



No. 08-079808- -00002-0000

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Tra. 2 PATENTES Eve: 1 REGDEPOSITO
Act. 444 RESPUESTAREQUE Folios: 75

As. 108.104

Señores

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

DIVISION DE NUEVAS CREACIONES

E. S. D.

RESPUESTA A OFICIO 10825 DEL 28 AGOSTO 2008

REF: Expediente No. 08 079808 - Solicitud de Patente
a favor de **UOP LLC**

Titulada: **PROCESO Y APARATO PARA CALENTAR GAS DE REGENERACIÓN**

JUAN PABLO CADENA SARMIENTO, vecino de Bogotá, portador de la tarjeta profesional No. 57492, obrando como apoderado de la sociedad **UOP LLC**, según lo acredita el documento de poder presentado en esa División, para dar cumplimiento al requerimiento notificado por fijación en lista el 28 de agosto de 2008, de acuerdo con los Artículos 38 y 39 de la Decisión 486 de la Comisión de la Comunidad Andina, me permito allegar:

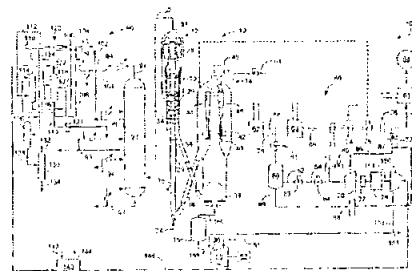
1. Documentos (2) donde consta la cesión del derecho a la Patente otorgado por los inventores al solicitante, debidamente apostillados, junto con sus correspondientes traducciones al castellano.
2. Copias certificadas por la Oficina de Patentes de Estados Unidos de las dos primeras solicitudes presentadas para la misma invención, de las cuales REIVINDICAMOS PRIORIDAD, junto con sus correspondientes traducciones al castellano.
3. Artes finales (2 de 12 cm X 12 cm y 1 de 6 cm X 6 cm).
4. Extracto para publicación y Tarjeta de archivo Temático.

De la señora Jefe atentamente,


JUAN PABLO CADENA SARMIENTO
C.C. No. 80.410.337 de Usaquén
Cra 7 No. 71-21, Torre B, Piso 4

Bogotá, 27 de octubre de 2008
MEVCAG/aac

(21) N° de solicitud: 08 079808		(22) Fecha de solicitud: 31-07-2008	
(541) Clasificación Internacional:			
(71) Solicitante(s): UOP LLC			
(72) Inventor(es): Keith Allen Couch, Xin Xiong Zhu, James Patrick Glavin			
(74) Agente: JUAN PABLO CADENA SARMIENTO			
(30) Prioridad	(31)	No. Prioridad	(32) Fecha
		11/832,147	01-08-2007
		11/832,152	01-08-2007
(85) Fecha inicio fase nacional:		(87) Publicación internacional:	
(86) Datos relativos a la presentación de la solíc. PCT		Fecha:	
Fecha de presentación de la solicitud:		No. Publicación:	
No. de solicitud			



(54) Título: PROCESO Y APARATO PARA CALENTAR GAS DE REGENERACIÓN

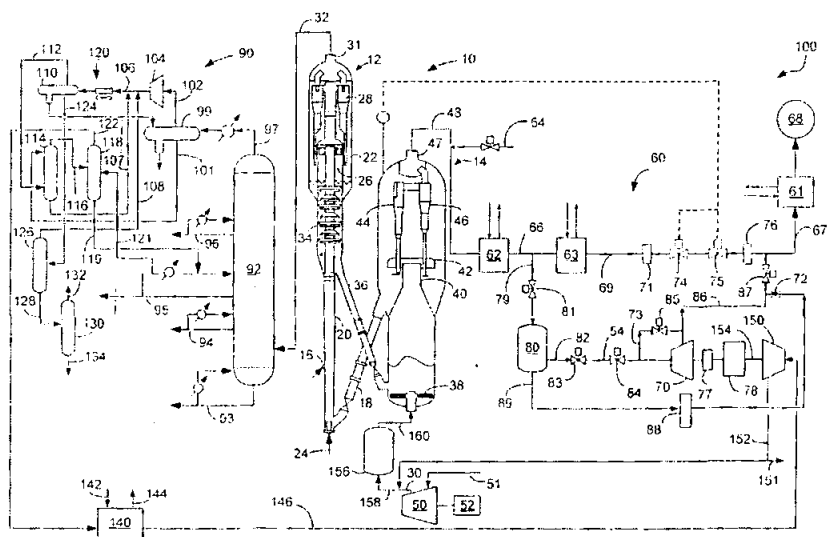
(57) Reivindicación(es):

1. Un proceso para procesar corrientes provenientes de una unidad de craqueo catalítico tipo fluido, el cual comprende:
 - contactar el catalizador de craqueo con una corriente de carga de hidrocarburos para craquear los hidrocarburos en productos hidrocarburos gaseosos con un peso molecular menor y depositar coque en el catalizador para proporcionar catalizador coquizado;
 - separar el citado catalizador coquizado de los citados productos hidrocarburos gaseosos;
 - agregar por lo menos una porción de una corriente de gas de regeneración con contenido de oxígeno al citado catalizador coquizado;
 - quemar coque en el citado catalizador coquizado con oxígeno para regenerar el citado catalizador y proporcionar gas de chimenea;
 - separar los citados productos hidrocarburos gaseosos para obtener una pluralidad de corrientes de producto, incluida una corriente de producto seleccionado; y
 - combinar por lo menos una porción de la citada corriente de producto seleccionado con por lo menos una porción de la citada corriente de gas de regeneración.

CONTINUA AL RESPALDO ...

6. Un aparato para procesar corrientes provenientes de una unidad de craqueo catalítico tipo fluido, el cual comprende:
- un reactor de craqueo catalítico tipo fluido para contactar el catalizador de craqueo con una corriente de carga de hidrocarburos para craquear los productos hidrocarburos en productos hidrocarburos gaseosos, que tienen un peso molecular menor, y depositar coque en el catalizador para proporcionar catalizador coquizado;
 - una salida de producto para descargar los citados productos hidrocarburos gaseosos del citado reactor;
 - un regenerador para quemar coque del citado catalizador coquizado mediante contacto con oxígeno;
 - una salida de gas de chimenea para descargar gas de chimenea del citado regenerador;
 - una sección de recuperación de producto en comunicación corriente abajo con dicha salida de producto, siendo la citada sección de recuperación de producto para separar los citados productos gaseosos en una pluralidad de corrientes de producto, incluida una corriente de producto seleccionado; y
- estando el citado regenerador en comunicación corriente abajo con la citada sección de recuperación de producto.

4



ARTE FINAL
12x12 cm

AS: 108104 (1)
40²



SPRINGFIELD, ILLINOIS

APOSTILLE

(Convention de La Haye du 5 Octobre 1961)

1. Country: United States of America
This public document
2. has been signed by ROSE A. NAGEL
3. acting in the capacity of NOTARY PUBLIC, MCHENRY COUNTY
4. bears the seal/stamp of STATE OF ILLINOIS

Certified

5. Springfield, Illinois
6. AUGUST 8, 2008
7. by the Secretary of State, State of Illinois
8. No. S08KL15063

9. Seal/Stamp:
10. Signature:



Jesse White

JESSE WHITE
SECRETARY OF STATE
STATE OF ILLINOIS

UOP LLC
(a Delaware limited liability company)

Certificate of Assistant Secretary

I, Frank S. Molinaro, do hereby certify that I am a duly elected Assistant Secretary – Patent Matters of UOP LLC, a limited liability company of Delaware, United States of America and that:

1) the attached is a true copy of the fully executed Assignment dated October 15, 2007, October 10, 2007, and October 11, 2007 whereby;

Keith A. COUCH
Xin X. ZHU
James P. GLAVIN

inventors of an invention entitled:

PROCESS FOR HEATING REGENERATION GAS

assigned their worldwide interest in said invention, and in an application for Letters Patent of the United States of America for said invention, including all foreign rights to said invention, to UOP LLC, a limited liability company, organized under the laws of the State of Delaware, United States of America, and having its principal office at Des Plaines, Illinois, United States of America;

2) that an application for Letters Patent for said invention was filed in the United States of America Patent Office under Application No. 11/832,147 on August 1, 2007;

3) that the invention so assigned is the same as the invention in respect of which an application for Letters Patent in **COLOMBIA** has been entitled:

PROCESS FOR HEATING REGENERATION GAS

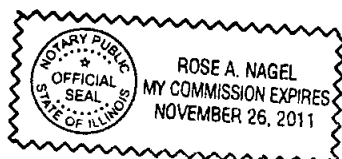
IN WITNESS WHEREOF, I have executed this certificate on behalf of UOP LLC on July 28, 2008.

Frank S. Molinaro

Frank S. Molinaro
Assistant Secretary – Patent Matters

NOTARY ACKNOWLEDGEMENT

This instrument was acknowledged before me in McHenry County, Illinois, U.S.A., on July 28, 2008, by Frank S. Molinaro, Assistant Secretary - Patent Matters of UOP LLC, a limited liability company of Delaware, United States of America.



Rose A. Nagel

Notary Public

TRADUCCION AL ESPAÑOL del Documento de Cesión a **UOP LLC** firmado por los cedentes y el cesionario.

APOSTILLA

(Convención de La Haya del 5 de Julio de 1961)

- 1. PAÍS: ESTADOS UNIDOS DE AMÉRICA
ESTE DOCUMENTO PÚBLICO
- 2. HA SIDO FIRMADO POR ROSE A. NAGEL
- 3. ACTUANDO EN CAPACIDAD DE NOTARIO PÚBLICO, CONDADO MCHENRY
- 4. LLEVA EL SELLO/TIMBRE DEL ESTADO DE ILLINOIS

CERTIFICADO

- 5. SPRINGFIELD, ILLINOIS
- 6. AGOSTO 8, 2008
- 7. POR EL SECRETARIO DE ESTADO, ESTADO DE ILLINOIS
- 8. NO. S08KL15063
- 9. SELLO/TIMBRE
- 10. FIRMA

(FIRMA)

JESSE WHITE
SECRETARIO DE ESTADO
ESTADO DE ILLINOIS

Hay un sello que dice:

SELLO DEL ESTADO DE ILLINOIS – AGOSTO 26 DE 1818

9

UOP LLC
(una compañía de responsabilidad limitada de Delaware)

Certificado del Secretario Asistente

Yo, Frank S. Molinaro, certifico que soy un Secretario Asistente debidamente certificado – Asuntos de Patentes de UOP LLC, una compañía de responsabilidad limitada de Delaware, Estados Unidos de América y que:

- 1) El anexo es una copia verdadera de la cesión plenamente perfeccionada fechada el 15 de octubre de 2007, 10 de octubre de 2007 y el 11 de octubre de 2007, donde;

Keith A. COUCH
Xin X. ZHU
James P. GLAVIN

Inventores de la invención titulada:

PROCESO PARA CALENTAR GAS DE REGENERACIÓN

cedieron su interés mundial en tal invención, así como el presentar solicitudes de patente en Estados Unidos de América para dicha invención, incluyendo los derechos en el extranjero para tal invención, a UOP LLC, una compañía de responsabilidad limitada, organizada bajo las leyes del Estado de Delaware, Estados Unidos de América, y teniendo su oficina principal en Des Plaines, Illinois, Estados Unidos de América;

- 2) que una solicitud para la patente de dicha invención fue presentada en la Oficina de Patentes de los Estados Unidos de América según expediente N° 11/832,147, el 1 de agosto de 2007;
- 3) que la invención así cedida es la misma que la invención respecto de la cual una solicitud para patente en Colombia ha sido titulada:

PROCESO PARA CALENTAR GAS DE REGENERACIÓN

COMO TESTIGO, yo he ejecutado este certificado en nombre de UOP LLC, el 28 de julio de 2008.

Firma _____
Frank S. Molinaro
Secretario Asistente – Asuntos de Patentes

RECONOCIMIENTO NOTARIAL

Este instrumento fue reconocido ante mí en el Condado de McHenry, Illinois, EE. UU., el 28 de julio de 2008, por Frank S. Molinaro, Secretario Asistente – Asuntos de Patentes de UOP LLC, una compañía de responsabilidad limitada de Delaware, Estados Unidos de América.

Firma _____
Notario Público

Hay un sello que dice: Sello oficial. Notario Público – Estado de Illinois. Rose A. Nagel. Mi encargo vence: el 26 de noviembre de 2011.

CESIÓN

Asunto legal N° UOP27704-02

CONSIDERANDO QUE **KEITH A. COUCH**, ciudadano de los Estados Unidos de América, residente en Arlington Heights, Illinois **XIN X. ZHU**, ciudadano del Reino Unido, residente en Long Grove, Illinois; y **JAMES P GLAVIN**, ciudadano de los Estados Unidos de América, residente en Naperville, Illinois de aquí en adelante considerados como "los inventores", han inventado ciertos mejoramientos útiles y nuevos en **PROCESO PARA CALENTAR GAS DE REFRIGERACIÓN**. CONSIDERANDO QUE los inventores aquí autorizan y requieren que su abogado/agente del expediente el haber insertado en cada página (donde se indica más abajo) la fecha de presentación y el número de la solicitud de dicha presentación cuando se sepa; y CONSIDERANDO QUE UOP LLC, una compañía organizada y existente según las leyes del Estado de Delaware y cuyo principal lugar de negocios es Des Plaines, Illinois, desea adquirir un interés en y para dicha solicitud, donde se divulgaron las invenciones, y las patentes de los Estados Unidos que pueden ser concedidas. AHORA, POR TANTO, por buena y valiosa contraprestación, cuyo recibo aquí se reconoce, dichos inventores efectivamente transfieren y ceden a la mencionada UOP LLC, sus sucesores y asignatarios, el derecho total, el título y el interés en, para y bajo tal solicitud; la invención protegida; cualquiera y todas las patentes resultantes a partir de ahí; cualquier renovación, republicación, extensiones, re-exámenes, sustituciones, continuaciones, o divisiones a partir de ahí y todos los derechos extranjeros derivados, incluyendo todos los derechos a reclamar prioridad en y a las invenciones divulgadas a partir de ahí. Los inventores autorizan y solicitan al Comisionado de Patentes y Marcas a expedir dichas patentes a la mencionada UOP LLC, sus sucesores y asignatarios. COMO TESTIGOS DE LO ANTERIOR, los inventores han puesto sus firmas abajo en la fecha especificada abajo.

Firma	15/10/07
<u>Keith A. Couch</u>	Fecha

Estado de Illinois
Condado de Cook

Este instrumento fue reconocido ante mí este 15 de octubre de 2007, por **Keith A. Couch**.

Firma

Notario Público

(SELLO) Hay un sello que dice:

"SELLO OFICIAL"
Geraldyn M. Mc Fadden
Notario Público, Estado de Illinois
Mi encargo expira el 12/11/2007

11

<u>Firma</u>	<u>10/10/07</u>
Xin X. Zhu	Fecha

Estado de Illinois
Condado de Cook

Este instrumento fue reconocido ante mí este 10 de octubre de 2007, por **Xin X. Zhu**.

Firma
Notario Público

(SELLO) Hay un sello que dice:

“SELLO OFICIAL”
Geraldyn M. Mc Fadden
Notario Público, Estado de Illinois
Mi encargo expira el 12/11/2007

<u>Firma</u>	<u>11/10/07</u>
James P. Glavin	Fecha

Estado de Illinois
Condado de Cook

Este instrumento fue reconocido ante mí este 11 de octubre de 2007, por **James P. Glavin**.

Firma
Notario Público

(SELLO) Hay un sello que dice:

“SELLO OFICIAL”
Geraldyn M. Mc Fadden
Notario Público, Estado de Illinois
Mi encargo expira el 12/11/2007

AS 108104 2/2



SPRINGFIELD, ILLINOIS

APOSTILLE

(Convention de La Haye du 5 Octobre 1961)

1. Country: United States of America
This public document
2. has been signed by ROSE A. NAGEL
3. acting in the capacity of NOTARY PUBLIC, MCHENRY COUNTY
4. bears the seal/stamp of STATE OF ILLINOIS

Certified

5. Springfield, Illinois
6. AUGUST 8, 2008
7. by the Secretary of State, State of Illinois
8. No. S08KL15062
9. Seal/Stamp:
10. Signature:

Jesse White

JESSE WHITE
SECRETARY OF STATE
STATE OF ILLINOIS



UOP LLC
(a Delaware limited liability company)

Certificate of Assistant Secretary

I, Frank S. Molinaro, do hereby certify that I am a duly elected Assistant Secretary – Patent Matters of UOP LLC, a limited liability company of Delaware, United States of America and that:

1) the attached is a true copy of the fully executed Assignment dated October 15, 2007, October 10, 2007, and October 11, 2007 whereby;

Keith A. COUCH
Xin X. ZHU
James P. GLAVIN

inventors of an invention entitled:

APPARATUS FOR HEATING REGENERATION GAS

assigned their worldwide interest in said invention, and in an application for Letters Patent of the United States of America for said invention, including all foreign rights to said invention, to UOP LLC, a limited liability company, organized under the laws of the State of Delaware, United States of America, and having its principal office at Des Plaines, Illinois, United States of America;

2) that an application for Letters Patent for said invention was filed in the United States of America Patent Office under Application No. 11/832,152 on August 1, 2007;

3) that the invention so assigned is the same as the invention in respect of which an application for Letters Patent in **COLOMBIA** has been entitled:

APPARATUS FOR HEATING REGENERATION GAS

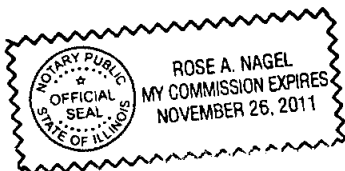
IN WITNESS WHEREOF, I have executed this certificate on behalf of UOP LLC on July 28, 2008.

Frank S. Molinaro

Frank S. Molinaro
Assistant Secretary – Patent Matters

NOTARY ACKNOWLEDGEMENT

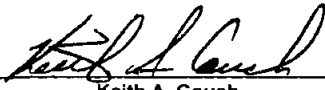
This instrument was acknowledged before me in McHenry County, Illinois, U.S.A., on July 28, 2008, by Frank S. Molinaro, Assistant Secretary - Patent Matters of UOP LLC, a limited liability company of Delaware, United States of America.



Rose A. Nagel
Notary Public

ASSIGNMENT

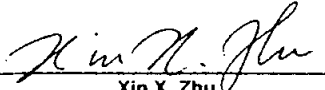
WHEREAS, KEITH A. COUCH, a citizen of the United States of America, residing in Arlington Heights, Illinois; XIN X. ZHU, a citizen of the United Kingdom, residing in Long Grove, Illinois; and JAMES P. GLAVIN, a citizen of the United States of America, residing in Naperville, Illinois; and hereinafter referred to as "the inventors" have invented certain new and useful improvements in APPARATUS FOR HEATING REGENERATION GAS. WHEREAS, the inventors hereby authorize and request their attorney/agent of record to have inserted on each page (where indicated below) the filing date and application number of said application when known; and WHEREAS, UOP LLC, a company organized and existing under the laws of the State of Delaware having a principal place of business at Des Plaines, Illinois, is desirous of acquiring an interest in and to said application, the inventions disclosed therein, any corresponding foreign patent application disclosing the same invention and the Letters Patents of the United States and foreign countries that may be issued thereon. NOW, THEREFORE, for good and valuable consideration, the receipt of which is hereby acknowledged, the inventors do hereby transfer, set over and assign unto UOP LLC, its successors and assigns, the entire right, title and interest in, to and under said application; the invention(s) covered thereby; any and all resultant patent or patents thereon; any renewals, reissues, extensions, reexaminations, substitutions, continuations, or divisions thereof, and all foreign rights thereunder including all rights to claim any priority in and to the inventions disclosed therein. Inventors hereby authorize and request the Commissioner of Patents and Trademarks to issue said Letters Patent to said UOP LLC, its successors and assigns. IN WITNESS WHEREOF, the inventors have set their signatures hereunto on the date specified below.


Keith A. Couch
10/15/07
Date

State of Illinois; County of Cook
This instrument was acknowledged before me on this 15th
day of October, 2007, by Keith A. Couch.

Notary Public

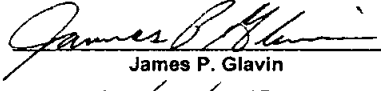
(SEAL) "OFFICIAL SEAL"
Geraldyn M. McFadden
Notary Public, State of Illinois
My Commission Exp. 11/12/2007


Xin X. Zhu
10/10/07
Date

State of Illinois; County of Cook
This instrument was acknowledged before me on this 10th
day of October, 2007, by Xin X. Zhu.

Notary Public

(SEAL) "OFFICIAL SEAL"
Geraldyn M. McFadden
Notary Public, State of Illinois
My Commission Exp. 11/12/2007


James P. Glavin
10/11/07
Date

State of Illinois; County of Cook
This instrument was acknowledged before me on this 11th
day of October, 2007, by James P. Glavin.

Notary Public

(SEAL) "OFFICIAL SEAL"
Geraldyn M. McFadden
Notary Public, State of Illinois
My Commission Exp. 11/12/2007

TRADUCCION AL ESPAÑOL del Documento de Cesión a **UOP LLC** firmado por los cedentes y el cesionario.

APOSTILLA

(Convención de La Haya del 5 de Julio de 1961)

1. PAÍS: ESTADOS UNIDOS DE AMÉRICA
ESTE DOCUMENTO PÚBLICO
2. HA SIDO FIRMADO POR ROSE A. NAGEL
3. ACTUANDO EN CAPACIDAD DE NOTARIO PÚBLICO, CONDADO
MCHENRY
4. LLEVA EL SELLO/TIMBRE DEL ESTADO DE ILLINOIS

CERTIFICADO

- | | |
|--|-------------------|
| 5. SPRINGFIELD, ILLINOIS | 6. AGOSTO 8, 2008 |
| 7. POR EL SECRETARIO DE ESTADO, ESTADO DE ILLINOIS | |
| 8. NO. S08KL15062 | |
| 9. SELLO/TIMBRE | 10. FIRMA |

(FIRMA)

JESSE WHITE
SECRETARIO DE ESTADO
ESTADO DE ILLINOIS

Hay un sello que dice:

SELLO DEL ESTADO DE ILLINOIS – AGOSTO 26 DE 1818

4

UOP LLC
(una compañía de responsabilidad limitada de Delaware)

Certificado del Secretario Asistente

Yo, Frank S. Molinaro, certifico que soy un Secretario Asistente debidamente certificado – Asuntos de Patentes de UOP LLC, una compañía de responsabilidad limitada de Delaware, Estados Unidos de América y que:

- 1) El anexo es una copia verdadera de la cesión plenamente perfeccionada fechada el 10 de octubre de 2007, el 15 de octubre de 2007 y el 11 de octubre de 2007, donde;

Keith A. COUCH
Xin X. ZHU
James P. GLAVIN

Inventores de la invención titulada:

APARATO PARA CALENTAR GAS DE REGENERACIÓN

cedieron su interés mundial en tal invención, así como el presentar solicitudes de patente en Estados Unidos de América para dicha invención, incluyendo los derechos en el extranjero para tal invención, a UOP LLC, una compañía de responsabilidad limitada, organizada bajo las leyes del Estado de Delaware, Estados Unidos de América, y teniendo su oficina principal en Des Plaines, Illinois, Estados Unidos de América;

- 2) que una solicitud para la patente de dicha invención fue presentada en la Oficina de Patentes de los Estados Unidos de América según expediente N° 11/832,152, el 1 de agosto de 2007;
- 3) que la invención así cedida es la misma que la invención respecto de la cual una solicitud para patente en Colombia ha sido titulada:

APARATO PARA CALENTAR GAS DE REGENERACIÓN

COMO TESTIGO, yo he ejecutado este certificado en nombre de UOP LLC, el 28 de julio de 2008.

Firma
Frank S. Molinaro
Secretario Asistente – Asuntos de Patentes

RECONOCIMIENTO NOTARIAL

Este instrumento fue reconocido ante mí en el Condado de McHenry, Illinois, EE. UU., el 28 de julio de 2008, por Frank S. Molinaro, Secretario Asistente – Asuntos de Patentes de UOP LLC, una compañía de responsabilidad limitada de Delaware, Estados Unidos de América.

Firma
Notario Público

Hay un sello que dice: Sello oficial. Notario Público – Estado de Illinois. Rose A. Nagel. Mi encargo vence: el 26 de noviembre de 2011.

CESIÓN

Asunto legal N° UOP27704-03

CONSIDERANDO QUE **KEITH A. COUCH**, ciudadano de los Estados Unidos de América, residente en Arlington Heights, Illinois **XIN X. ZHU**, ciudadano del Reino Unido, residente en Long Grove, Illinois; y **JAMES P GLAVIN**, ciudadano de los Estados Unidos de América, residente en Naperville, Illinois de aquí en adelante considerados como "los inventores", han inventado ciertos mejoramientos útiles y nuevos en **APARATO PARA CALENTAR GAS DE REGENERACIÓN**. CONSIDERANDO QUE los inventores aquí autorizan y requieren que su abogado/agente del expediente el haber insertado en cada página (donde se indica más abajo) la fecha de presentación y el número de la solicitud de dicha presentación cuando se sepa; y CONSIDERANDO QUE UOP LLC, una compañía organizada y existente según las leyes del Estado de Delaware y cuyo principal lugar de negocios es Des Plaines, Illinois, desea adquirir un interés en y para dicha solicitud, donde se divulgaron las invenciones, y las patentes de los Estados Unidos que pueden ser concedidas. AHORA, POR TANTO, por buena y valiosa contraprestación, cuyo recibo aquí se reconoce, dichos inventores efectivamente transfieren y ceden a la mencionada UOP LLC, sus sucesores y asignatarios, el derecho total, el título y el interés en, para y bajo tal solicitud; la invención protegida; cualquiera y todas las patentes resultantes a partir de ahí; cualquier renovación, republicación, extensiones, re-exámenes, sustituciones, continuaciones, o divisiones a partir de ahí y todos los derechos extranjeros derivados, incluyendo todos los derechos a reclamar prioridad en y a las invenciones divulgadas a partir de ahí. Los inventores autorizan y solicitan al Comisionado de Patentes y Marcas a expedir dichas patentes a la mencionada UOP LLC, sus sucesores y asignatarios. COMO TESTIGOS DE LO ANTERIOR, los inventores han puesto sus firmas abajo en la fecha especificada abajo.

Firma	15/10/07
_____ Keith A. Couch	_____ Fecha

Estado de Illinois
Condado de Cook

Este instrumento fue reconocido ante mí este 15 de octubre de 2007, por **Keith A. Couch**.

Firma

Notario Público

(SELLO) Hay un sello que dice:

"SELLO OFICIAL"
Geraldyn M. Mc Fadden
Notario Público, Estado de Illinois
Mi encargo expira el 12/11/2007

12

<u>Firma</u>	<u>10/10/07</u>
Xin X. Zhu	Fecha

Estado de Illinois
Condado de Cook

Este instrumento fue reconocido ante mí este 10 de octubre de 2007, por **Xin X. Zhu**.

Firma
Notario Público

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<u>Firma</u>	<u>11/10/07</u>
James P. Glavin	Fecha

Estado de Illinois
Condado de Cook

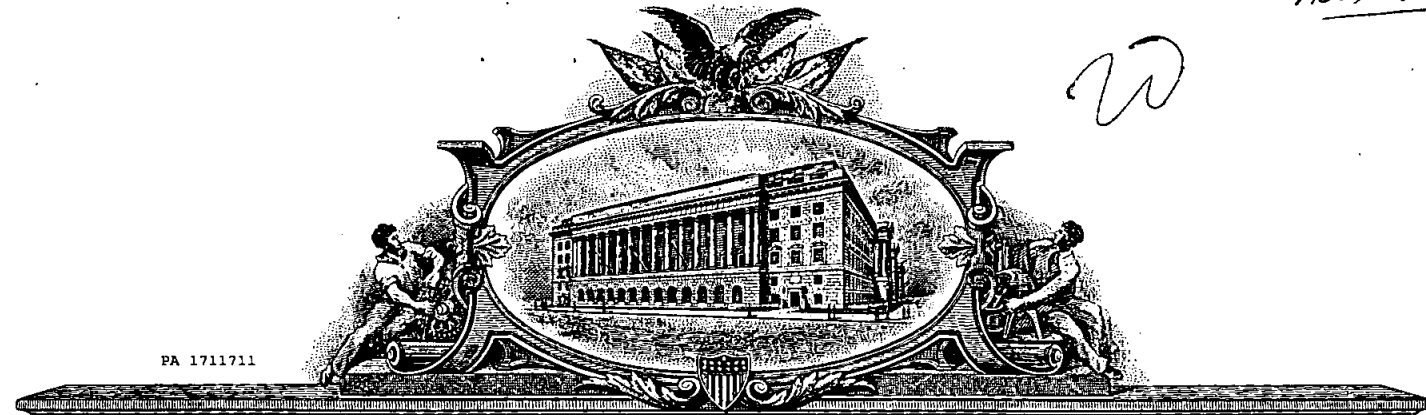
Este instrumento fue reconocido ante mí este 11 de octubre de 2007, por **James P. Glavin**.

Firma
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(SELLO) Hay un sello que dice:

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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.

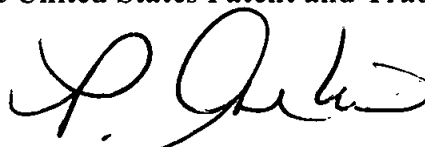
APPLICATION NUMBER: 11/832,152

FILING DATE: August 01, 2007

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS US11/832,152

By Authority of the

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P. SWAIN

Certifying Officer

Electronic Acknowledgement Receipt

EFS ID:	2031408
Application Number:	11832152
International Application Number:	
Confirmation Number:	5606
Title of Invention:	Apparatus for Heating Regeneration Gas
First Named Inventor/Applicant Name:	Keith A Couch
Customer Number:	23490
Filer:	Maryann Maas./Rose Lubich
Filer Authorized By:	Maryann Maas.
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The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 and 1.17	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	UOP27704-03-Application-Data-Sheet.PDF	8318 2d184d32b18424665b5deab347c2ec3b9c22d320	no	2
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
2	Drawings	UOP27704-03-Drawings.PDF	39406 855ef9cc8825dde1ce007756d7131f8c74a32a	no	2
Warnings:					
Information:					
3		UOP27704-03-Spec-Claims-Abstract.PDF	98380 6f2a26ee6cbbb2efa0cec77ec32959187e716978	yes	14
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	10	
	Claims		11	13	
	Abstract		14	14	
Warnings:					
Information:					
4	Fee Worksheet (PTO-06)	fee-info.pdf	8339 1dec68da8f02206b6f015718304abd83fb6aee31	no	2
Warnings:					
Information:					
Total Files Size (in bytes):			154443		

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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.

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APPLICATION DATA SHEET

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APPLICATION DATA SHEET

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Application Information

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APPARATUS FOR HEATING REGENERATION GAS

BACKGROUND OF THE INVENTION

[0001] The field of the invention is power recovery from a fluid catalytic cracking (FCC) unit.

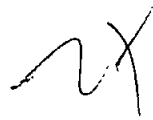
5 [0002] FCC technology, now more than 50 years old, has undergone continuous improvement and remains the predominant source of gasoline production in many refineries. This gasoline, as well as lighter products, is formed as the result of cracking heavier (i.e. higher molecular weight), less valuable hydrocarbon feed stocks such as gas oil.

[0003] In its most general form, the FCC process comprises a reactor that is closely
10 coupled with a regenerator, followed by downstream hydrocarbon product separation. Hydrocarbon feed contacts catalyst in the reactor to crack the hydrocarbons down to smaller molecular weight products. During this process, the catalyst tends to accumulate coke thereon, which is burned off in the regenerator.

[0004] The heat of combustion in the regenerator typically produces flue gas at
15 temperatures of 677° to 788°C (1250° to 1450°F) and at a pressure range of 138 to 276 kPa (20 to 40 psig). Although the pressure is relatively low, the extremely high temperature, high volume of flue gas from the regenerator contains sufficient kinetic energy to warrant economic recovery.

[0005] To recover energy from a flue gas stream, flue gas may be fed to a power recovery
20 unit, which for example may include an expander turbine. The kinetic energy of the flue gas is transferred through blades of the expander to a rotor coupled either to a main air blower, to produce combustion air for the FCC regenerator, and/or to a generator to produce electrical power. Because of the pressure drop of 138 to 207 kPa (20 to 30 psi) across the expander turbine, the flue gas typically discharges with a temperature drop of approximately 125° to
25 167°C (225 to 300°F). The flue gas may be run to a steam generator for further energy recovery. A power recovery train may include several devices, such as an expander turbine, a generator, an air blower, a gear reducer, and a let-down steam turbine.

[0006] In order to reduce damage to components downstream of the regenerator, it is also
30 known to remove flue gas solids. This is commonly accomplished with first and second stage separators, such as cyclones, located in the regenerator. Some systems also include a third



stage separator (TSS) or even a fourth stage separator (FSS) to remove further fine particles, commonly referred to as "fines".

[0007] The FCC process produces around 30% of the dry gas produced in a refinery. Dry gas comprises mainly methane, ethane and other light gases. Dry gas is separated from other

5 FCC products at high pressures. FCC dry gas is heavily olefinic and typically used as fuel gas throughout a refinery. Olefinic dry gas, such as dry gas having over 10 wt-% olefins is not viable for use in gas turbines in which the olefins can cause internal fouling particularly due to the presence of diolefins. In some cases, FCC units produce more dry gas than the refinery consumes. The excess dry gas can be flared which is an environmental concern. To make less
10 dry gas, the riser temperature can be reduced, adversely affecting the product slate, or throughput can be reduced, adversely affecting productivity. Olefinic dry gas can also be obtained from other unit operations such as those that are hydrogen deficient like cokers and steam crackers.

SUMMARY OF THE INVENTION

15 [0008] We have discovered an apparatus for improving product utilization from an FCC unit. The apparatus involves combusting product gas with oxygen before adding oxygen or an oxygen-containing gas, typically air, to an FCC regenerator. The regenerator is less likely to produce NO_x and CO in the flue gas stream when heated air is supplied to the regenerator.

The apparatus may involve expanding the high pressure product gas obtained from an FCC
20 product stream to lower pressure to recover power before combustion. The preferred product gas is dry gas which may be obtained from many hydrocarbon processing reactions which are hydrogen deficient.

[0009] Advantageously, the apparatus can enable the FCC unit to utilize a low value product stream to produce gasses that are more environmentally friendly.

25 [0010] Additional features and advantages of the invention will be apparent from the description of the invention, figures and claims provided herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 is a schematic drawing of an FCC unit, a power recovery train and an FCC product recovery system in a refinery.

30 [0012] FIG. 2 is a schematic of an alternate embodiment of the invention of FIG. 1.

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DETAILED DESCRIPTION

[0013] Now turning to the figures, wherein like numerals designate like components, FIG. 1 illustrates a refinery complex 100 that is equipped for processing streams from an FCC unit for power recovery. The refinery complex 100 generally includes an FCC unit section 10, a power recovery section 60 and a product recovery section 90. The FCC unit section 10 includes a reactor 12 and a catalyst regenerator 14. Process variables typically include a cracking reaction temperature of 400° to 600°C and a catalyst regeneration temperature of 500° to 900°C. Both the cracking and regeneration occur at an absolute pressure below 5 atmospheres. FIG. 1 shows a typical FCC process unit of the prior art, where a heavy hydrocarbon feed or raw oil stream in a line 16 is contacted with a newly regenerated cracking catalyst entering from a regenerated catalyst standpipe 18. This contacting may occur in a narrow riser 20, extending upwardly to the bottom of a reactor vessel 22. The contacting of feed and catalyst is fluidized by gas from a fluidizing line 24. Heat from the catalyst vaporizes the oil, and the oil is thereafter cracked to lighter molecular weight hydrocarbons in the presence of the catalyst as both are transferred up the riser 20 into the reactor vessel 22. The cracked light hydrocarbon products are thereafter separated from the cracking catalyst using cyclonic separators which may include a rough cut separator 26 and one or two stages cyclones 28 in the reactor vessel 22. Product gases exit the reactor vessel 10 through a product outlet 31 to line 32 for transport to a downstream product recovery section 90. Inevitable side reactions occur in the riser 20 leaving coke deposits on the catalyst that lower catalyst activity. The spent or coked catalyst requires regeneration for further use. Coked catalyst, after separation from the gaseous product hydrocarbon, falls into a stripping section 34 where steam is injected through a nozzle to purge any residual hydrocarbon vapor. After the stripping operation, the coked catalyst is fed to the catalyst regenerator 14 through a spent catalyst standpipe 36.

[0014] FIG. 1 depicts a regenerator 14 known as a combustor. However, other types of regenerators are suitable. In the catalyst regenerator 14, a stream of oxygen-containing gas, such as air, is introduced through an air distributor 38 to contact the coked catalyst, burn coke deposited thereon, and provide regenerated catalyst and flue gas. A main air blower 50 is driven by a driver 52 to deliver air or other oxygen containing gas from line 51 into the regenerator 14. The driver 52 may be, for example, a motor, a steam turbine driver, or some other device for power input. The catalyst regeneration process adds a substantial amount of

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heat to the catalyst, providing energy to offset the endothermic cracking reactions occurring in the reactor conduit 16. Catalyst and air flow upwardly together along a combustor riser 40 located within the catalyst regenerator 14 and, after regeneration, are initially separated by discharge through a disengager 42. Finer separation of the regenerated catalyst and flue gas exiting the disengager 42 is achieved using first and second stage separator cyclones 44, 46, respectively within the catalyst regenerator 14. Catalyst separated from flue gas dispenses through a diplegs from cyclones 44, 46 while flue gas relatively lighter in catalyst sequentially exits cyclones 44, 46 and exits the regenerator vessel 14 through flue gas outlet 47 in line 48. Regenerated catalyst is recycled back to the reactor riser 12 through the regenerated catalyst standpipe 18. As a result of the coke burning, the flue gas vapors exiting at the top of the catalyst regenerator 14 in line 48 contain CO, CO₂ and H₂O, along with smaller amounts of other species.

[0015] Hot flue gas exits the regenerator 14 through the flue gas outlet 47 in a line 48 and enters the power recovery section 60. The power recovery section 60 is in downstream communication with the flue gas outlet 47 via line 48. "Downstream communication" means that at least a portion of the fluid from the upstream component flows into the downstream component. Many types of power recovery configurations are suitable, and the following embodiment is very well suited but not necessary to the present invention. Line 48 directs the flue gas to a heat exchanger 62, which is preferably a high pressure steam generator (e.g., a 4137 kPa (gauge) (600 psig)). Arrows to and from the heat exchanger 62 indicate boiler feed water in and high pressure steam out. The heat exchanger 62 may be a medium pressure steam generator (e.g., a 3102 kPa (gauge) (450 psig)) or a low pressure steam generator (e.g., a 345 kPa (gauge) (50 psig)) in particular situations. As shown in the embodiment of FIG. 1, a boiler feed water (BFW) quench injector 64 may be provided to selectively deliver fluid into conduit 48.

[0016] A supplemental heat exchanger 63 may also be provided downstream of the heat exchanger 62. For example, the supplemental temperature reduction would typically be a low pressure steam generator for which arrows indicate boiler feed water in and low pressure steam out. However, the heat exchanger 63 may be a high or medium pressure steam generator in particular situations. In the embodiment of FIG. 1, conduit 66 provides fluid communication from heat exchanger 62 to the supplemental heat exchanger 63. Flue gas exiting the supplemental heat exchanger 63 is directed by conduit 69 to a waste flue gas line

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67 and ultimately to an outlet stack 68, which is preferably equipped with appropriate environmental equipment, such as an electrostatic precipitator or a wet gas scrubber. Typically, the flue gas is further cooled in a flue gas cooler 61 to heat exchange with a heat exchange media which is preferably water to generate high pressure steam. Arrows to and from flue gas cooler 61 indicate heat exchange media coming in and heated heat exchange media exiting, which is preferably boiler feed water coming in and steam going out. The illustrated example of FIG. 1 further provides that conduit 69 may be equipped to direct the flue gas through a first multi-hole orifice (MHO) 71, a first flue gas control valve (FGCV) 74, and potentially a second FGCV 75 and second MHO 76 on the path to waste flue gas line 67 all to reduce the pressure of the flue gas in conduit 69 before it reaches the stack 68. FGCV's 74, 75 are typically butterfly valves and may be controlled based on a pressure or temperature reading from the regenerator 14.

[0017] In order to generate electricity, the power recovery section 60 further includes a power recovery expander 70, which is typically a steam turbine, and a power recovery generator ("generator") 78. More specifically, the expander 70 has an output shaft that is typically coupled to an electrical generator 78 by driving a gear reducer 77 that in turn drives the generator 78. The generator 78 provides electrical power that can be used as desired within the plant or externally. Alternatively, the expander 70 may be coupled to the main air blower 50 to serve as its driver, obviating driver 52, but this arrangement is not shown.

[0018] In an embodiment, the power recovery expander 70 is located in downstream communication with the heat exchanger 62. However, a heat exchanger may be upstream or downstream of the expander 70. For example, a conduit 79 feeds flue gas through an isolation valve 81 to a third stage separator (TSS) 80, which removes the majority of remaining solid particles from the flue gas. Clean flue gas exits the TSS 80 in a flue gas line 82 which feeds a flue gas stream to a combine line 54 which drives the expander 70.

[0019] To control flow flue gas between the TSS 80 and the expander 70, an expander inlet control valve 83 and a throttling valve 84 may be provided upstream of the expander 70 to further control the gas flow entering an expander inlet. The order of the valves 83, 84 may be reversed and are preferably butterfly valves. Additionally, a portion of the flue gas stream can be diverted in a bypass line 73 from a location upstream of the expander 70, through a synchronization valve 85, typically a butterfly valve, to join the flue gas in the exhaust line 86. After passing through an isolation valve 87, the clean flue gas in line 86 joins the flowing

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waste gas downstream of the supplemental heat exchanger 63 in waste flue gas line 67 and flows to the outlet stack 68. An optional fourth stage separator 88 can be provided to further remove solids that exit the TSS 80 in an underflow stream in conduit 89. After the underflow stream is further cleaned in the fourth stage separator 88, it can rejoin the flue gas in line 86 after passing through a critical flow nozzle 72 that sets the flow rate therethrough.

[0020] In the product recovery section 90, the gaseous FCC product in line 32 is directed to a lower section of an FCC main fractionation column 92. Several fractions may be separated and taken from the main column including a heavy slurry oil from the bottoms in line 93, a heavy cycle oil stream in line 94, a light cycle oil in line 95 and a heavy naphtha stream in line 96. Any or all of lines 93-96 may be cooled and pumped back to the main column 92 to cool the main column typically at a higher location. Gasoline and gaseous light hydrocarbons are removed in overhead line 97 from the main column 92 and condensed before entering a main column receiver 99. An aqueous stream is removed from a boot in the receiver 99. Moreover, a condensed light naphtha stream is removed in line 101 while a gaseous light hydrocarbon stream is removed in line 102. Both streams in lines 101 and 102 may enter a vapor recovery section 120 of the product recovery section 90.

[0021] The vapor recovery section 120 is shown to be an absorption based system, but any vapor recovery system may be used including a cold box system. To obtain sufficient separation of light gas components the gaseous stream in line 102 is compressed in compressor 104. More than one compressor stage may be used, but typically a dual stage compression is utilized. The compressed light hydrocarbon stream in line 106 is joined by streams in lines 107 and 108, chilled and delivered to a high pressure receiver 110. An aqueous stream from the receiver 110 may be routed to the main column receiver 99. A gaseous hydrocarbon stream in line 112 is routed to a primary absorber 114 in which it is contacted with unstabilized gasoline from the main column receiver 99 in line 101 to effect a separation between C_3^+ and C_2^- . A liquid C_3^+ stream in line 107 is returned to line 106 prior to chilling. An off-gas stream in line 116 from the primary absorber 114 may be used as a selected product stream of the plurality of product streams separated from the FCC product in the present invention or optionally be directed to a secondary absorber 118, where a circulating stream of light cycle oil in line 121 diverted from line 95 absorbs most of the remaining C_5^+ and some C_3 - C_4 material in the off-gas stream. Light cycle oil from the bottom of the secondary absorber in line 119 richer in C_3^+ material is returned to the main

column 92 via the pump-around for line 95. The overhead of the secondary absorber 118 comprising dry gas of predominantly C_2^- hydrocarbons with hydrogen sulfide, amines and hydrogen is removed in line 122 and may be used as a selected product stream of the plurality of product streams separated from the FCC product in the present invention. It is

5 contemplated that another stream may also comprise a selected product stream of the plurality of product streams separated from the FCC product in the present invention

[0022] Liquid from the high pressure receiver 110 in line 124 is sent to a stripper 126.

Most of the C_2^- is removed in the overhead of the stripper 126 and returned to line 106 via overhead line 108. A liquid bottoms stream from the stripper 126 is sent to a debutanizer column 130 via line 128. An overhead stream in line 132 from the debutanizer comprises C_3 - C_4 olefinic product while a bottoms stream in line 134 comprising stabilized gasoline may be further treated and sent to gasoline storage.

[0023] A selected product stream line, preferably line 122 comprising the secondary absorber off-gas containing dry gas may be introduced into an amine absorber unit 140. A

15 lean aqueous amine solution is introduced via line 142 into absorber 140 and is contacted with the flowing dry gas stream to absorb hydrogen sulfide, and a rich aqueous amine absorption solution containing hydrogen sulfide is removed from absorption zone 140 via line 144 and recovered. A selected product stream line preferably comprising a dry gas stream having a reduced concentration of hydrogen sulfide is removed from absorption zone 140 via line 146. Any of lines carrying product from the FCC reactor 12 including lines 114 or 122 and 146 may serve as selected product lines in communication with the downstream power recovery section 60 to transport a selected product stream from the gas recovery section 120 of the product recovery section 90 to the power recovery section 60. Additionally, dry gas may be delivered to the power recovery section 60 from any other source in the refinery 100 such as a coker unit or a steam cracker unit.

[0024] The selected FCC product gas from the product recovery section 90 in line 146 can be used in the power recovery section 60 in a continuous process and in the same refinery complex. The power recovery section 60 is in downstream communication with the vapor recovery section of the product recovery section 90 via line 146. As an alternative to sending the selected gas in line 146 to the refinery fuel gas header, the selected product gas may be let down in pressure at a volume increase across an expander 150 to recover pressure energy from the gas. The selected gas is still at the high pressure utilized in the vapor recovery



section 120 of the product recovery section 90 when delivered to the expander 150 due to operation of the compressor 104. The selected gas exits expander 150 in exhaust line 152. The expander is connected by a shaft 154 to an electrical generator 78 for generating electrical power that can be used in the refinery or exported. Beside connection by shaft 154 to the electrical generator, the expander 150 may alternatively or additionally be connected by a shaft (not shown) to the main air blower 50 for blowing air to the regenerator 14 obviating the need for driver 52. A gear reducer may be provided on the shaft 154 between the expander 150 and the generator 78 in which case the gear reducer (not shown) would connect two shafts of which shaft 154 is one. The expander 150 may be in downstream communication with the selected product line 146 and with vapor recovery section 120 of the product recovery section 90 via line 146.

[0025] It is also contemplated that an additional steam expander (not shown) may be connected by an additional shaft or the same shaft 154 to further turn electrical generator 78 and produce additional electrical power or power the main air blower 50. The additional steam expander would be fed by surplus steam in the refinery. The additional expander could be either an extraction or induction turbine. In the latter case, the additional expander could take the form of an additional chamber in expander 150 or 70 with the surplus steam feeding the additional chamber (not shown). The additional expander may be coupled by a gear reducer (not shown) to the additional shaft or the same shaft 154. It is also contemplated that expanders 70 and 150 could be the same expander with induction feed from line 82, 54 or 146, respectively, introducing a stream to an intermediate chamber of the expander.

[0026] The selected product gas may be used as a regeneration gas preheating media. A portion of the selected product gas may be diverted for other purposes in line 151. After, before or instead of routing the selected product gas to the expander 150 for power recovery, the selected gas is routed to the regeneration gas preheater 156 in expander exhaust line 152 if the expander 150 is utilized. Heat from combusting the selected product gas serves to preheat regeneration gas before contacting the coked FCC catalyst in the regenerator 14 serving to minimize production of nonselective flue gas components such as NO_x and CO. The preheated regeneration gas should be heated to a temperature of between about 350 and about 800°F (177 to 427°C).

[0027] In the embodiment of FIG. 1, a regeneration gas delivery line 158 is in downstream communication with the main air blower 50 and delivers oxygen-containing

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regeneration gas such as air to the regeneration gas preheater 156 which is in downstream communication with the line 158 and the blower 50. The regeneration gas preheater 156 is in downstream communication with the vapor recovery section 120 of the product recovery section 90 via lines 116, 122, 146 and/or 152, and the regenerator 14 is in downstream communication with the regeneration gas heater 156. The line 158 may be in downstream communication with line 152 thereby combining the oxygen-containing regeneration gas stream from the blower 50 and at least a portion of the selected product gas in line 152 before they both enter the regeneration gas preheater 156. The oxygen-containing regeneration gas and the selected product gas are ignited continuously to combust the selected product gas in the regeneration gas preheater 156 and achieve an elevated temperature in a combusted gas stream. The regeneration gas preheater 156 is in downstream communication with the selected product lines 116, 122, 146 and/or 152. The flow rate of oxygen from blower 50 should be sufficient to combust the selected gas in the regeneration gas heater 156 and combust coke from catalyst in the regenerator 14. Hence, the combust gas stream in line 160 will contain excess oxygen-containing regeneration gas and combusted selected product gas. The preheater 156 may be in downstream communication with the expander 150. Accordingly, the pressure let down across the expander 150 should provide the selected gas stream in line 152 at a pressure that is equivalent to the regeneration gas leaving the blower 50 in line 158. A combust line 160 is in downstream communication with the preheater 156. The preheated regeneration gas containing combusted selected gas enter the regenerator 14 through combust line 160 at elevated temperature preferably through distributor 38. The distributor 38 of the regenerator 14 is in downstream communication with the product recovery section 90, the blower 50 and the regeneration gas preheater 156.

[0028] This arrangement is economically attractive as it may maximize utilization of existing assets, but it also allows for the burning of olefin rich dry gas from the FCC reactor 12 or other reactor in which hydrogen is deficient, which is not viable for use in gas turbines in which the olefins can cause internal fouling.

[0029] FIG. 2 shows an alternative embodiment in which most elements are the same as in FIG. 1 indicated by like reference numerals but with differences in configuration indicated by designating the reference numeral with a prime symbol ("’"). The flue gas heater 156’ is in downstream communication with the vapor recovery section 120 of the product recovery section 90 via lines 116, 122, 146 and/or 152’. An oxygen-containing gas stream in line 158



is combined with at least a portion of the selected product gas in line 152'. Together or separately, the oxygen-containing stream and the selected product gas stream enter into the regeneration gas preheater 156', are ignited and a combust stream of combusted selected product gas at elevated temperature exit the preheater 156' in combust line 160'. A

5 regeneration gas delivery line 30' in downstream communication with the blower 50 delivers an oxygen-containing regeneration gas. A combine line 163 is in downstream communication with the regeneration gas delivery line 30' and the combust line 160' carrying the combust stream in downstream communication with the preheater 156'. Upon mixing, the combust stream heats the regeneration gas in the combine line 163 to provide
10 regeneration gas at elevated temperature to the distributor 38 in regenerator 14 both in parallel downstream communication with the blower 50 via delivery line 30' and the preheater 156' via line 160'. The preheated regeneration gas delivered to the regenerator 14 in combine line 163 contacts the coked catalyst at elevated temperature to minimize the generation of undesirable combustion products while combusting coke from the coked
15 catalyst.

[0030] A further combust line 162 may carry combusted selected product gas to the heat exchanger 61 in downstream communication with the preheater 156'. A back pressure valve 161 may regulate flow so that combusted gas in excess of that necessary to achieve the desired temperature of regeneration gas in combine line 163 is diverted to additional heat
20 exchange preferably for the generation of steam in heat exchanger 61. It is also envisioned that the combust line may feed flue gas lines 48 or 66 to boost heat exchange and preferably steam generation in heat exchangers 62 and 63 that may be in downstream communication with preheater 156'. It is also envisioned that this embodiment may be applicable to the embodiment of FIG. 1.

25 [0031] Preferred embodiments of this invention are described herein, including the best mode known to the inventors for carrying out the invention. It should be understood that the illustrated embodiments are exemplary only, and should not be taken as limiting the scope of the invention.

CLAIMS:

1. An apparatus for processing streams from a fluid catalytic cracking unit comprising:

a fluid catalytic cracking reactor for contacting cracking catalyst with a hydrocarbon
5 feed stream to crack the hydrocarbons to gaseous product hydrocarbons having
lower molecular weight and deposit coke on the catalyst to provide coked catalyst;
a product outlet for discharging said gaseous product hydrocarbons from said reactor;
a regenerator for combusting coke from said coked catalyst by contact with oxygen;
a flue gas outlet for discharging flue gas from said regenerator;
10 a product recovery section in downstream communication with said product outlet,
said product recovery section for separating said gaseous products into a plurality
of product streams including a selected product stream; and
said regenerator being in downstream communication with said product recovery
section.

15 2. The apparatus of claim 1 further comprising a distributor in said regenerator for
distributing an oxygen-containing gas, said distributor being in downstream communication
with said product recovery section.

20 3. The apparatus of claim 1 further comprising a preheater in downstream
communication with said product recovery section and said regenerator is in downstream
communication with said preheater.

4. The apparatus of claim 3 further comprising a blower for blowing oxygen-
containing gas into said regenerator, said regenerator being in downstream communication
with said blower and said preheater.

25 5. The apparatus of claim 4 further comprising said preheater being in downstream
communication with said blower.

6. The apparatus of claim 5 further comprising a regeneration gas delivery line in
downstream communication with both said blower and a selected product line in downstream
communication with said product recovery section and said regeneration gas preheater being
in downstream communication with said regeneration gas delivery line.

30 7. The apparatus of claim 5 further comprising a combust line downstream of said
regeneration gas preheater and a distributor in said regenerator for distributing an oxygen-

containing gas, said distributor in downstream communication with said product recovery section and said combust line.

8. The apparatus of claim 3 further comprising a blower for blowing oxygen-containing gas into said regenerator, said regeneration gas preheater being in downstream communication with said blower.

9. The apparatus of claim 8 further comprising a regeneration gas delivery line in downstream communication with said blower, a selected product line in downstream communication with said product recovery section, said regeneration gas preheater being in downstream communication with said selected product line, and a combust line in downstream communication with said regeneration gas preheater.

10. The apparatus of claim 9 further comprising a combine line in downstream communication with both said combust line and said regeneration gas delivery line and a distributor in downstream communication with said combine line, said distributor for distributing an oxygen-containing gas.

11. The apparatus of claim 1 wherein an expander is in downstream communication with a selected product line in downstream communication with said product recovery section.

12. An apparatus for processing a flue gas stream from a fluid catalytic cracking unit comprising:

- a fluid catalytic cracking reactor for contacting cracking catalyst with a hydrocarbon feed stream to crack the hydrocarbons to gaseous product hydrocarbons having lower molecular weight and deposit coke on the catalyst to provide coked catalyst;
- a product outlet for discharging said gaseous product hydrocarbons from said reactor;
- a regenerator for combusting coke from said coked catalyst by contact with oxygen;
- a flue gas outlet for discharging flue gas from said regenerator;
- a source of dry gas; and
- a preheater in downstream communication with said source of dry gas and said regenerator being in downstream communication with said preheater.

13. The apparatus of claim 12 further comprising a blower for blowing oxygen-containing gas into said regenerator, said regenerator being in downstream communication with said blower and said preheater.

14. The apparatus of claim 12 further comprising said preheater being in downstream communication with said blower.

15. The apparatus of claim 13 further comprising a regeneration gas delivery line in downstream communication with said blower and said preheater being in downstream communication with said regeneration gas delivery line.

16. The apparatus of claim 15 further comprising a combust line downstream of said preheater and a distributor in said regenerator for distributing an oxygen-containing gas, said distributor in downstream communication with said product recovery section and said combust line.

17. An apparatus for processing streams from a fluid catalytic cracking unit comprising:

- a fluid catalytic cracking reactor for contacting cracking catalyst with a hydrocarbon feed stream to crack the hydrocarbons to gaseous product hydrocarbons having lower molecular weight and deposit coke on the catalyst to provide coked catalyst;
- a product outlet for discharging said gaseous product hydrocarbons from said reactor;
- a regenerator for combusting coke from said coked catalyst by contact with oxygen;
- a flue gas outlet for discharging flue gas from said regenerator;
- a product recovery section in downstream communication with said product outlet, said product recovery section for separating said gaseous products into a plurality of product streams including a selected product stream;
- a preheater in downstream communication with said product recovery section;
- a blower for blowing an oxygen-containing gas into said regenerator; and
- said regenerator being in downstream communication with said preheater and said blower.

18. The apparatus of claim 17 wherein said preheater is in downstream communication with said blower.

19. The apparatus of claim 18 further comprising a combine line in downstream communication with both a combust line in downstream communication with said preheater and a regeneration gas delivery line in downstream communication with said blower.

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ABSTRACT

Disclosed is an apparatus for combusting dry gas to heat the air fed to an FCC regenerator to increase its temperature and minimize production of undesirable combustion products. Preferably, the dry gas is a selected FCC product gas. Alternatively or
5 additionally, dry gas from an FCC product stream is separated and delivered to an expander to recover power before combustion.

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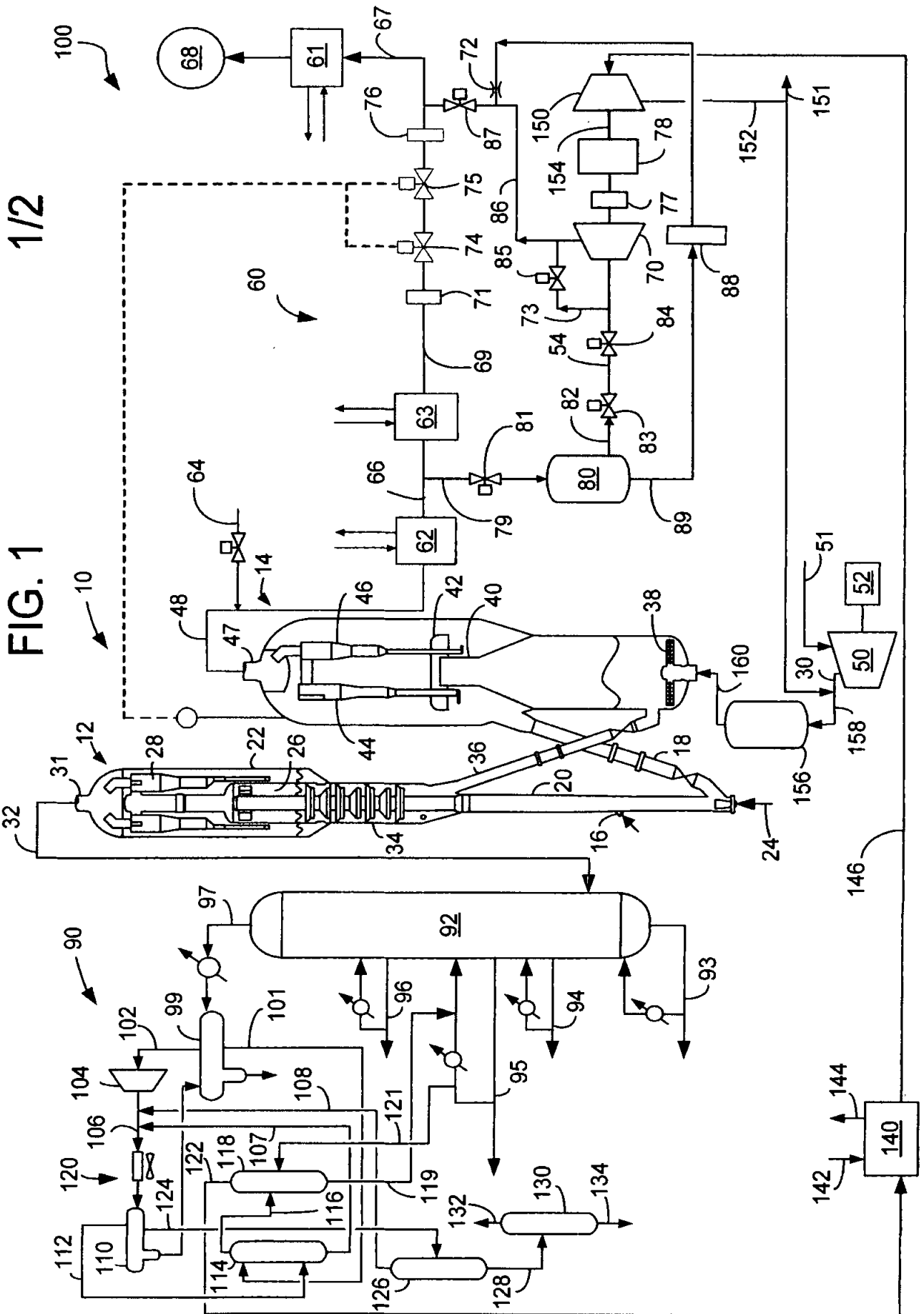
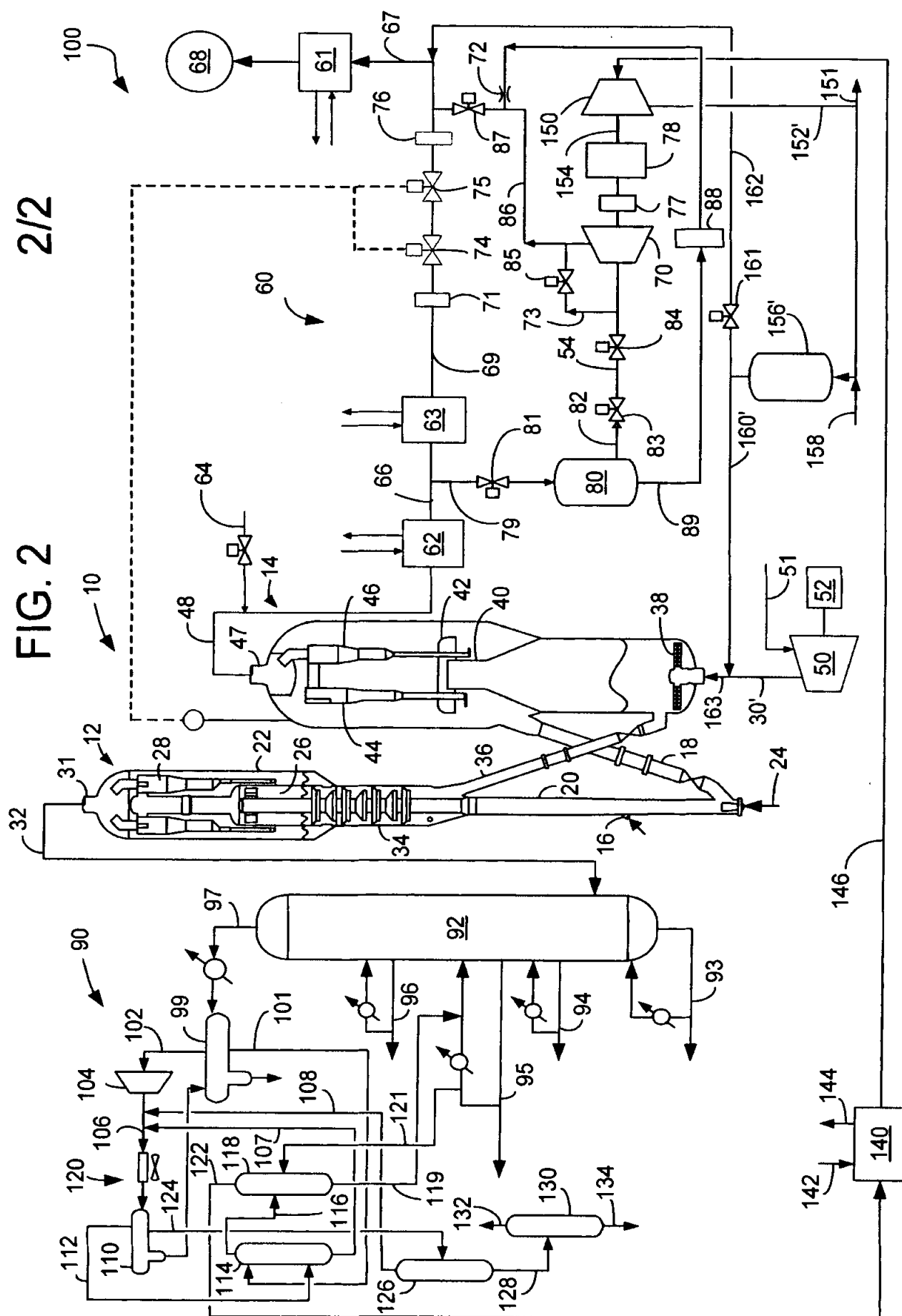


FIG. 2



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TRADUCCIÓN DEL INGLÉS AL ESPAÑOL del documento de prioridad relacionado con la Solicitud de Patente de los Estados Unidos de América No. 11/832,152 titulada:

APARATO PARA CALENTAR GAS DE REGENERACIÓN

ANEXOS. La solicitud de Patente de los Estados Unidos No. 11/832,152 arriba mencionada y Certificación del Comisionado de Patentes y Marcas de los Estados Unidos.

LOS ESTADOS UNIDOS DE AMÉRICA
A TODO AQUEL QUE PUEDA LLEGARLE LA PRESENTE:

DEPARTAMENTO DE COMERCIO DE ESTADOS UNIDOS
Oficina de Marcas y Patentes de Estados Unidos

Julio 28, 2008

ESTE ES PARA CERTIFICAR QUE EL ANEXO ES UNA COPIA VERDADERA DE LOS ARCHIVOS DE LA OFICINA DE MARCAS Y PATENTES DE LOS ESTADOS UNIDOS DE TALES DOCUMENTOS DE LA SOLICITUD PARA PATENTE IDENTIFICADA ABAJO LA CUAL CUMPLIÓ CON LOS REQUERIMIENTOS PARA OTORGARSELE UNA FECHA DE PRESENTACION BAJO 35 USC 111

NUMERO DE SOLICITUD: 11/832,152

FECHA DE PRESENTACIÓN: Agosto 1, 2007

EL CODIGO DE PAIS Y NUMERO DE PRIORIDAD DE LA SOLICITUD PARA SER UTILIZADOS EN LA PRESENTACIÓN EN EL EXTERIOR BAJO LA CONVENCION DE PARIS ES US11/832,152

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

Hay un sello que dice:

Oficina de Marcas y
Patentes de Estados Unidos
Departamento de Comercio

(firma)
P. SWAIN
Funcionario que Certifica

clm

REIVINDICACIONES:

1. Un aparato para procesar flujos de una unidad de craqueo de fluido catalítico que comprende:

Un reactor de craqueo de fluido catalítico para contactar el catalizador de craqueo con un flujo alimentador de hidrocarburo para craquear los hidrocarburos a hidrocarburos de producto gaseosos que tienen bajo peso molecular y coque de depósito para en el catalizador para proveer catalizador coqueado;

Una salida de producto para descargar los mencionados hidrocarburos de producto gaseosos del mencionado reactor;

Un regenerador para el coque de combustión del mencionado catalizador coqueado mediante contacto con oxígeno;

Una salida de gas de combustión para descargar gas de combustión del mencionado regenerador;

Una sección de recuperación de producto en comunicación hacia abajo con la mencionada salida de producto, la mencionada sección de recuperación para separar los mencionados productos gaseosos en una pluralidad de flujos de productos incluyendo un seleccionado flujo de producto; y el mencionado regenerador que se encuentra en comunicación hacia abajo con la mencionada sección de recuperación.

2. El aparato de la reivindicación 1 además de comprender un distribuidor en el mencionado regenerador para distribuir una gas que contiene oxígeno, mencionado distribuidor estando en comunicación hacia abajo con la mencionada sección de recuperación de producto.

3. El aparato de la reivindicación 1 además de comprender un precalentador en comunicación hacia abajo con la mencionada sección de recuperación de producto y el mencionado regenerador se encuentra en comunicación hacia abajo con el mencionado precalentador.

4. El aparato de la reivindicación 3 además de comprender un soplador para soplar gas que contiene oxígeno hacia el mencionado regenerador, mencionado regenerador estando en comunicación hacia abajo con el mencionado soplador y el mencionado precalentador.

5. El aparato de la reivindicación 4 además de comprender el mencionado precalentador estando en comunicación hacia abajo con el mencionado soplador.

6. El aparato de la reivindicación 5 además de comprender una línea de entrega de gas de regeneración en comunicación hacia abajo con los ambos mencionados soplador y línea de producto seleccionado en comunicación hacia abajo con la mencionada sección de recuperación y el mencionado precalentador de gas de regeneración estando en comunicación hacia abajo con la mencionada línea de entrega de gas de regeneración.

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7. El aparato de la reivindicación 5 además de comprender una línea de combustión hacia abajo con el mencionado precalentador de gas de regeneración y un distribuidor en el mencionado regenerador para distribuir un gas que contiene oxígeno, el mencionado distribuidor en comunicación hacia abajo con la sección de recuperación de producto y la mencionada línea de combustión.

8. El aparato de la reivindicación 3 además de comprender un soplador de gas que contiene oxígeno hacia el mencionado regenerador, el mencionado precalentador de gas de regeneración estando en comunicación hacia abajo con el mencionado soplador.

9. El aparato de la reivindicación 8 además de comprender una línea de entrega de gas de regeneración en comunicación hacia abajo con el mencionado soplador, una línea de producto seleccionado en comunicación hacia abajo con la mencionada sección de recuperación de producto, dicho precalentador de gas de regeneración estando en comunicación hacia abajo con la mencionada línea de producto seleccionado, y una línea de combustión en comunicación hacia abajo con el mencionado precalentador de gas de regeneración.

10. El aparato de la reivindicación 9 además de comprender una línea de combinación en comunicación hacia abajo con ambas mencionadas línea de combustión y línea de entrega de gas de regeneración y un distribuidor en comunicación hacia abajo con la mencionada línea de combinación, mencionado distribuidor para distribuir un gas que contiene oxígeno.

11. El aparato de la reivindicación 1 en donde un extensor está en comunicación hacia abajo con una línea de producto seleccionado en comunicación hacia abajo con la mencionada sección de recuperación de producto.

12. Un aparato para procesar un flujo de gas de combustión desde una unidad de craqueo de fluido catalítico que comprende:

Un reactor de craqueo de fluido catalítico para contactar el catalizador de craqueo con un flujo alimentador de hidrocarburo para craquear los hidrocarburos a hidrocarburos de producto gaseosos que tienen bajo peso molecular y coque de depósito para en el catalizador para proveer catalizador coqueado;

Una salida de producto para descargar los mencionados hidrocarburos de producto gaseosos del mencionado reactor;

Un regenerador para la combustión de coque del mencionado catalizador coqueado mediante contacto con oxígeno;

Una salida de gas de combustión para descargar gas de combustión del mencionado regenerador;

Una fuente de gas seco; y

Un precalentador en contacto hacia abajo con la mencionada fuente de gas seco y el mencionado regenerador estando en comunicación con el mencionado precalentador.

13. El aparato de la reivindicación 12 además de comprender un soplador para soplar gas que contiene oxígeno hacia el mencionado regenerador, el mencionado regenerador estando en comunicación hacia abajo con el mencionado soplador y precalentador.

14. El aparato de la reivindicación 12 además de comprender el mencionado precalentador estando en comunicación hacia abajo con el mencionado soplador.

15. El aparato de la reivindicación 13 además de comprender una línea de entrega de gas de regeneración en comunicación hacia abajo con el mencionado soplador y el mencionado precalentador estando en comunicación hacia abajo con la mencionada línea de entrega de gas de regeneración.

16. El aparato de la reivindicación 15 además de comprender una línea de combustión comunicada hacia abajo del mencionado precalentador y un distribuidor en el mencionado regenerador para distribuir un gas que contiene oxígeno, mencionado distribuidor en comunicación hacia abajo con la mencionada sección de recuperación de producto y la mencionada línea de combustión.

17. Un aparato para procesar flujos desde una unidad de craqueo de fluido catalítico que comprende:

Un reactor de craqueo de fluido catalítico para contactar el catalizador de craqueo con un flujo alimentador de hidrocarburo para craquear los hidrocarburos a hidrocarburos de producto gaseosos que tienen bajo peso molecular y coque de depósito para en el catalizador para proveer catalizador coqueado;

Una salida de producto para descargar los mencionados hidrocarburos de producto gaseosos del mencionado reactor;

Un regenerador para la combustión de coque del mencionado catalizador coqueado mediante contacto con oxígeno;

Una salida de gas de combustión para descargar gas de combustión del mencionado regenerador;

Una sección de recuperación de producto en comunicación hacia abajo con la mencionada salida de producto, la mencionada sección de recuperación de producto para separar los mencionados productos gaseosos en una pluralidad de flujos de producto incluyendo un flujo de producto seleccionado;

Un precalentador en comunicación hacia abajo con la mencionada sección de recuperación de producto.

Un soplador para soplar un gas que contiene oxígeno hacia el mencionado regenerador; y

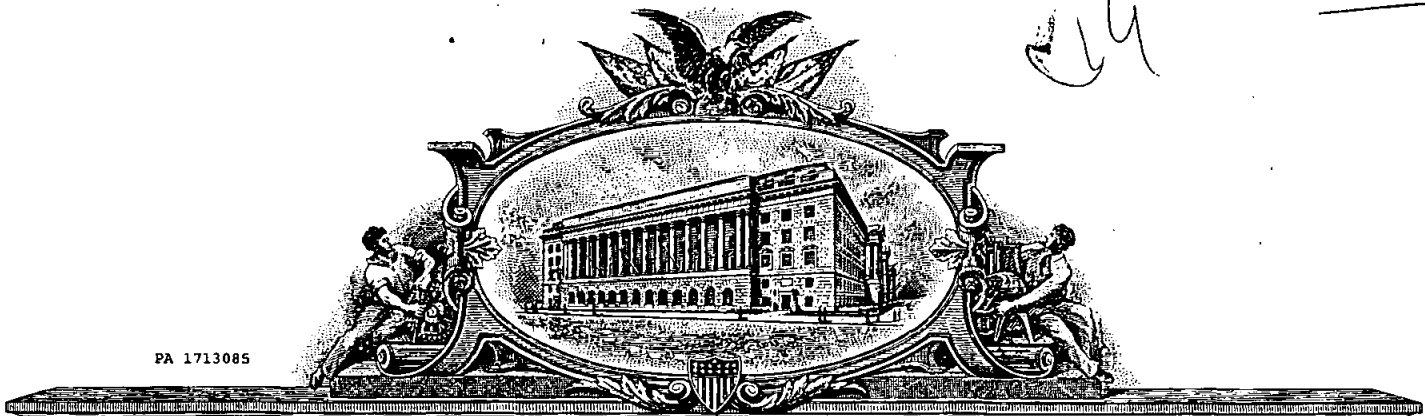
El mencionado regenerador estando en comunicación hacia abajo con el mencionado precalentador y mencionado soplador.

18. El aparato de la reivindicación 17 en donde el mencionado precalentador está en comunicación hacia abajo con el mencionado soplador.

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19. El aparato de la reivindicación 18 además de comprender una línea de combinación en comunicación hacia abajo con ambas una línea de combustión en comunicación hacia abajo con el mencionado precalentador y una línea de entrega de gas de regeneración en comunicación hacia abajo con el mencionado soplador.

PA 1713085



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

August 05, 2008

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: 11/832,147

FILING DATE: August 01, 2007

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS US11/832,147

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



M. SIAS

Certifying Officer

Electronic Acknowledgement Receipt

EFS ID:	2035302
Application Number:	11832147
International Application Number:	
Confirmation Number:	5597
Title of Invention:	Process for Heating Regeneration Gas
First Named Inventor/Applicant Name:	Keith A Couch
Customer Number:	23490
Filer:	Maryann Maas./Rose Lubich
Filer Authorized By:	Maryann Maas.
Attorney Docket Number:	uop27704-02
Receipt Date:	01-AUG-2007
Filing Date:	
Time Stamp:	14:27:04
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment was successfully received in RAM	\$ 1000
RAM confirmation Number	8634
Deposit Account	011125
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 and 1.17	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	UOP27704-02-Application-Data-Sheet.PDF	8416 435dd1649d27d1c6fb921ca7ad57ac3c ac96e1e	no	2
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
2	Drawings	UOP27704-02-Drawings.PDF	40088 ed91d5a17353a8976b3a8e2d8821379 b968879e4	no	2
Warnings:					
Information:					
3		UOP27704-02-Spec-Claims-Abstract.PDF	97257 ddad530bd45965eb13c846714eb9d8ed c5392504	yes	14
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	10	
	Claims		11	13	
	Abstract		14	14	
Warnings:					
Information:					
4	Fee Worksheet (PTO-06)	fee-info.pdf	8340 4cf6abe2349792a0d7e4a5940a50a187 bb429194	no	2
Warnings:					
Information:					
Total Files Size (in bytes):			154101		

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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

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.

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APPLICATION DATA SHEET

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APPLICATION DATA SHEET

Correspondence Information

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Application Information

Title Line One:: Process for Heating Regeneration Gas
Total Drawing Sheets:: 2
Formal Drawings?:: Yes
Application Type:: Utility
Docket Number:: UOP27704-02

Representative Information

Representative Customer Number:: 23490

PROCESS FOR HEATING REGENERATION GAS

BACKGROUND OF THE INVENTION

[0001] The field of the invention is power recovery from a fluid catalytic cracking (FCC) unit.

5 [0002] FCC technology, now more than 50 years old, has undergone continuous improvement and remains the predominant source of gasoline production in many refineries. This gasoline, as well as lighter products, is formed as the result of cracking heavier (i.e. higher molecular weight), less valuable hydrocarbon feed stocks such as gas oil.

10 [0003] In its most general form, the FCC process comprises a reactor that is closely coupled with a regenerator, followed by downstream hydrocarbon product separation. Hydrocarbon feed contacts catalyst in the reactor to crack the hydrocarbons down to smaller molecular weight products. During this process, the catalyst tends to accumulate coke thereon, which is burned off in the regenerator.

15 [0004] The heat of combustion in the regenerator typically produces flue gas at temperatures of 677° to 788°C (1250° to 1450°F) and at a pressure range of 138 to 276 kPa (20 to 40 psig). Although the pressure is relatively low, the extremely high temperature, high volume of flue gas from the regenerator contains sufficient kinetic energy to warrant economic recovery.

20 [0005] To recover energy from a flue gas stream, flue gas may be fed to a power recovery unit, which for example may include an expander turbine. The kinetic energy of the flue gas is transferred through blades of the expander to a rotor coupled either to a main air blower, to produce combustion air for the FCC regenerator, and/or to a generator to produce electrical power. Because of the pressure drop of 138 to 207 kPa (20 to 30 psi) across the expander turbine, the flue gas typically discharges with a temperature drop of approximately 125° to
25 167°C (225 to 300°F). The flue gas may be run to a steam generator for further energy recovery. A power recovery train may include several devices, such as an expander turbine, a generator, an air blower, a gear reducer, and a let-down steam turbine.

30 [0006] In order to reduce damage to components downstream of the regenerator, it is also known to remove flue gas solids. This is commonly accomplished with first and second stage separators, such as cyclones, located in the regenerator. Some systems also include a third



stage separator (TSS) or even a fourth stage separator (FSS) to remove further fine particles, commonly referred to as "fines".

[0007] The FCC process produces around 30% of the dry gas produced in a refinery. Dry gas mainly comprises ethane, methane and other light gases. Dry gas is separated from other FCC products at high pressures. FCC dry gas is heavily olefinic and typically used as fuel gas throughout a refinery. Olefinic dry gas, such as dry gas having over 10 wt-% olefins is not viable for use in gas turbines in which the olefins can cause internal fouling particularly due to the presence of diolefins. In some cases, FCC units produce more dry gas than the refinery consumes. The excess dry gas can be flared which is an environmental concern. To make less dry gas, the riser temperature can be reduced, adversely affecting the product slate, or throughput can be reduced, adversely affecting productivity. Olefinic dry gas can also be obtained from other unit operations such as those that are hydrogen deficient like cokers and steam crackers.

SUMMARY OF THE INVENTION

[0008] We have discovered a process for improving product utilization from an FCC unit. The process involves combusting product gas with oxygen before adding oxygen or an oxygen-containing gas, typically air, to an FCC regenerator. The regenerator is less likely to produce NO_x and CO in the flue gas stream when heated air is supplied to the regenerator. The process may involve expanding the high pressure product gas obtained from an FCC product stream to lower pressure to recover power before combustion. The preferred product gas is dry gas which may be obtained from many hydrocarbon processing reactions which are hydrogen deficient.

[0009] Advantageously, the process can enable the FCC unit to utilize a low value product stream to produce gasses that are more environmentally friendly.

[0010] Additional features and advantages of the invention will be apparent from the description of the invention, figures and claims provided herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 is a schematic drawing of an FCC unit, a power recovery train and an FCC product recovery system in a refinery.

[0012] FIG. 2 is a schematic of an alternate embodiment of the invention of FIG. 1.

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DETAILED DESCRIPTION

[0013] Now turning to the figures, wherein like numerals designate like components, FIG. 1 illustrates a refinery complex 100 that is equipped for processing streams from an FCC unit for power recovery. The refinery complex 100 generally includes an FCC unit section 10, a power recovery section 60 and a product recovery section 90. The FCC unit section 10 includes a reactor 12 and a catalyst regenerator 14. Process variables typically include a cracking reaction temperature of 400° to 600°C and a catalyst regeneration temperature of 500° to 900°C. Both the cracking and regeneration occur at an absolute pressure below 5 atmospheres. FIG. 1 shows a typical FCC process unit of the prior art, where a heavy hydrocarbon feed or raw oil stream in a line 16 is contacted with a newly regenerated cracking catalyst entering from a regenerated catalyst standpipe 18. This contacting may occur in a narrow riser 20, extending upwardly to the bottom of a reactor vessel 22. The contacting of feed and catalyst is fluidized by gas from a fluidizing line 24. Heat from the catalyst vaporizes the oil, and the oil is thereafter cracked to lighter molecular weight hydrocarbons in the presence of the catalyst as both are transferred up the riser 20 into the reactor vessel 22. The cracked light hydrocarbon products are thereafter separated from the cracking catalyst using cyclonic separators which may include a rough cut separator 26 and one or two stages cyclones 28 in the reactor vessel 22. Product gases exit the reactor vessel 10 through a product outlet 31 to line 32 for transport to a downstream product recovery section 90. Inevitable side reactions occur in the riser 20 leaving coke deposits on the catalyst that lower catalyst activity. The spent or coked catalyst requires regeneration for further use. Coked catalyst, after separation from the gaseous product hydrocarbon, falls into a stripping section 34 where steam is injected through a nozzle to purge any residual hydrocarbon vapor. After the stripping operation, the coked catalyst is fed to the catalyst regenerator 14 through a spent catalyst standpipe 36.

[0014] FIG. 1 depicts a regenerator 14 known as a combustor. However, other types of regenerators are suitable. In the catalyst regenerator 14, a stream of oxygen-containing gas, such as air, is introduced through an air distributor 38 to contact the coked catalyst, burn coke deposited thereon, and provide regenerated catalyst and flue gas. A main air blower 50 is driven by a driver 52 to deliver air or other oxygen containing gas from line 51 into the regenerator 14. The driver 52 may be, for example, a motor, a steam turbine driver, or some other device for power input. The catalyst regeneration process adds a substantial amount of

heat to the catalyst, providing energy to offset the endothermic cracking reactions occurring in the reactor conduit 16. Catalyst and air flow upwardly together along a combustor riser 40 located within the catalyst regenerator 14 and, after regeneration, are initially separated by discharge through a disengager 42. Finer separation of the regenerated catalyst and flue gas exiting the disengager 42 is achieved using first and second stage separator cyclones 44, 46, respectively within the catalyst regenerator 14. Catalyst separated from flue gas dispenses through a diplegs from cyclones 44, 46 while flue gas relatively lighter in catalyst sequentially exits cyclones 44, 46 and exits the regenerator vessel 14 through flue gas outlet 47 in line 48. Regenerated catalyst is recycled back to the reactor riser 12 through the regenerated catalyst standpipe 18. As a result of the coke burning, the flue gas vapors exiting at the top of the catalyst regenerator 14 in line 48 contain CO, CO₂ and H₂O, along with smaller amounts of other species.

[0015] Hot flue gas exits the regenerator 14 through the flue gas outlet 47 in a line 48 and enters the power recovery section 60. The power recovery section 60 is in downstream communication with the flue gas outlet 47 via line 48. "Downstream communication" means that at least a portion of the fluid from the upstream component flows into the downstream component. Many types of power recovery configurations are suitable, and the following embodiment is very well suited but not necessary to the present invention. Line 48 directs the flue gas to a heat exchanger 62, which is preferably a high pressure steam generator (e.g., a 4137 kPa (gauge) (600 psig)). Arrows to and from the heat exchanger 62 indicate boiler feed water in and high pressure steam out. The heat exchanger 62 may be a medium pressure steam generator (e.g., a 3102 kPa (gauge) (450 psig)) or a low pressure steam generator (e.g., a 345 kPa (gauge) (50 psig)) in particular situations. As shown in the embodiment of FIG. 1, a boiler feed water (BFW) quench injector 64 may be provided to selectively deliver fluid into conduit 48.

[0016] A supplemental heat exchanger 63 may also be provided downstream of the heat exchanger 62. For example, the supplemental temperature reduction would typically be a low pressure steam generator for which arrows indicate boiler feed water in and low pressure steam out. However, the heat exchanger 63 may be a high or medium pressure steam generator in particular situations. In the embodiment of FIG. 1, conduit 66 provides fluid communication from heat exchanger 62 to the supplemental heat exchanger 63. Flue gas exiting the supplemental heat exchanger 63 is directed by conduit 69 to a waste flue gas line

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67 and ultimately to an outlet stack 68, which is preferably equipped with appropriate environmental equipment, such as an electrostatic precipitator or a wet gas scrubber.

Typically, the flue gas is further cooled in a flue gas cooler 61 to heat exchange with a heat exchange media which is preferably water to generate high pressure steam. Arrows to and from flue gas cooler 61 indicate heat exchange media coming in and heated heat exchange media exiting, which is preferably boiler feed water coming in and steam going out. The illustrated example of FIG. 1 further provides that conduit 69 may be equipped to direct the flue gas through a first multi-hole orifice (MHO) 71, a first flue gas control valve (FGCV) 74, and potentially a second FGCV 75 and second MHO 76 on the path to waste flue gas line 67 all to reduce the pressure of the flue gas in conduit 69 before it reaches the stack 68. FGCV's 74, 75 are typically butterfly valves and may be controlled based on a pressure or temperature reading from the regenerator 14.

[0017] In order to generate electricity, the power recovery section 60 further includes a power recovery expander 70, which is typically a steam turbine, and a power recovery generator ("generator") 78. More specifically, the expander 70 has an output shaft that is typically coupled to an electrical generator 78 by driving a gear reducer 77 that in turn drives the generator 78. The generator 78 provides electrical power that can be used as desired within the plant or externally. Alternatively, the expander 70 may be coupled to the main air blower 50 to serve as its driver, obviating driver 52, but this arrangement is not shown.

[0018] In an embodiment, the power recovery expander 70 is located in downstream communication with the heat exchanger 62. However, a heat exchanger may be upstream or downstream of the expander 70. For example, a conduit 79 feeds flue gas through an isolation valve 81 to a third stage separator (TSS) 80, which removes the majority of remaining solid particles from the flue gas. Clean flue gas exits the TSS 80 in a flue gas line 82 which feeds a flue gas stream to a combine line 54 which drives the expander 70.

[0019] To control flow flue gas between the TSS 80 and the expander 70, an expander inlet control valve 83 and a throttling valve 84 may be provided upstream of the expander 70 to further control the gas flow entering an expander inlet. The order of the valves 83, 84 may be reversed and are preferably butterfly valves. Additionally, a portion of the flue gas stream can be diverted in a bypass line 73 from a location upstream of the expander 70, through a synchronization valve 85, typically a butterfly valve, to join the flue gas in the exhaust line 86. After passing through an isolation valve 87, the clean flue gas in line 86 joins the flowing

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waste gas downstream of the supplemental heat exchanger 63 in waste flue gas line 67 and flows to the outlet stack 68. An optional fourth stage separator 88 can be provided to further remove solids that exit the TSS 80 in an underflow stream in conduit 89. After the underflow stream is further cleaned in the fourth stage separator 88, it can rejoin the flue gas in line 86 after passing through a critical flow nozzle 72 that sets the flow rate therethrough.

[0020] In the product recovery section 90, the gaseous FCC product in line 32 is directed to a lower section of an FCC main fractionation column 92. Several fractions may be separated and taken from the main column including a heavy slurry oil from the bottoms in line 93, a heavy cycle oil stream in line 94, a light cycle oil in line 95 and a heavy naphtha stream in line 96. Any or all of lines 93-96 may be cooled and pumped back to the main column 92 to cool the main column typically at a higher location. Gasoline and gaseous light hydrocarbons are removed in overhead line 97 from the main column 92 and condensed before entering a main column receiver 99. An aqueous stream is removed from a boot in the receiver 99. Moreover, a condensed light naphtha stream is removed in line 101 while a gaseous light hydrocarbon stream is removed in line 102. Both streams in lines 101 and 102 may enter a vapor recovery section 120 of the product recovery section 90.

[0021] The vapor recovery section 120 is shown to be an absorption based system, but any vapor recovery system may be used including a cold box system. To obtain sufficient separation of light gas components the gaseous stream in line 102 is compressed in compressor 104. More than one compressor stage may be used, but typically a dual stage compression is utilized. The compressed light hydrocarbon stream in line 106 is joined by streams in lines 107 and 108, chilled and delivered to a high pressure receiver 110. An aqueous stream from the receiver 110 may be routed to the main column receiver 99. A gaseous hydrocarbon stream in line 112 is routed to a primary absorber 114 in which it is contacted with unstabilized gasoline from the main column receiver 99 in line 101 to effect a separation between C_3^+ and C_2^- . A liquid C_3^+ stream in line 107 is returned to line 106 prior to chilling. An off-gas stream in line 116 from the primary absorber 114 may be used as a selected product stream of the plurality of product streams separated from the FCC product in the present invention or optionally be directed to a secondary absorber 118, where a circulating stream of light cycle oil in line 121 diverted from line 95 absorbs most of the remaining C_5^+ and some C_3 - C_4 material in the off-gas stream. Light cycle oil from the bottom of the secondary absorber in line 119 richer in C_3^+ material is returned to the main

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column 92 via the pump-around for line 95. The overhead of the secondary absorber 118 comprising dry gas of predominantly C_2^- hydrocarbons with hydrogen sulfide, amines and hydrogen is removed in line 122 and may be used as a selected product stream of the plurality of product streams separated from the FCC product in the present invention. It is

5 contemplated that another stream may also comprise a selected product stream of the plurality of product streams separated from the FCC product in the present invention

[0022] Liquid from the high pressure receiver 110 in line 124 is sent to a stripper 126. Most of the C_2^- is removed in the overhead of the stripper 126 and returned to line 106 via overhead line 108. A liquid bottoms stream from the stripper 126 is sent to a debutanizer
10 column 130 via line 128. An overhead stream in line 132 from the debutanizer comprises C_3 - C_4 olefinic product while a bottoms stream in line 134 comprising stabilized gasoline may be further treated and sent to gasoline storage.

[0023] A selected product stream line, preferably line 122 comprising the secondary absorber off-gas containing dry gas may be introduced into an amine absorber unit 140. A
15 lean aqueous amine solution is introduced via line 142 into absorber 140 and is contacted with the flowing dry gas stream to absorb hydrogen sulfide, and a rich aqueous amine absorption solution containing hydrogen sulfide is removed from absorption zone 140 via line 144 and recovered. A selected product stream line preferably comprising a dry gas stream having a reduced concentration of hydrogen sulfide is removed from absorption zone 140 via
20 line 146. Any of lines carrying product from the FCC reactor 12 including lines 114 or 122 and 146 may serve as selected product lines in communication with the downstream power recovery section 60 to transport a selected product stream from the gas recovery section 120 of the product recovery section 90 to the power recovery section 60. Additionally, dry gas may be delivered to the power recovery section 60 from any other source in the refinery 100
25 such as a coker unit or a steam cracker unit.

[0024] The selected FCC product gas from the product recovery section 90 in line 146 can be used in the power recovery section 60 in a continuous process and in the same refinery complex. The power recovery section 60 is in downstream communication with the vapor recovery section of the product recovery section 90 via line 146. As an alternative to sending
30 the selected gas in line 146 to the refinery fuel gas header, the selected product gas may be let down in pressure at a volume increase across an expander 150 to recover pressure energy from the gas. The selected gas is still at the high pressure utilized in the vapor recovery

section 120 of the product recovery section 90 when delivered to the expander 150 due to operation of the compressor 104. The selected gas exits expander 150 in exhaust line 152. The expander is connected by a shaft 154 to an electrical generator 78 for generating electrical power that can be used in the refinery or exported. Beside connection by shaft 154 to the electrical generator, the expander 150 may alternatively or additionally be connected by a shaft (not shown) to the main air blower 50 for blowing air to the regenerator 14 obviating the need for driver 52. A gear reducer may be provided on the shaft 154 between the expander 150 and the generator 78 in which case the gear reducer (not shown) would connect two shafts of which shaft 154 is one. The expander 150 may be in downstream communication with the selected product line 146 and with vapor recovery section 120 of the product recovery section 90 via line 146.

[0025] It is also contemplated that an additional steam expander (not shown) may be connected by an additional shaft or the same shaft 154 to further turn electrical generator 78 and produce additional electrical power or power the main air blower 50. The additional steam expander would be fed by surplus steam in the refinery. The additional expander could be either an extraction or induction turbine. In the latter case, the additional expander could take the form of an additional chamber in expander 150 or 70 with the surplus steam feeding the additional chamber (not shown). The additional expander may be coupled by a gear reducer (not shown) to the additional shaft or the same shaft 154. It is also contemplated that expanders 70 and 150 could be the same expander with induction feed from line 82, 54 or 146, respectively, introducing a stream to an intermediate chamber of the expander.

[0026] The selected product gas may be used as a regeneration gas preheating media. A portion of the selected product gas may be diverted for other purposes in line 151. After, before or instead of routing the selected product gas to the expander 150 for power recovery, the selected gas is routed to the regeneration gas preheater 156 in expander exhaust line 152 if the expander 150 is utilized. Heat from combusting the selected product gas serves to preheat regeneration gas before contacting the coked FCC catalyst in the regenerator 14 serving to minimize production of nonselective flue gas components such as NO_x and CO. The preheated regeneration gas should be heated to a temperature of between about 350 and about 800°F (177 to 427°C).

[0027] In the embodiment of FIG. 1, a regeneration gas delivery line 158 is in downstream communication with the main air blower 50 and delivers oxygen-containing

regeneration gas such as air to the regeneration gas preheater 156 which is in downstream communication with the line 158 and the blower 50. The regeneration gas preheater 156 is in downstream communication with the vapor recovery section 120 of the product recovery section 90 via lines 116, 122, 146 and/or 152, and the regenerator 14 is in downstream communication with the regeneration gas heater 156. The line 158 may be in downstream communication with line 152 thereby combining the oxygen-containing regeneration gas stream from the blower 50 and at least a portion of the selected product gas in line 152 before they both enter the regeneration gas preheater 156. The oxygen-containing regeneration gas and the selected product gas are ignited continuously to combust the selected product gas in the regeneration gas preheater 156 and achieve an elevated temperature in a combusted gas stream. The regeneration gas preheater 156 is in downstream communication with the selected product lines 116, 122, 146 and/or 152. The flow rate of oxygen from blower 50 should be sufficient to combust the selected gas in the regeneration gas heater 156 and combust coke from catalyst in the regenerator 14. Hence, the combust gas stream in line 160 will contain excess oxygen-containing regeneration gas and combusted selected product gas. The preheater 156 may be in downstream communication with the expander 150. Accordingly, the pressure let down across the expander 150 should provide the selected gas stream in line 152 at a pressure that is equivalent to the regeneration gas leaving the blower 50 in line 158. A combust line 160 is in downstream communication with the preheater 156. The preheated regeneration gas containing combusted selected gas enter the regenerator 14 through combust line 160 at elevated temperature preferably through distributor 38. The distributor 38 of the regenerator 14 is in downstream communication with the product recovery section 90, the blower 50 and the regeneration gas preheater 156.

[0028] This arrangement is economically attractive as it may maximize utilization of existing assets, but it also allows for the burning of olefin rich dry gas from the FCC reactor 12 or other reactor in which hydrogen is deficient, which is not viable for use in gas turbines in which the olefins can cause internal fouling.

[0029] FIG. 2 shows an alternative embodiment in which most elements are the same as in FIG. 1 indicated by like reference numerals but with differences in configuration indicated by designating the reference numeral with a prime symbol ("’"). The flue gas heater 156’ is in downstream communication with the vapor recovery section 120 of the product recovery section 90 via lines 116, 122, 146 and/or 152’. An oxygen-containing gas stream in line 158

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is combined with at least a portion of the selected product gas in line 152'. Together or separately, the oxygen-containing stream and the selected product gas stream enter into the regeneration gas preheater 156', are ignited and a combust stream of combusted selected product gas at elevated temperature exit the preheater 156' in combust line 160'. A

5 regeneration gas delivery line 30' in downstream communication with the blower 50 delivers an oxygen-containing regeneration gas. A combine line 163 is in downstream communication with the regeneration gas delivery line 30' and the combust line 160' carrying the combust stream in downstream communication with the preheater 156'. Upon mixing, the combust stream heats the regeneration gas in the combine line 163 to provide
10 regeneration gas at elevated temperature to the distributor 38 in regenerator 14 both in parallel downstream communication with the blower 50 via delivery line 30' and the preheater 156' via line 160'. The preheated regeneration gas delivered to the regenerator 14 in combine line 163 contacts the coked catalyst at elevated temperature to minimize the generation of undesirable combustion products while combusting coke from the coked
15 catalyst.

[0030] A further combust line 162 may carry combusted selected product gas to the heat exchanger 61 in downstream communication with the preheater 156'. A back pressure valve 161 may regulate flow so that combusted gas in excess of that necessary to achieve the desired temperature of regeneration gas in combine line 163 is diverted to additional heat
20 exchange preferably for the generation of steam in heat exchanger 61. It is also envisioned that the combust line may feed flue gas lines 48 or 66 to boost heat exchange and preferably steam generation in heat exchangers 62 and 63 that may be in downstream communication with preheater 156'. It is also envisioned that this embodiment may be applicable to the embodiment of FIG. 1.

25 [0031] Preferred embodiments of this invention are described herein, including the best mode known to the inventors for carrying out the invention. It should be understood that the illustrated embodiments are exemplary only, and should not be taken as limiting the scope of the invention.

CLAIMS:

1. A process for processing streams from a fluid catalytic cracking unit comprising:
contacting cracking catalyst with a hydrocarbon feed stream to crack the

hydrocarbons to gaseous product hydrocarbons having lower molecular weight

and deposit coke on the catalyst to provide coked catalyst;

separating said coked catalyst from said gaseous product hydrocarbons;

adding at least a portion of an regeneration gas stream containing oxygen to said
coked catalyst;

combusting coke on said coked catalyst with oxygen to regenerate said catalyst and
provide flue gas;

separating said gaseous product hydrocarbons to obtain a plurality of product streams
including a selected product stream; and

combining at least a portion of said selected product stream with at least a portion of
said regeneration gas stream.

2. The process of claim 1 further including combusting at least a portion of said
selected product stream with oxygen to provide a combusted gas stream after combining at
least a portion of said selected product stream with at least a portion of said regeneration gas
stream and adding said at least a portion of said regeneration gas stream in said combusted
gas stream to said coked catalyst.

3. The process of claim 1 further including:

adding oxygen to said selected product stream; and

combusting said selected product stream with oxygen before combining at least a
portion of said selected product stream with at least a portion of said regeneration
gas stream.

4. The process of claim 1 further including:

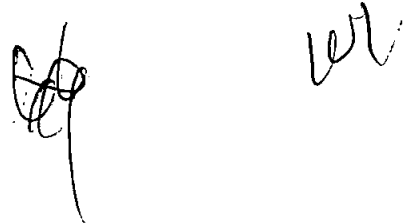
delivering said selected product stream to an expander;

expanding the volume of said selected product stream in said expander; and

recovering power from said combined stream in said expander.

5. The process of claim 4 wherein said power is recovered in an expander coupled to
an air blower to the regenerator.

6. The process of claim 4 wherein said power is recovered in an expander coupled to
an electrical generator.



7. The process of claim 1 wherein said selected product stream is a dry gas stream.

8. The process of claim 1 wherein said selected product stream is taken from a vapor recovery section.

9. A process for preheating an regeneration gas stream to a regenerator of a fluid
5 catalytic cracking unit comprising:

contacting cracking catalyst with a hydrocarbon feed stream to crack the
hydrocarbons to gaseous product hydrocarbons having lower molecular weight
and deposit coke on the catalyst to provide coked catalyst;

separating said coked catalyst from said gaseous product hydrocarbons;

10 obtaining a dry gas stream;

adding a regeneration gas stream to at least a portion of said dry gas stream;

adding at least a portion of said regeneration gas stream to said coked catalyst; and
combusting coke on said coked catalyst with oxygen to regenerate said catalyst.

10. The process of claim 9 further comprising:

15 adding oxygen to said dry gas stream; and

combusting said dry gas stream with oxygen to provide a combusted dry gas stream
before combining at least a portion of said dry gas stream with said regeneration
gas stream.

11. The process of claim 9 further comprising:

20 combusting said dry gas stream with oxygen to provide a combusted dry gas stream
after combining at least a portion of said dry gas stream with said regeneration gas
stream; and

adding at least a portion of said regeneration gas stream in said combusted dry gas
stream to said coked catalyst.

25 12. The process of claim 9 further including expanding said dry gas stream to a lower
pressure to recover power.

13. The process of claim 12 wherein said power is recovered in an expander coupled
to an air blower to the regenerator.

30 14. The process of claim 12 wherein said power is recovered in an expander coupled
to an electrical generator.

15. The process of claim 9 further including obtaining said dry gas stream from said
gaseous product hydrocarbons.

16. A process for recovering power from a fluid catalytic cracking effluent comprising:

contacting cracking catalyst with a hydrocarbon feed stream to crack the hydrocarbons to gaseous product hydrocarbons with lower molecular weight and deposit coke on the catalyst to provide coked catalyst;
separating said coked catalyst from said gaseous product hydrocarbons;
adding at least a portion of an regeneration gas stream to said coked catalyst;
combusting coke on said coked catalyst with oxygen to regenerate said catalyst and provide flue gas;
separating said catalyst from said flue gas;
fractionating said gaseous product hydrocarbons to obtain a plurality of product streams;
obtaining a dry gas stream from said plurality of product streams;
combining at least a portion of said regeneration gas stream and at least a portion of said dry gas stream; and
combusting at least a portion of said dry gas stream with at least a portion of said regeneration gas stream to provide a combusted dry gas stream.

17. The process of claim 16 further comprising combining said combusted dry gas stream with at least a portion of said regeneration gas stream before adding at least a portion of said regeneration gas stream to said coked catalyst.

18. The process of claim 16 further comprising adding at least a portion of said regeneration gas stream in said combusted dry gas stream to said coked catalyst.

19. The process of claim 16 further including expanding said dry gas stream to a lower pressure to recover power.

20. The process of claim 16 wherein said power is recovered in an expander coupled to an electrical generator.

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ABSTRACT

Disclosed is a process for combusting dry gas to heat the air supplied to an FCC regenerator to increase its temperature and minimize production of undesirable combustion products. Preferably, the dry gas is a selected FCC product gas. Alternatively or
5 additionally, dry gas from an FCC product stream is separated and delivered to an expander to recover power before combustion.

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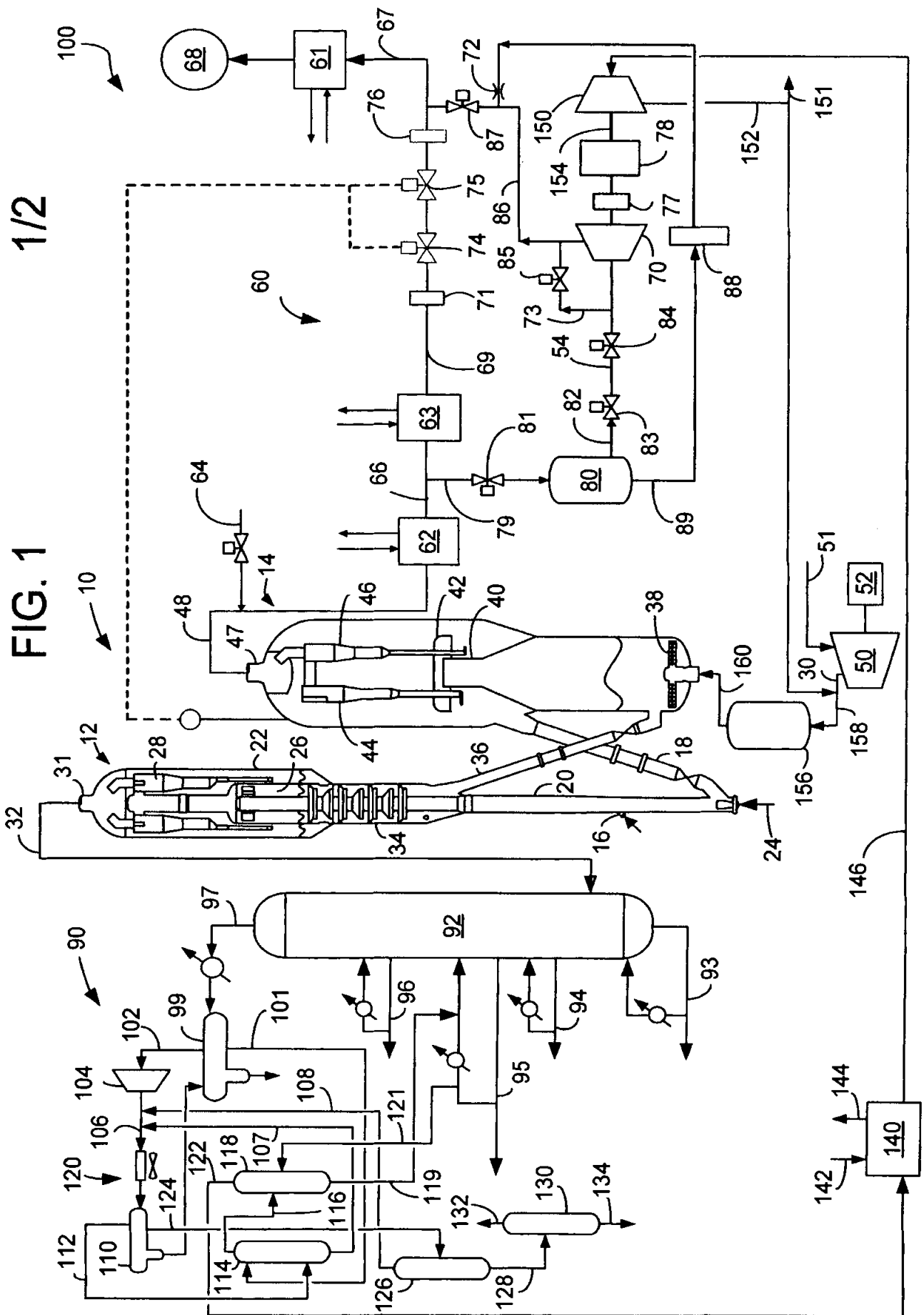
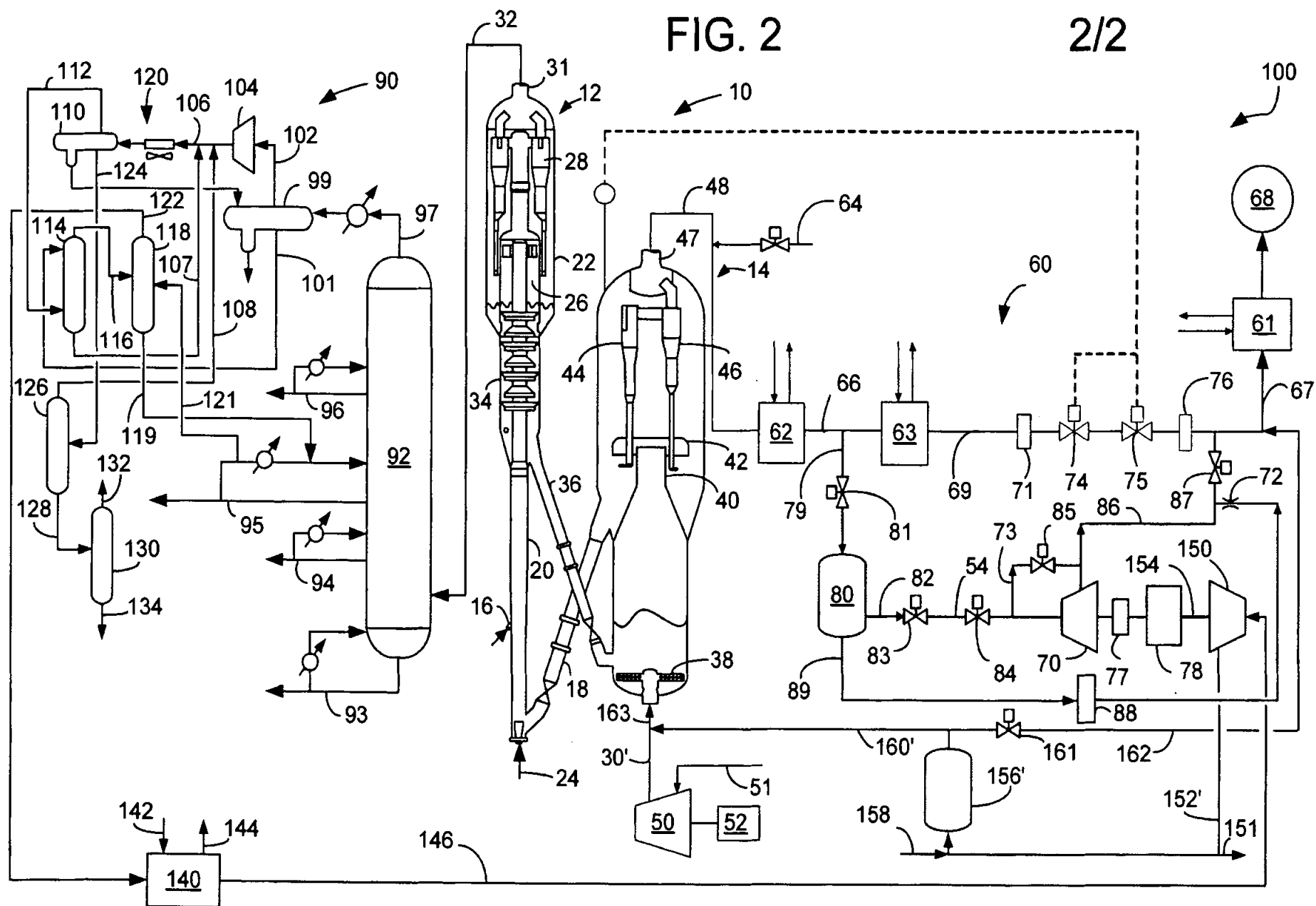


FIG. 2

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TRADUCCIÓN DEL INGLÉS AL ESPAÑOL del documento de prioridad relacionado con la Solicitud de Patente de los Estados Unidos de América No. 11/832,147 titulada:

PROCESO PARA CALENTAR GAS DE REGENERACIÓN

ANEXOS. La solicitud de Patente de los Estados Unidos No. 11/832,147 arriba mencionada y Certificación del Comisionado de Patentes y Marcas de los Estados Unidos.

LOS ESTADOS UNIDOS DE AMÉRICA
A TODO AQUEL QUE PUEDA LLEGARLE LA PRESENTE:

DEPARTAMENTO DE COMERCIO DE ESTADOS UNIDOS
Oficina de Marcas y Patentes de Estados Unidos

Agosto 5, 2008

ESTE ES PARA CERTIFICAR QUE EL ANEXO ES UNA COPIA VERDADERA DE LOS ARCHIVOS DE LA OFICINA DE MARCAS Y PATENTES DE LOS ESTADOS UNIDOS DE TALES DOCUMENTOS DE LA SOLICITUD PARA PATENTE IDENTIFICADA ABAJO LA CUAL CUMPLIÓ CON LOS REQUERIMIENTOS PARA OTORGARSELE UNA FECHA DE PRESENTACION BAJO 35 USC 111

NUMERO DE SOLICITUD: 11/832,147

FECHA DE PRESENTACIÓN: Agosto 1, 2007

EL CODIGO DE PAIS Y NUMERO DE PRIORIDAD DE LA SOLICITUD PARA SER UTILIZADOS EN LA PRESENTACIÓN EN EL EXTERIOR BAJO LA CONVENCION DE PARIS ES US11/832,136

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

Hay un sello que dice:

Oficina de Marcas y
Patentes de Estados Unidos
Departamento de Comercio

(firma)
M. SIAS
Funcionario que Certifica

REIVINDICACIONES:

1. Un proceso para procesar corrientes provenientes de una unidad de craqueo catalítico tipo fluido, el cual comprende:
contactar el catalizador de craqueo con una corriente de carga de hidrocarburos para craquear los hidrocarburos en productos hidrocarburos gaseosos con un peso molecular menor y depositar coque en el catalizador para proporcionar catalizador coquizado;
separar el citado catalizador coquizado de los citados productos hidrocarburos gaseosos;
agregar por lo menos una porción de una corriente de gas de regeneración con contenido de oxígeno al citado catalizador coquizado;
quemar coque en el citado catalizador coquizado con oxígeno para regenerar el citado catalizador y proporcionar gas de chimenea;
separar los citados productos hidrocarburos gaseosos para obtener una pluralidad de corrientes de producto, incluida una corriente de producto seleccionado; y
combinar por lo menos una porción de la citada corriente de producto seleccionado con por lo menos una porción de la citada corriente de gas de regeneración.
2. El proceso de la reivindicación 1 que incluye además quemar por lo menos una porción de la citada corriente de producto seleccionado con oxígeno para proporcionar una corriente de gas quemado, luego de combinar por lo menos una porción de la citada corriente de producto seleccionado con por lo menos una porción de la citada corriente de gas de regeneración y agregar la citada por lo menos una porción de la citada corriente de gas de regeneración en la citada corriente de gas quemado al citado catalizador coquizado.
3. El proceso de la reivindicación 1 que incluye además:
agregar oxígeno a la citada corriente de producto seleccionado; y
quemar la citada corriente de producto seleccionado con oxígeno antes de combinar por lo menos una porción de la citada corriente de producto seleccionado con por lo menos una porción de la citada corriente de gas de regeneración.
4. El proceso de la reivindicación 1 que incluye además:
entregar la citada corriente de producto seleccionado a un expansor;
expandir el volumen de la citada corriente de producto seleccionado en el citado expansor; y
recuperar energía de la citada corriente combinada en el citado expansor.
5. El proceso de la reivindicación 4 en donde el mencionado poder es recuperado en un extensor acoplado a un soplador de aire a un regenerador.

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6. El proceso de la reivindicación 4 en donde el mencionado poder es recuperado en un extensor acoplado a un generador eléctrico.

7. El proceso de la reivindicación 1 en donde el mencionado flujo de producto seleccionado es un flujo de gas seco.

8. El proceso de la reivindicación 1 en donde el seleccionado flujo de producto es tomado de una sección de recuperación de vapor.

9. Un proceso para precalentar un flujo de gas de regeneración a un regenerador de una unidad de craqueo de fluido catalítico que comprende:

Contacto de catalizador de craqueo con un flujo alimentador de hidrocarburo para craquear los hidrocarburos a hidrocarburos de producto gaseoso que tengan más bajo peso molecular y depositar coque en el catalizador para proveer catalizador coqueado;

Separación de dicho catalizador coqueado de los mencionados hidrocarburos de producto gaseosos;

Obtención de un flujo de gas seco;

Adición de un flujo de gas de regeneración a al menos una porción del mencionado flujo de gas seco;

Adición de al menos una porción del mencionado flujo de gas de regeneración al mencionado catalizador coqueado; y

Combustión de coque en el mencionado catalizador coqueado con oxígeno para regenerar el mencionado catalizador.

10. El proceso de la reivindicación 9 además de comprender:

Adición de oxígeno al mencionado flujo de gas seco, y

Combustión del mencionado flujo de gas seco con oxígeno para proveer un flujo de gas seco quemado antes de combinar al menos una porción del mencionado flujo de gas seco con el mencionado flujo de gas de regeneración.

11. El proceso de la reivindicación 9 además de comprender:

una Combustión del mencionado flujo de gas seco con oxígeno para proveer un flujo de gas quemado después de combinar al menos una porción del mencionado flujo de gas seco con el mencionado flujo de gas de regeneración, y

Adición de al menos una porción del mencionado flujo de gas de regeneración en el mencionado flujo de gas seco para el mencionado catalizador coqueado.

12. El proceso de la reivindicación 9 además de incluir la expansión del mencionado flujo del gas seco a una presión inferior para recuperar poder.

13. El proceso de la reivindicación 12 en donde el mencionado poder es recuperado en un extensor acoplado a un generador de aire a un regenerador.

14. El proceso de la reivindicación 12 en donde el citado poder es recuperado en un extensor acoplado a un generador eléctrico.

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15. El proceso de la reivindicación 9 además de incluir la obtención del mencionado flujo de gas seco de los mencionados hidrocarburos de producto gaseosos.

16. Un proceso para la recuperación de poder de efluente de craqueo catalítico fluido que comprende:

Contacto del catalizador de craqueo con un flujo alimentador de hidrocarburo para craquear los hidrocarburos a hidrocarburos de producto gaseosos con un bajo peso molecular y depositar coque para proveer catalizador coqueado;

Separación del mencionado catalizador coqueado de mencionados hidrocarburos de producto gaseosos;

Combustión de coque en el mencionado catalizador coqueado con oxígeno para regenerar el mencionado catalizador y proveer gas de combustión.

Separación del mencionado catalizador del mencionado gas de combustión;

Fraccionamiento de los mencionados hidrocarburos para obtener una pluralidad de flujos de producto;

Obtención de un flujo de gas seco de la mencionada pluralidad de flujos de producto;

Combinación de al menos una porción del mencionado flujo de gas de regeneración y al menos una porción del mencionado flujo de gas seco; y

Combustión de al menos una porción del mencionado flujo de gas seco con al menos una porción del mencionado flujo de gas de regeneración para proveer un flujo de gas seco quemado.

17. El proceso de la reivindicación 16 además de comprender la combinación del mencionado flujo de gas seco quemado con al menos una porción del mencionado flujo de gas de regeneración antes de adicionar al menos una porción del mencionado gas de regeneración al mencionado catalizador coqueado.

18. El proceso de la reivindicación 16 además comprender la adición de al menos una porción del mencionado flujo de gas de recuperación en el mencionado flujo de gas seco quemado para el mencionado catalizador coqueado.

19. el proceso de la reivindicación 16 además de incluir la expansión del mencionado flujo de gas seco a una presión más baja para recuperar poder.

20. el proceso de la reivindicación 16 en donde el mencionado poder es recuperado en un extensor acoplado a un generador eléctrico.



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Bogotá D.C.,

Doctor(a)

CADENA SARMIENTO JUAN PABLO

Apoderado(a) y/o Representante de

UOP LLC

REFERENCIA	Radicación No. 08 79808
	Trámite 2
	Evento 1
	Actuación 416
	Oficio No. 9225
	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 09 del mes de noviembre de 2009.

Cúmplase

Dado en Bogotá DC,

10 NOV. 2009

ALIX CARMENZA CESPEDES DE VERGEL
Directora de Nuevas Creaciones (c)

adpa10



2020

Bogotá D.C.,

Doctor(a)

CADENA SARMIENTO JUAN PABLO

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10 NOV. 2009

ALIX CARMENZA CESPEDES DE VERGEL
Directora de Nuevas Creaciones (c)

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