEN, residente de 2359 Sesame Street NW, Mogadore, Ohio 44260 y por DAVID L. KRAFT, residente de 5882 Great Coutr Circle NW, Massillon, Ohio 44646, todos ciudadanos de los Estados Unidos de América

ATESTIGUAN: que

CONSIDERANDO QUE, nosotros somos los inventores colaboradores de un mejoramiento o invención en

CAMA DE FLUIDEZ CIRCULANTE (CFB) CON BOQUILLAS DE AIRE SECUNDARIO EN-CALDERA

Para lo cual hemos preparado y registrado una aplicación para certificado de patente de los Estados Unidos de América el día 30 de septiembre de 2009 y

CONSIDERANDO QUE BABCOCK Y WILCOX POWER GENERATION GROUP, INC, una corporación organizada bajo las leyes del estado de Delaware, U.S.A. y que tiene su oficina principal en 20 S. Van Buren Ave., Barberton, Ohio, U.S.A. desea adquirir el derecho, título e interés completo de y sobre dicho mejoramiento e invención y cualquiera de todos los certificados de patente que pueden estar otorgados en el mismo.

Ahora, por lo tanto, a Todos a Los Que Corresponda, será conocido que para y en consideración de la suma de un dólar (\$1.00) que nos fue pagado en la mano, y otras consideraciones valiosas, el recibo de lo cual se reconoce en la presente, nosotros, MIKHAIL MARYMCHICK, KIPLIN C. ALEXANDER, MARK C GOODEN y DAVID L. KRAFT, han



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Handwritten mark: *SA*

vendido, asignado, transferido, cedido y por los presentes venden, asignan, transfieren y ceden a dicho BABCOCK Y WILCOX POWER GENERATION GROUP, INC, sus sucesores y designados, el derecho título e interés total en y sobre el mejoramiento, invención y solicitud para Certificado de Patente del mismo mencionados previamente y en y para cualquiera y todos los certificados de patente de los Estados Unidos que puedan ser reconocidos para el mismo y para y en todas las extensiones, divisiones o re-emisiones de dichos certificados de patentes, lo mismo para ser usado y disfrutado por WILCOX POWER GENERATION GROUP, INC, para su propio uso y provecho, y el uso y provecho de sus sucesores y representantes, al final completo del término para el cual dicho certificado de patente puede ser mencionado, tan completa y enteramente poseído y disfrutado por nosotros si esta cesión y venta no se hubiera hecho.

Y, por las consideraciones dichas previamente, a través del presente convenimos y acordamos con dicho BABCOCK Y WILCOX POWER GENERATION GROUP, INC, sus sucesores y representantes, que al momento de la ejecución y entrega de los presentes, somos los colaboradores y dueños ante la ley del completo derecho, título e interés en y sobre el mejoramiento, invención, aplicación y certificados de patente previamente mencionados, y que aquellos están igualmente libre de gravamen, y que nosotros tenemos derecho y autoridad legal para vender y convenir el mismo en la manera que se expone en la presente.

Y, por la consideración previamente mencionada, hemos vendido, asignado, transferido y cedido, y por los presentes vendemos, asignamos, transferimos y cedemos a BABCOCK Y WILCOX POWER GENERATION GROUP, INC, sus sucesores y representantes o designados, el derecho, título e interés total en y sobre cualquiera de los certificados de patente o otras formas de protección que puedan ser reconocidas en países diferentes a los Estados Unidos de América, o otras formas de protección que pueden ser reconocidas y en y para cualquiera de las aplicaciones para certificados de patentes o otras formas de protección que puedan estar archivadas para dicho mejoramiento e invención en países distintos a los Estados Unidos, incluyendo todos los derechos para reclamar prioridad, y en y para la invención descrita en dichas aplicaciones, y nosotros, a través del presente autorizamos y damos poder a BABCOCK Y WILCOX POWER GENERATION GROUP, INC, sus sucesores, representantes y designados, para aplicar para certificados de patente, u otras formas de protección sobre dicho mejoramiento o invención, en su propio nombre o en



92

nombre de sus sucesores, representantes y designados, en y en todos los países en donde este desee registrar tales solicitudes y en donde tales solicitudes puedan ser registradas por otros distintos a los inventores; y nosotros, a través del presente convenimos y estamos de acuerdo en firmar todos los papeles e ilustraciones, tomar todos los votos legales, y hacer todos los actos necesarios o que se requieran para la adquisición de certificados de patente válidos, o otras formas de protección, para dicho mejoramiento o invención en países distintos a los Estados Unidos, y para invertir o confirmar mas adelante el derecho y título sobre el mismo en BABCOCK Y WILCOX POWER GENERATION GROUP, INC., sus sucesores, representantes o designados, pero a sus expensas.

En fe de lo cual los testigos hemos estampado aquí nuestras firmas y sellado en el día y año escritos previamente.

(Firmado Ilegible)

MIKHAIL MARYAMCHIK

(Firmado Ilegible)

KIPLIN C. ALEXANDER

(Firmado Ilegible)

MARK C. GODDEN

(Firmado Ilegible)

DAVID L. KRAFT

TESTIGOS

(Firmado Ilegible)

(Firmado Ilegible)

ESTADO DE OHIO

CONDADO DE (Ilegible)

En este, el día 7 de octubre de 2009, ante mí se presentaron personalmente Mikhail Maryamchik, Kiplin C. Alexander, Mark C. Godden y David L. Kraft conocidos por ser las personas descritas y las cuales ejecutaron el instrumento anterior, y ellos reconocieron ante mí que ellos ejecutaron lo mismo por el propósito allí establecido

SELLO

(Firmado Ilegible)

SELLO NOTARIAL DEL ESTADO DE OHIO AMY M. SAUS

NOTARIO PÚBLICO, ESTADO DE OHIO

Clemencia Paredes Tejeda
TRADUCTORA OFICIAL
ESPAÑOL - INGLÉS
ENGLISH - FRENCH
SPANISH - FRANÇAIS
ESPAÑOL - INGLÉS

Resolución
6694/78
Ministerio de Justicia

22

Condado de Stark

Mi comisión expira en 19 de diciembre de 2010

PATENT

REGISTRADO: 10/26/2009

ROLLO: 023420 MARCO: 0821



APOSTILLA

(Convención de la Haya del 5 de octubre de 1961)

1. País: Estados Unidos de América

Este documento público

2. Ha sido firmado por M.K. Carter

3. Actuando en su capacidad de: Oficial certificador

4. Lleva el sello/estampilla de: Oficina de Patentes y Marcas Registradas de los Estados Unidos

Certificado

5. En Washington D.C.

6. El 12 de octubre de 2010

7. Por Oficial Asistente de Autenticación, Departamento de Estado de los Estados Unidos

8. No. 11001136-3

9. Sello / Estampilla

10. Firma

(Ilegible)

Patrick O. Hatchett

MINISTERIO DE
RELACIONES EXTERIORES
2010 NOV 30 P 2:17
JEFE DE LEGALIZACIONES
BOGOTA D.C.

NO SE ASUME
RESPONSABILIDAD
DEL TEXTO
039354
C. Paredes Tejada
CUYA FIRMA APARECE EN EL
DOCUMENTO DESEMPEÑA
LAS FUNCIONES INDICADAS.

Resolución
6694/78
Injusticia

Clemencia Paredes Tejada
TRADUCTORA OFICIAL
ENGLISH - FRENCH - SPANISH
ANGLAIS - FRANÇAIS - ESPAGNOL

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 121109
	Trámite 2
	Evento 1
	Actuación 416
	Oficio No. 13283
	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,

22 JUN. 2011



JOSE LUIS SALAZAR LOPEZ
Director de Nuevas Creaciones (C)

jfernand