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Clarke, Modet & C^o

COLOMBIA

SEÑORES
DIVISION DE NUEVAS CREACIONES
SUPERINTENDENCIA DE INDUSTRIA Y COM
E. S.

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



No. 06-056173-00004-0000

Fecha: 2007-08-22 15:34:28 Dep. 2020 NUECREACION
Ira 2 PATENTES Eve: 1 REGDEPOSITO
Act 538 PETICION Folios: 2

REF

EXPEDIENTE No: **06056173**

SOLICITANTE : CEMEX TRADEMARKS WORLDWIDE LTD

TITULO: METODO Y APARATO PARA RECUPERAR ENERGIA DE

MATERIALES DE DESECHO MEDIANTE SU COMBUSTION USANDO UNA

PORCION DE AIRE TERCIARIO

FECHA SOLICITUD : JUNIO 9, 2006

ASUNTO: SOLICITUD ESTUDIO DE FONDO

DILIA RODRÍGUEZ D'ALEMAN, en mi condición de apoderada de la Sociedad solicitante, por el presente escrito atentamente solicito a Usted que habiéndose surtido la publicación de la presente solicitud, en la Gaceta de la Propiedad Industrial No.578 de fecha Julio 31 de 2007 y se proceda con el estudio de Fondo.

Para tal fin me permito anexar la tasa correspondiente.

Agradezco continuar con el presente trámite.

Señor Jefe,


DILIA RODRÍGUEZ D'ALEMAN
C.C. 41.654.882 Bogotá

P-784

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SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



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SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

NIT : 800176089-2

RECIBO OFICIAL DE CASH : 07 - 27,200
FECHA : ABRIL 3 DE 2007

***** CONSIGNACION *****

DEPOSITANTE	TIPO PAGO	BANCO	CUENTA	No. PAGO	FECHA PGO	Vr. PAGO
CLARKE MODET	CONSIGNACION	BANCO POPULAR	050-00110-6	63066570	03/04/2007	23,540,000.00

***** CONCEPTO *****

CANT.	CONCEPTO	TOTAL CONCEPTO
1	50005-01-01 SOLICITUDES	404,000.00
	B5 EXAMEN DE PATENTABILIDAD DE INVEN	404,000.00
	TOTAL :	\$ 404,000.00

SON: CUATROCIENTOS CUATRO MIL PESOS

RESPONSABLE : 

RECIBO DE CASH APLICADO AL EXPEDIENTE No. _____

DIVISIÓN DE NUEVAS CREACIONES

RADICACIÓN EXPEDIENTE No. 06-56173

EL EXTRACTO DE LA PRESENTE SOLICITUD DE **PATENTE DE INVENCION**

FUE PUBLICADO EN LA GACETA DE PROPIEDAD INDUSTRIAL No 578 DE

FECHA **31 DE JULIO DE 2007** EL TÉRMINO HÁBIL SEÑALADO POR LA LEY

EXPIRA EL **26 DE OCTUBRE DE 2007**

NOTA: Dentro del plazo de los seis (6) meses siguientes a partir de la fecha de publicación en la gaceta de Propiedad Industrial, deberá solicitar y cancelar el examen de patentabilidad so pena de que la solicitud caiga en abandono, de acuerdo con lo establecido en el Artículo 44 de la Decisión 486/2000.

SE PRESENTARON OPOSICIONES POR PARTE DE TERCEROS.

SI _____

NO X

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SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
DIVISIÓN DE NUEVAS CREACIONES

2020
Bogotá, D.C.,

Abogada
Dilia María Rodríguez D'A.
(Apoderada)

ASUNTO	Radicación	06 - 56 173
	Trámite	002
	Evento	001
	Actuación	430
	Oficio	11490
	Folios	041

Patente de Invención	☒	Patente de Modelo de Utilidad	☐
Vía Nacional	☐		
Vía PCT (fase nacional)	☐	Cap. I	☐
		Cap. II	☐
Solicitud Internacional n.º	_____		
Fecha de Presentación Intrnl.	_____		

Como resultado del examen de fondo, realizado con fundamento en el artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le comunica:

1. Documentos estudiados

<u>Descripción:</u>	Folios 5 a 16 como se radicó inicialmente
<u>Reivindicaciones:</u>	Folios 17 a 27 como se radicó inicialmente
<u>Dibujos:</u>	Folios 29 a 31 como se radicó inicialmente
<u>Prioridad:</u>	Folios 48 a 106; 2005-06-10, US, 11/149229* * el número mencionado inicialmente fue el 7001177, pero fue corregido oportunamente, ver aclaración abajo.

2. Análisis de la Prioridad

El 2006-10-10 el solicitante presentó una corrección, según la cual el número de solicitud sobre la cual se reclama la prioridad no era el 7001177 -como aparece en el folio 1- sino el 11/149 229. Como se pudo comprobar, el número 7 001 177 no corresponde a una solicitud sino a una patente concedida en los Estados Unidos

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de América, cuya primera página se anexa. Dicha patente corresponde a la solicitud US 11/149 229, fechada el 2005-06-10 -que es la fecha citada en el folio 1 como fecha de presentación de la primera solicitud- y tiene un título equivalente al de la presente solicitud. Puesto que todos los datos, con excepción del número, son iguales a los presentados originalmente, se admite la corrección.

3. Objeto de la invención

Título de la solicitud: *Método y aparato para recuperar energía de materiales de desecho mediante su combustión usando una porción de aire terciario*, folio 1.

El objeto de la presente solicitud de patente de invención consiste en suministrar un aparato y un método que permite aprovechar la energía de los desechos en cooperación con un horno industrial, utilizando una porción del aire total que entra al horno, mediante el uso de cámaras dotadas de esclusas o válvulas que impiden la circulación del aire mientras se realiza la combustión.

El problema planteado en esta solicitud es satisfacer la necesidad de aprovechar la energía de los desechos sólidos en hornos industriales rotatorios (para fabricación de cemento) dotados de un calcinador anexo.

Para solucionar este problema técnico la solicitud en estudio proporciona un aparato (y un método) que tiene una o más cámaras de combustión dentro del ducto de alimentación de aire terciario al calcinador con medios de retención removibles enfriados por agua, que permiten realizar la combustión completa sin circulación de aire; y, unos medios de alimentación de desechos que realizan la alimentación antes de efectuar la combustión; en donde la cámara de combustión entrega el gas caliente, producido por la combustión, al calcinador, donde se aprovecha como fuente de energía adicional.

Clasificación Internacional de Patentes (IPC): F27B 7/02, 7/34, F23B 10/00

4. De la solicitud de Patente

Antes de entrar en detalles específicos, se le dan al solicitante ciertas indicaciones generales, algunas de las cuales son aplicables a este caso y todas deberán ser tenidas en cuenta en las eventuales modificaciones:

El título o nombre de la invención debe concordar con lo que se reclama en el capítulo reivindicatorio. Esto es, si en las reivindicaciones se reclama un producto, tal producto debe ser mencionado en el título, y si en las reivindicaciones se reclama un procedimiento o un sistema o un método, también debe ser mencionado allí. Normalmente, el título debe contener máximo diez palabras aunque eventualmente pueden ser más.

En Colombia, la máxima autoridad en cuestiones del lenguaje es la Academia Colombiana de la Lengua. En caso de duda sobre el significado de las palabras, se debe acoger la definición que trae el Diccionario de la Real Academia Española (DRAE).

En Colombia, es de uso obligatorio el Sistema Internacional de unidades. Esto implica, también, que la coma decimal es de uso obligatorio. Cuando aparezca algún valor con unidades diferentes a las exigidas, deberá incluirse su

correspondiente conversión al Sistema Internacional.

La parte técnica de la solicitud se divide en tres secciones, debidamente separadas, preferiblemente en este orden: Capítulo descriptivo, capítulo reivindicatorio y dibujos o figuras. Ninguna de estas secciones podrá llevar membretes (encabezamientos o pies de página) ajenos al contenido técnico de la solicitud.

Por lo menos el capítulo descriptivo debe estar debidamente paginado y estar escrito a doble espacio, con el fin de facilitar la referencia a los apartados del texto. La terminología empleada en la descripción y en las reivindicaciones debe ser igual para designar las diferentes partes, piezas, elementos, detalles o aspectos de lo que se mencione en ellas; los cuales, a su vez, deben estar designados con números o signos de referencia.

Dentro del texto de la descripción y las reivindicaciones se aconseja encerrar entre paréntesis el número o signo de referencia cada vez que se mencione el detalle correspondiente, con el fin de distinguirlo de otros tipos de números o signos que eventualmente aparezcan allí.

Las reivindicaciones deben estar numeradas individual y consecutivamente (1, 2, ... 5, 6, etc.) El capítulo reivindicatorio no debe tener subtítulos.

Normalmente se pueden encontrar dos categorías de reivindicaciones: una, la de producto y la otra, de procedimiento.

En las reivindicaciones se deben definir los alcances de la protección que desea el solicitante. En consecuencia, las reivindicaciones forman un cuerpo aparte de la descripción y como tal debe ser redactado: la primera vez que se mencione un nombre dentro de las reivindicaciones debería estar acompañado de un artículo indeterminado; y, la inclusión -entre paréntesis- de un número de referencia no sustituye la definición del elemento o aspecto al que se refiere, simplemente sirve de información complementaria. Se debe entender que la descripción sirve para interpretar las reivindicaciones y, en consecuencia, si en una reivindicación se reclama un aparato, por ejemplo, no se deberían mencionar aspectos del funcionamiento del aparato dentro de la reivindicación, limitándose a definir únicamente los elementos que constituyen el aparato.

Cada una de las figuras debe estar debidamente identificada, preferiblemente con un número consecutivo: Figura 1, figura 2, ...

Las figuras deben ser realizadas siguiendo las reglas del dibujo técnico.

Se prefiere que dentro de las figuras no se incluya ningún texto. Cada uno de los detalles ilustrados en las figuras deberá estar señalado con un número o signo de referencia, el cual será el mismo en todas las figuras en donde se encuentre el detalle en cuestión.

La patente de modelo de utilidad no puede incluir los procedimientos, por definición. Si alguna de las reivindicaciones de una solicitud de patente de modelo de utilidad reclama un procedimiento, debe ser suprimida.

Descripción (artículo 28 D. 486)

Durante el análisis del texto de la descripción y de las ilustraciones anexadas, se observaron los siguientes defectos:

- 1) El texto de la descripción no está debidamente paginado.
- 2) No se utilizó tinta negra indeleble para la elaboración de la descripción, las reivindicaciones ni los dibujos; y, esto tiene como consecuencia que tales apartados no sean nítidos y se dificulte su copia para las bases de datos.
- 3) En el folio 5 aparece por primera vez la expresión *pet coque*, cuyo significado se desconoce. Incidentalmente, se debería dar una definición del término *clinker*

(porque no se encuentra en el Diccionario de la Real Academia Española (DRAE) [se sugiere: *Sustancia resultante de la calcinación en un horno de mezclas de calizas arcillosas que se han preparado artificialmente con la inclusión eventual de otras materias*, aunque puede ser otra expresión que se ajuste mejor a lo que el solicitante quiere decir].)

4) En el folio 6 aparece por primera vez una expresión numérica (6,470,812) en la cual se hace mal empleo de la coma. La coma, en relación con los números, debe ser la coma decimal, de uso obligatorio en Colombia.

5) En el folio 7 aparece por primera vez un intervalo (1 a 5 metros) en el cual, en primer lugar, se omite el símbolo de la primera cifra; y, en segundo lugar, no se utiliza el símbolo en conjunción con los números: *1 m a 5 m*, o si se prefiere, *un metro a cinco metros*. En el folio 8 aparece el mismo defecto, esta vez en la expresión ~~entre 650 a 950 °C~~ que debería ser *entre 650 °C y 950 °C*; y, en el folio 9: ~~de un 10 a 30%~~ que debería ser *entre cerca de 10% y cerca de 30%* o, preferiblemente: *del 10% al 30%* para evitar ambigüedades.

6) En el mismo folio 7 aparece la expresión *el método y mecanismo* (sic) *anteriormente descrito describe la expulsión* que carece de sentido.

7) La nitidez de los dibujos en los folios 29 a 31 deja mucho que desear.

8) En el folio 11 aparece la expresión *tubos enfriados deslizables* (8a) pero, en ninguna de las figuras anexadas se encuentra el signo de referencia (8a) además, en la figura 3, folio 31, aparece el signo (8 // a) en donde la doble barra significa un cambio de línea. Incidentalmente, se le sugiere al solicitante que encierre entre paréntesis todos los números y signos de referencia, con el objeto de evitar confundirlos con otros tipos de números que eventualmente pueden aparecer en una solicitud de patente.

9) En el mismo folio 11 aparece la expresión *en donde la porción de descarga* (10) *comprende una porción de descarga* en la cual se está emplea lo que se define como parte de la definición.

10) En el folio 14 aparece la expresión *entre 1,200 a 1,400 °C* en la cual, en primer lugar, se omiten las unidades de la primera cifra; en segundo lugar, no se sabe a ciencia cierta si la cantidad es 1200 o 1,200 (con la coma decimal); y, en tercer lugar, las unidades de temperatura son los °C no los ° C, porque el símbolo C en este contexto corresponde a la unidad *coulomb* y el símbolo ° corresponde a los grados del ángulo plano. Entonces, la expresión objetada debería ser corregida así: *entre 1200 °C y 1400 °C*. En el mismo folio aparecen otros intervalos que deben ser corregidos.

11) En el folio 15 aparece la expresión *y/o*. Al respecto, el *Diccionario panhispánico de dudas* de la Real Academia Española y de la Asociación de Academias de la Lengua Española, primera edición, octubre de 2005, página 681, dice:

y/o: Hoy es frecuente el empleo conjunto de las conjunciones copulativa y disyuntiva separadas por una barra oblicua, calco del inglés «and/or», con la intención de hacer explícita la posibilidad de elegir entre la suma o la alternativa de dos opciones: «Se necesitan traductores de inglés y/o francés». Se olvida que la conjunción 'o' puede expresar en español ambos valores conjuntamente.

El examinador ha subrayado la última frase porque es particularmente aplicable a este caso.

12) En el folio 16 aparecen dos intervalos que deben ser corregidos.

- La descripción no cumple con los requisitos de claridad y divulgación completa, lo que dificulta o impide su comprensión y ejecución de acuerdo al Art. 28 de la Decisión 486

Reivindicaciones (artículo 30 D 486)

Durante el análisis del texto de las reivindicaciones se observaron los siguientes defectos:

En el capítulo reivindicatorio se emplean mal muchos (con relación al total) gerundios, lo que dificulta la legibilidad del mismo. En general, se recomienda sustituir, donde su sentido lo permita, cada gerundio por una expresión del tipo *que + [(se) + verbo]* así, por ejemplo: *prolongándose* por *que se prolonga* -en la reivindicación 4, folio 18-; cuando no se pueda reemplazar directamente por el verbo: por ejemplo, *en donde cada cámara de combustión comprendiendo* debe ser reemplazada por *en donde cada cámara de combustión comprende*: -en la reivindicación 5, folio 18-. Con relación a lo anterior, se le recuerda al solicitante que las mejores traducciones no son literales -palabra por palabra- sino que deben conservar el sentido general pero se adaptan al idioma al que se traducen, con especial referencia a las normas gramaticales y de sintaxis.

En la reivindicación 23, folio 26, aparece un intervalo (650 a 900° C) que debe ser corregido de acuerdo con lo expuesto en el apartado 10) de la descripción, arriba. Un defecto similar ocurre en la reivindicación 26, folio 27.

En la reivindicación 24, folio 27, aparece otro intervalo defectuoso.

En la reivindicación 27, folio 27, aparece la expresión *un exceso de más de un 300%* en la cual se debe suprimir el artículo indeterminado *un* antes de *300%* porque *300* es una cifra determinada y porque si se mantiene, convierte la expresión en dubitativa, ambigua. Entonces, la expresión objetada se debe reemplazar por *un exceso de más del 300%*.

- Debe entenderse que las reivindicaciones dependientes de las reivindicaciones objetadas son, asimismo, objetadas, por razones análogas.
- Las reivindicaciones no cumplen con los requisitos de definición, claridad y concisión de acuerdo al Art. 30 de la Decisión 486.

Se deben presentar, entonces, nuevos capítulos descriptivo y reivindicatorio, ambos completos, junto con un nuevo juego de dibujos, donde se hayan corregido todas las objeciones que se han hecho arriba. Esto con el fin de evitar -cuando solo se presentan algunas páginas sueltas corregidas- que el lector tenga que desplazarse desde un sitio a otro de la solicitud y luego regresar a donde estaba antes sin perder la ilación de la lectura, porque esto produce confusión y afecta negativamente la claridad de dichos capítulos.

Se le advierte al interesado que las modificaciones sugeridas arriba podrían resultar inconducentes si se mantienen las objeciones a la patentabilidad que se insinúan adelante.

5. Determinación del Estado de la Técnica

- La fecha que se ha tenido en cuenta para determinar el Estado de la Técnica es la

Fecha de presentación de la solicitud prioritaria 2005-06-10.

- Se realizó la búsqueda en el estado de la técnica de documentos relacionados con la solicitud teniendo en cuenta la fecha indicada; y durante la búsqueda de anterioridades se encontraron los siguientes documentos, que forman parte de la familia de patentes de la presente solicitud: Patente US 7 001 177 del 2006-02-21; publicación EP 1 734 322 A1 del 2006-12-20; y, patente EP 1 734 322 B1 del 2008-08-13. Se anexa la copia de las primeras páginas de estos documentos

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 junto con la copia del Informe de Búsqueda Europeo y las copias del capítulo reivindicatorio admitido por la Oficina Europea, en su versión en inglés, y, del capítulo reivindicatorio admitido por la USPTO. También se encontraron los siguientes documentos que forman parte del estado de la técnica más cercano al objeto de la solicitud:

n.º	Documento	Título	Fecha de publicación
D1	Patente DE 23 12 379, cuyo titular es Friedhelm Berger	«Ofen mit Füllschacht zum Brennen oder Sintern von Zement, Kalk, Magnesit Dolomit oder ähnlichen Stoffen»(Un horno con una tolva de alimentación para quemar o sinterizar el cemento, la cal, la magnesita la dolomita o los materiales similares)	1974-09-19
D2	Publicación GB 2 034 014 A, cuyos inventores son Takashi Ohno, Toshio Tsuji, Atsushi Nanbu, Shizuo Tsuchida, Shunro Ueda, Matsamichi Kabaya, Akikazu Tsuda, Motokazu Kikuchi y Tadatoshi Shimazaki quienes le cedieron sus derechos a la Bridgestone Tire KK	«Method of utilizing waste tires»(Un método para utilizar llantas de desecho)	1980-05-29
D3	Publicación EP 0 764 614 A2, cuyo inventor es Ludger Brentrup, quien le cedió sus derechos a la Krupp Polysius AG	«Anlage und Verfahren zur Herstellung von Zementklinker»(Un equipo y un proceso de producción de clinker de cemento)	1997-03-26
D4	Publicación US 2002/0035804 A1, cuyos inventores son Armando García Segovia, Luis Ramón Farías Martínez, José Javier Garza Ondarza, Jorge Berrun Castanon, Héctor Agustín Cantun Martínez y Ángel Cuevas Martínez	«Apparatus and method for fractionating alternative solid fuels»(Un aparato y un método para fraccionar combustibles alternativos sólidos)	2002-03-28
D5	Publicación US 2003/0089282 A1, cuyos inventores son Claus-Jurgen Steffer, Wolfgang Muller y Stefan Kolien	«Process and device for feeding dispersible solid fuels into the calcinator of a cement clinker production line»(Un procedimiento y un dispositivo para alimentar combustibles sólidos dispersables dentro del calcinador de una línea de producción de cemento clinker)	2003-05-15
D6	Publicación US 2003/0150161 A1, cuyos inventores son Armando García Segovia, Luis Ramón Farías Martínez, José Javier Garza Ondarza, Jorge Berrun Castanon, Héctor Agustín Cantun Martínez y Ángel Cuevas Martínez	«Apparatus and method for fractionating alternative solid fuels»(Un aparato y un método para fraccionar combustibles alternativos sólidos)	2003-08-14

Se anexa la copia de las páginas pertinentes de estos documentos

NOTAS: No se realizaron las evaluaciones de los demás requisitos de patentabilidad, porque se hicieron algunas objeciones respecto a la definición, la

claridad, la concisión y el sustento por la descripción de las reivindicaciones; esto es, no se pudo practicar un análisis comparativo completo, por ausencia de materia.

A pesar de lo anterior, con base en las enseñanzas de los documentos encontrados hasta ahora (con especial referencia a los documentos D4, D5, D6 con relación a las reivindicaciones 1 a 21) y en el Informe de Búsqueda Europeo, citado arriba, se prevén objeciones respecto al nivel inventivo del objeto de la solicitud.

Teniendo en cuenta lo anterior, se le sugiere al solicitante que, si considera que el objeto de la solicitud reúne los requisitos para ello -en especial los determinados por el artículo 81 de la Decisión 486-, cambie la modalidad de su solicitud a patente de modelo de utilidad. De aceptar esta sugerencia, deberá expresarlo así y deberá realizar los ajustes que considere necesarios en el capítulo reivindicatorio para que no se encuentre ninguna objeción previsible -en el momento en que la Oficina examine su solicitud para verificar el cumplimiento de los requisitos, bajo esta nueva modalidad-.

Esta sugerencia se hace en concordancia con lo dispuesto en el artículo 35 de la mencionada Decisión.

6. Análisis preliminar de las anterioridades.

A continuación, los números de referencia son los del documento en referencia.

En el documento D1 se revela, entre otras cosas, un horno con una tolva de alimentación para quemar o sinterizar el cemento, la cal, la magnesita la dolomita o los materiales similares.

En el documento D2, se revela entre otras cosas, un método para utilizar llantas gastadas en un aparato para producir cemento por medio de un horno rotatorio, que comprende cargar las llantas (preferiblemente enteras), o pedazos de llanta, en una ubicación en donde la temperatura del gas esté entre los 600 °C y los 1400 °C en cantidades no mayores del 60% del total del combustible empleado para producir la energía calorífica. Cuando hay acero dentro de las llantas, se oxida en la zona de calcinación y en la zona de quemado y actúa efectivamente como materia prima del cemento.

En el documento D3 se revela, entre otras cosas, una planta de producción de cemento clinker que tiene una etapa de pretratamiento de materias primas (1), un horno de calcinación de clinker (2), una línea desprovista de gas (3) que conecta al horno con la etapa de pretratamiento, un enfriador de clinker (4) y, conectada con la línea desprovista de gas (3), un reactor que produce un gas combustible a partir de materiales de desecho (en especial, llantas viejas) y que tiene la forma de un reactor de gasificación (5) conectado con el enfriador por medio de una línea de aire terciario (6) de tal manera que por lo menos parte del aire de desecho que sale del enfriador (4) puede ser usado como el medio gasificador dentro del reactor. Se ha provisto un dispositivo (8) para controlar la cantidad de aire terciario suministrado a la línea de aire del reactor, de acuerdo con la altura del material de desecho o la temperatura dentro del reactor.

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En el documento D4 se revela, entre otras cosas, un aparato y un método para fraccionar combustibles sólidos alternativos, como llantas enteras, para producir materiales volátiles y coque. El aparato comprende una zona de alimentación; una zona de gasificación, donde se procesan los sólidos para obtener una fracción gaseosa, coque y metal; unas parrillas enfriadas que controlan la permeabilidad y el tiempo de permanencia de los combustibles sólidos en la zona de gasificación; y, una zona de descarga.

En el documento D5 se revela, entre otras cosas, una cámara de alimentación en la cual el combustible no tiene contacto directo con las llamas y donde la cámara se encuentra fuera del calcinador pero está conectado con éste por medio de una abertura en una pared.

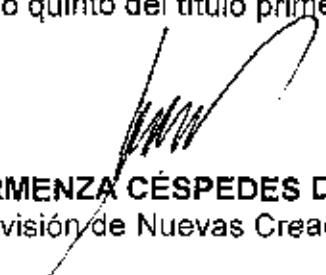
En el documento D6 se revela, entre otras cosas, un aparato y un método para fraccionar combustibles sólidos alternativos, como llantas enteras, para producir materiales volátiles y coque. El aparato comprende una zona de alimentación; una zona de gasificación, donde se procesan los sólidos para obtener una fracción gaseosa, coque y metal; unas parrillas enfriadas que controlan la permeabilidad y el tiempo de permanencia de los combustibles sólidos en la zona de gasificación; y, una zona de descarga; en el cual el coque combustible sólido y las fracciones sólidas y gaseosas siguen una ruta, dentro de la zona de alimentación, la zona de gasificación y la zona de descarga, que es concurrente con la ruta seguida por los gases dentro del aparato.

7. Conclusión:

Los requisitos de patentabilidad de la presente solicitud se encuentran afectados negativamente por la falta de claridad de la descripción y las reivindicaciones y por la falta de definición y de concisión de estas últimas.

En cumplimiento del artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le indica que debe dar respuesta dentro del término de sesenta días contados a partir de la fecha de notificación de la presente comunicación. En caso de no dar respuesta al presente requerimiento, o si a pesar de la respuesta subsistieran los impedimentos para la concesión, se denegará la patente.

Notifíquese el presente oficio conforme a lo dispuesto en el número 5.2, letra e), del capítulo quinto del título primero de la Circular Única n.º 10 de 2001.


ALIX CARMENZA CÉSPEDES DE VERGEL
Jefe de División de Nuevas Creaciones

El anterior requerimiento fue notificado por fijación en lista, de fecha
15 OCT. 2009

CONCEPTO TÉCNICO n.º 3492

EXAMINADOR TÉCNICO
Código n.º 202009



US007001177B1

(12) **United States Patent**
Alemany et al.

(10) Patent No.: **US 7,001,177 B1**
(45) Date of Patent: **Feb. 21, 2006**

(54) **METHOD AND APPARATUS FOR
RECOVERING ENERGY FROM WASTE
MATERIALS BY COMBUSTION USING A
PORTION OF TERTIARY AIR**

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(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(21) Appl. No.: 11/149,229

(22) Filed: Jun. 10, 2005

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F27B 15/08 (2006.01)

(52) U.S. Cl. 432/61; 432/58; 432/106

(58) Field of Classification Search 432/61,
432/58, 14, 106, 69; 110/245, 346; 122/7 R;
106/700

See application file for complete search history.

(56)

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Primary Examiner—Gregory A. Wilson

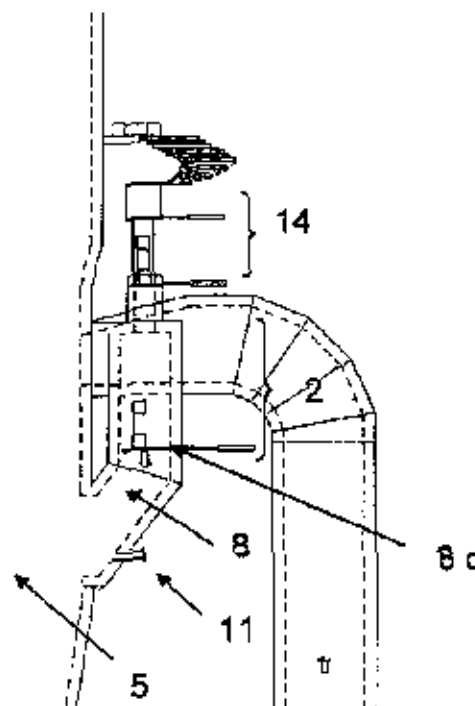
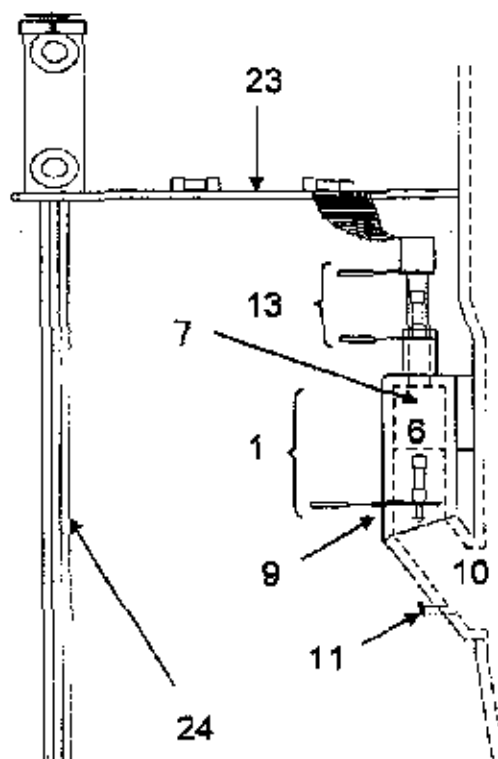
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(57)

ABSTRACT

A method and apparatus for using in rotary kilns having a calciner and a tertiary air duct, which uses the hot air from the tertiary air duct for burning waste material in a combustion chamber formed therein, achieving a complete combustion of the waste material and discharging the hot combustion gas to the tertiary air duct for its use as supplemental energy source by the rotary kiln.

30 Claims, 3 Drawing Sheets



sealing means 13, 14 of each combustion chamber 1, 2, and are received inside the open receiving section 16 and retained therein by means of the first sliding quadrangular gate 19 which is in a closed position.

Once the middle charge chamber 17 is able to receive a batch of tires, the first sliding quadrangular gate 19 is opened by its respective hydraulic or pneumatic piston 20 and the batch of tires falls to the middle chamber by gravity and is retained therein by the water cooled sliding quadrangular gate 21, and the first sliding quadrangular gate 19 is immediately closed.

Once the combustion chamber 1, 2, is able to process the batch of tires, the water cooled sliding quadrangular gate 21 is opened and the batch of tires falls through the discharge section 18 and enters to the combustion portion 6 of the combustion chamber 1, 2 by gravity through its charge opening 7 and is retained therein by means of the water cooled sliding retaining valve 9, and the water cooled sliding quadrangular gate 21 is immediately closed.

While the water cooled sliding quadrangular gate 21 is at an open position the first sliding quadrangular gate 19 remains closed for avoiding any heat loss or the entrance of cool air from the exterior into the combustion chambers 1, 2.

Once the batch of tires is inside the combustion portion 6 of the combustion chamber 1, 2, it is contacted with hot tertiary air at a temperature of from 650° C. to 900° C. and the ignition of tires is achieved in a time of 2 to 5 seconds after its contact with the hot tertiary air. During the combustion process, a temperature of 1,200 to 1,400° C. is achieved thus destroying all the organic compounds contained in the tires and avoiding the emanation of polluting compounds and achieving a complete combustion of the waste, thanks to an excess of air of more than a 300%.

The grill type water cooled sliding retaining valve 9 allows the flow of air and combustion gases through itself and controls the residence time of the tires inside the combustion chamber, which is of from 80 to 120 seconds, thus guaranteeing a complete decomposition of the combustible portion of the tires and a complete combustion of the tires. The hot combustion gases and remaining tertiary air are discharged through the gas and wire discharge portion 10 for its use as supplemental energy source by the rotary kiln and the grill type water cooled sliding retaining valve 9 is opened for discharging the remaining tire wire by gravity to the calciner through the gas and wire discharge portion 10 for its incorporation to the cement clinker as iron oxide.

The typical main pet coque save achieved by each combustion chamber of the apparatus of the present invention is approximately of from 10 to 30% per combustion chamber.

Although it was described that the apparatus of the present invention comprises only two combustion chambers, it may be possible to install more than two combustion chambers and correspondent delivering means for raising the amount of fuel substitution and overall processing capacity of waste material.

The grill type water cooled sliding retaining valve 9 may have any number of rods depending of the size of the waste material to be processed and/or the size of the tertiary air duct.

Although it was described that the first valve means and cooled valve means of the feeding and sealing means 13 comprise a sliding quadrangular gate 19 and a water cooled sliding quadrangular valve 21, they may comprise a gate having any shape, swing gates, or any other suitable valve means.

The waste material that can be processed by the apparatus of the present invention is not limited only to tires. Bulk material that may be contained in tanks, barrels, can also be processed by the apparatus of the present invention. Also mixtures of tires and bulk material can be processed by the apparatus of the present invention.

Since the waste material is retained inside the combustion chamber 1, 2, until a complete decomposition of the combustible portion of the tires and a complete combustion of the tires is achieved, it is avoided that unburned material may reach the calciner or other parts of the rotary kiln and the possibility that the waste material burns in any other place of the kiln lowering the oxygen content and building up of encrustations.

Similarly, the method in accordance with the present invention comprises:

burning waste material inside a combustion chamber formed into the calciner tertiary air feeding duct using a fraction of tertiary air at a temperature of from between about 650° C. to 900° C. and retaining the material therein for a predetermined amount of time for allowing a complete decomposition of the combustible portion of the waste and a complete combustion of the waste thanks to an excess of oxygen of more than a 300%, achieving a combustion temperature of from 1,200° C. to 1,400° C.;

discharging the hot combustion gas to the tertiary air duct for its use as supplemental energy source by the rotary kiln; and

discharging remaining material to the tertiary air duct for its incorporation to the cement clinker once a complete combustion of the waste material is achieved.

Finally it must be understood that the method and apparatus for recovering energy from waste materials by combustion using a portion of tertiary air, of the present invention, is not limited exclusively to the embodiments above described and illustrated and that the persons having ordinary skill in the art can, with the teaching provided by the invention, to make modifications to the method and apparatus for recovering energy from waste materials by combustion using a portion of tertiary air of the present invention, which will clearly be within of the true inventive concept and of the scope of the invention which is claimed in the following claims.

What is claimed is:

1. An apparatus for recovering energy from waste materials by combustion using hot tertiary air for using in rotary kilns having a calciner and a tertiary air duct comprising:

one or more combustion chambers formed into the calciner tertiary air feeding duct, each having water cooled releasable retaining means therein for retaining the waste material inside the combustion chamber until a complete combustion is achieved by using a fraction of tertiary air, said water cooled releasable retaining means allowing the flow of combustion gas and air through itself;

one or more feeding means each connected to a combustion chamber for feeding waste material to the combustion chamber further avoiding the loss of heat or the entrance of cool air from the exterior into the combustion chambers through the feeding means; and

wherein the combustion chamber delivers hot combustion gas to the calciner for its use as supplemental energy source by the rotary kiln and remaining material in order to be incorporated to the cement clinker.

2. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1,

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wherein the combustion chamber releasable retaining means comprising a grill type water cooled sliding retaining valve.

3. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein the feeding means further avoiding the loss of heat or the entrance of cool air from the exterior into the combustion chambers, comprising a plurality of water cooled slideable valves.

4. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein each combustion chamber comprising a duct, and each combustion chamber having:

a combustion portion vertically oriented, including a charge opening at a superior end and an inferior end; and

a gas and wire discharge portion prolonging from the inferior end of the combustion portion, directly connected to the calciner, wherein the discharge portion is inclined with respect to the combustion portion towards the feeding duct in order to reach and connect to said feeding duct;

water cooled valve means located at the inferior end of the combustion portion, allowing the flow of combustion gas and air through itself; and

means for driving the water cooled valve means.

5. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein each combustion chamber comprising a duct having a quadrangular shaped cross section, and each combustion chamber having:

a combustion portion vertically oriented, including a charge opening at a superior end and an inferior end; and

a gas and wire discharge portion prolonging from the inferior end of the combustion portion, directly connected to the calciner, wherein the discharge portion is inclined with respect to the combustion portion towards the feeding duct in order to reach and connect to said feeding duct;

water cooled valve means located at the inferior end of the combustion portion, allowing the flow of combustion gas and air through itself; and

means for driving the water cooled valve means.

6. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein each feeding mean comprising:

a vertical conduct, having: a feeding aperture at a superior end, a discharge opening directly and hermetically connected to the combustion chamber, an open receiving section, a middle charge chamber and a discharge section;

first valve means, located at the top of the open receiving section;

means for driving the first valve means;

cooled valve means, located at the bottom of the middle charge chamber; and

means for driving the cooled valve means.

7. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein each feeding mean comprising:

a vertical conduct having a quadrangular shaped cross section, having: a feeding aperture at a superior end, a discharge opening directly and hermetically connected to the combustion chamber, an open receiving section, a middle charge chamber and a discharge section;

first valve means, located at the top of the open receiving section;

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means for driving the first valve means;

cooled valve means, located at the bottom of the middle charge chamber; and

means for driving the cooled valve means.

8. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein each combustion chamber comprising a duct, and each combustion chamber having:

a combustion portion vertically oriented, including a charge opening at a superior end and an inferior end; and

a gas and wire discharge portion prolonging from the inferior end of the combustion portion, directly connected to the calciner, wherein the discharge portion is inclined with respect to the combustion portion towards the feeding duct in order to reach and connect to said feeding duct;

valve means allowing the flow of combustion gas and air through itself; and

means for driving the valve means,

wherein the valve means comprising a cooled grill type sliding retaining valve, comprised by a plurality of sliding rods connected by a horizontal connection member, each rod passing through a perforation located at the inferior end of the combustion portion.

9. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein each combustion chamber comprising a duct having a quadrangular shaped cross section, and each combustion chamber having:

a combustion portion vertically oriented, including a charge opening at a superior end and an inferior end; and

a gas and wire discharge portion prolonging from the inferior end of the combustion portion, directly connected to the calciner, wherein the discharge portion is inclined with respect to the combustion portion towards the feeding duct in order to reach and connect to said feeding duct;

valve means allowing the flow of combustion gas and air through itself; and

means for driving the valve means;

wherein the valve means comprising a cooled grill type sliding retaining valve, comprised by four water cooled sliding rods connected by a horizontal connection member, each rod passing through a perforation located at the inferior end of the combustion portion.

10. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein each combustion chamber comprising a duct, and each combustion chamber having:

a combustion portion vertically oriented, including a charge opening at a superior end and an inferior end; and

a gas and wire discharge portion prolonging from the inferior end of the combustion portion, directly connected to the calciner, wherein the discharge portion is inclined with respect to the combustion portion towards the feeding duct in order to reach and connect to said feeding duct;

valve means allowing the flow of combustion gas and air through itself; and

means for driving the valve means;

wherein the valve means comprising a cooled grill type sliding retaining valve, comprised by a plurality of water cooled sliding rods connected by a horizontal

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connection member, each rod passing through a perforation located at the inferior end of the combustion portion; and
 wherein the means for driving the valve means comprising a pneumatic piston connected to an end of the horizontal connection member for pushing or retry the cooled retaining valve in or out of the combustion chamber.

11. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein each combustion chamber comprising a duct having a quadrangular shaped cross section, and each combustion chamber having:

- a combustion portion vertically oriented, including a charge opening at a superior end and an inferior end; and
- a gas and wire discharge portion prolonging from the inferior end of the combustion portion, directly connected to the calciner, wherein the discharge portion is inclined with respect to the combustion portion towards the feeding duct in order to reach and connect to said feeding duct;

valve means allowing the flow of combustion gas and air through itself; and
 means for driving the valve means;

wherein the valve means comprising a cooled grill type sliding retaining valve, comprised by four water cooled sliding rods connected by a horizontal connection member, each rod passing through a perforation located at the inferior end of the combustion portion; and

wherein the means for driving the valve means comprising a pneumatic piston connected to an end of the horizontal connection member for pushing or retry the cooled retaining valve in or out of the combustion chamber.

12. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein each feeding mean comprising:

- a vertical conduct, having: a feeding aperture at a superior end, a discharge opening directly and hermetically connected to the combustion chamber, an open receiving section, a middle charge chamber and a discharge section;

first valve means, located at the top of the open receiving section;

means for driving the first valve means;

cooled valve means, located at the bottom of the middle charge chamber;

means for driving the second valve means; and

wherein the cooled valve means comprising a cooled sliding gate which can horizontally slide in for a closed position, and slide out for an opened position of the vertical conduct, located at the end of the middle charge chamber and when closed, the gate completely isolates the superior sections of the vertical conduct from the discharge section and combustion chamber.

13. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein each feeding mean comprising:

- a vertical conduct, having a quadrangular shaped cross section and having: a feeding aperture at a superior end, a discharge opening directly and hermetically connected to the combustion chamber, an open receiving section, a middle charge chamber and a discharge section;

first valve means, located at the top of the open receiving section;

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means for driving the first valve means;

cooled valve means, located at the bottom of the middle charge chamber;

means for driving the second valve means;

wherein the first valve means comprising a sliding quadrangular gate which can horizontally slide in for a closed position, and slide out for an opened position of the vertical conduct, located at the top of the open receiving section and when closed, the gate completely isolates the middle charge section of the vertical conduct from the exterior; and

wherein the cooled valve means comprising a water cooled sliding quadrangular gate which can horizontally slide in for a closed position, and slide out for an opened position of the vertical conduct, located at the end of the middle charge chamber and when closed, the gate completely isolates the superior sections of the vertical conduct from the discharge section and combustion chamber.

14. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein each feeding mean comprising:

- a vertical conduct, having: a feeding aperture at a superior end, a discharge opening directly and hermetically connected to the combustion chamber, an open receiving section, a middle charge chamber and a discharge section;

first valve means, located at the top of the open receiving section;

means for driving the first valve means; and

cooled valve means, located at the end of the middle charge chamber;

means for driving the second valve means; and

wherein the means for driving the first valve means and cooled valve means each comprising a pneumatic piston that pushes or withdraw a gate inside or out the vertical conduct.

15. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein each feeding mean comprising:

- a vertical conduct, having a quadrangular shaped cross section, having: a feeding aperture at a superior end, a discharge opening directly and hermetically connected to the combustion chamber, an open receiving section, a middle charge chamber and a discharge section;

first valve means, located at the top of the open receiving section;

means for driving the first valve means; and

cooled valve means, located at the end of the middle charge chamber;

means for driving the second valve means; and

wherein the means for driving the first valve means and cooled valve means each comprising a pneumatic piston that pushes or withdraw a gate inside or out the vertical conduct.

16. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein

each combustion chamber comprising a duct having a quadrangular cross section, and each combustion chamber having:

- a combustion portion vertically oriented, including a charge opening at a superior end and three perforations horizontally aligned and located at an inferior end; and
- a gas and wire discharge portion prolonging from the inferior end of the combustion portion, directly con-

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connected to the calciner, wherein the discharge portion is inclined with respect to the combustion portion towards the feeding duct in order to reach and connect to said feeding duct and having a fossil fuel entrance located near the connection with the calciner;

a cooled grill type sliding retaining valve, comprised by four water cooled sliding rods connected by a horizontal connection member, each rod passing through a perforation located at the inferior end of the combustion portion;

means for sliding in and out the grill type sliding retaining valve comprising a hydraulic or pneumatic piston connected to an end of the horizontal connection member for pushing or retri the retaining valve in or out of the combustion chamber;

each feeding means comprising:

a vertical conduct having a quadrangular cross section, having: a feeding aperture at a superior end, a discharge opening directly and hermetically connected to the charge opening of the combustion portion of a combustion chamber, an open receiving section, a middle charge chamber and a discharge section;

first valve means, comprising a first sliding quadrangular gate which can horizontally slide in, for a closed position and out for an opened position of the vertical conduct, located at an end of the open receiving section, and when closed, the gate completely isolates the other sections of the vertical conduct from the exterior;

means for sliding in and out the first sliding quadrangular gate, comprising a pneumatic piston that pushes or withdraw the gate inside or out the vertical conduct;

second valve means comprising a water cooled sliding quadrangular gate which can horizontally slide in for a closed position and out for an opened position of the vertical conduct, located at the end of the middle charge chamber and when closed, the gate completely isolates the superior sections of the vertical conduct from the discharge section and combustion chamber; and

means for sliding in and out the cooled sliding quadrangular gate, comprising a pneumatic piston that pushes or withdraw the gate inside or out the vertical conduct.

17. An apparatus for recovering energy from waste materials by combustion using hot tertiary air as claimed in claim 1, further including delivering means, for delivering the waste material directly to the feeding means.

18. An apparatus for recovering energy from waste materials by combustion using hot tertiary air as claimed in claim 10, further including delivering means, for delivering the

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waste material directly to the open receiving section feeding aperture of the feeding means, comprising an horizontal conveyor belt located at the same level of the feeding aperture and an elevator for elevating the waste material from the ground level to the conveyor belt level and delivering the waste material to the conveyor belt.

19. An apparatus for recovering energy from waste materials as claimed in claim 1, wherein the waste material comprise whole tires.

20. An apparatus for recovering energy from waste materials as claimed in claim 1, wherein the waste material comprise waste material packs.

21. An apparatus for recovering energy from waste materials as claimed in claim 1, wherein the waste material comprise whole tires and waste material packs.

22. A method for recovering energy from waste materials by combustion using tertiary air for using in rotary kilns having a calciner and a tertiary air duct connected thereof comprising:

burning waste material inside a combustion chamber formed into the calciner tertiary air feeding duct using a fraction of tertiary air and retaining the material therein for a predetermined amount of time for allowing a complete decomposition of the combustible portion of the waste and a complete combustion of the waste;

discharging the hot combustion gas to the tertiary air duct for its use as supplemental energy source by the rotary kiln; and

discharging remaining material to the tertiary air duct for its incorporation to the cement clinker once a complete combustion of the waste material is achieved.

23. A method as claimed in claim 22, wherein the temperature of the tertiary air is from between about 650 degrees C to 900 degrees C.

24. A method as claimed in claim 22, wherein the time necessary for achieving a complete decomposition of the combustible portion of the waste and a complete combustion of the waste is: from 80 to 120 seconds.

25. A method as claimed in claim 22, wherein the remaining material is discharged to the tertiary air duct by gravity.

26. A method as claimed in claim 22, wherein it is achieved a combustion temperature of from 1,200 degrees C to 1,400 degrees C.

27. A method as claimed in claim 22, wherein the complete combustion is achieved thanks to an excess of oxygen of more than a 300%.

28. A method as claimed in claim 22, wherein the waste material comprise whole tires.

29. A method as claimed in claim 22, wherein the waste material comprise waste material packs.

30. A method as claimed in claim 22, wherein the waste material comprise whole tires and waste material packs.

* * * * *

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(11) **EP 1 734 322 A1**

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(84) Designated Contracting States: AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR Designated Extension States: AL BA HR MK YU (30) Priority: 10.06.2005 US 149229 (71) Applicant: Cemex Trademarks Worldwide Ltd. 2555 Brugg (CH)	(72) Inventors: • Torres Alemany, José San Pedro Garza Garcia, N.L. (MX) • Martinez Vera, Enrique Ramon San Pedro Garza Garcia, N.L. (MX) (74) Representative: Jenkins, Peter David et al Page White & Farrer Bedford House John Street London, WC1N 2BF (GB)
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(54) **Method and apparatus for recovering energy from waste materials by combustion in a cement clinker production line**

(57) A method and apparatus for using in rotary kilns having a calciner and a tertiary air duct, which uses the hot air from the tertiary air duct for burning waste material

In a combustion chamber formed therein, achieving a complete combustion of the waste material and discharging the hot combustion gas to the tertiary air duct for its use as supplemental energy source by the rotary kiln.

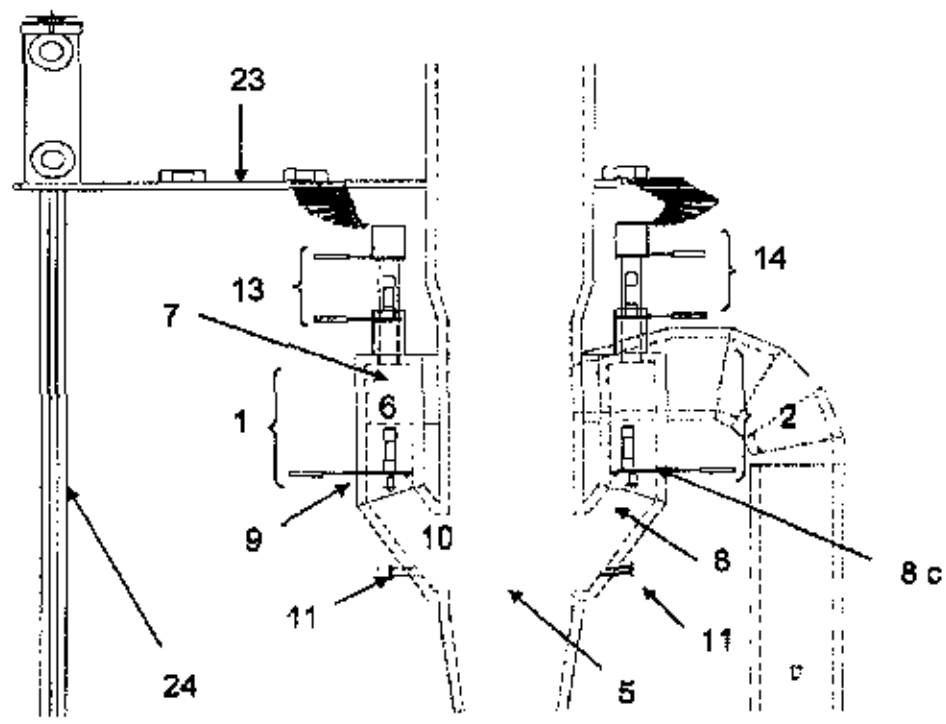


FIGURE 1

EP 1 734 322 A1



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 25 2971

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 9 November 2006	Examiner Lombos, Thierry
CATEGORY OF CITED DOCUMENTS X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background D: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons &: member of the same patent family, corresponding document			

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EP0 FORM 1503 08/05 (P0403A)

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EP 1 734 322 B1

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(22) Date of filing: **08.08.2008**

(54) **Method and apparatus for recovering energy from waste materials by combustion in a cement clinker production line**

Verfahren und Einrichtung zur Energierückgewinnung aus Schuttgütern beim Brennen in einer Zementklinkerproduktionslinie

Procédé et dispositif de récupération d'énergie par combustion de déchets dans un four à calciner d'une ligne de production pour clinker de ciment

(84) Designated Contracting States:

**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LU LV MC NL PL PT RO SE SI
SK TR**

(30) Priority: **10.08.2006 US 149229**

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- **ALESI S K: "Modifying an existing preheater system for improved productivity and efficiency (cement industry)" CONFERENCE PROCEEDINGS ARTICLE, 22 May 1990 (1990-05-22), pages 389-405, XP010007181**
- **ANONYMOUS: "Plant for manufacturing of cement clinker" RESEARCH DISCLOSURE, MASON PUBLICATIONS, HAMPSHIRE, GB, vol. 314, no. 87, June 1990 (1990-06), XP007115257 ISSN: 0374-4353**
- **ANONYMOUS: "Preheating of low-grade fuel for calciner in cement manufacturing plant" RESEARCH DISCLOSURE, MASON PUBLICATIONS, HAMPSHIRE, GB, vol. 175, no. 5, November 1978 (1978-11), XP007108108 ISSN: 0374-4353**

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

vention as defined in the following claims.

Claims

1. An apparatus for recovering energy from waste materials by combustion using hot tertiary air for using in rotary kilns having a calciner (5) and a tertiary air duct comprising: one or more combustion chambers (1, 2) formed into the calciner tertiary air feeding duct (3, 4), each having water cooled releasable retaining means (9) therein for retaining the waste material inside the combustion chamber (1, 2) until a complete combustion is achieved by using a fraction of tertiary air; said water cooled releasable retaining means (9) allowing the flow of combustion gas and air through itself; one or more feeding means (13, 14) each connected to a combustion chamber (1, 2) for feeding waste material to the combustion chamber (1, 2) further avoiding the loss of heat or the entrance of cool air from the exterior into the combustion chambers (1, 2) through the feeding means; and wherein the combustion chamber (1, 2) delivers hot combustion gas to the calciner (5) for its use as supplemental energy source by the rotary kiln and remaining material in order to be incorporated to the cement clinker.
2. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein the combustion chamber (1, 2) releasable retaining means comprising a grill type water cooled sliding retaining valve (9).
3. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein the feeding means (13, 14) further avoiding the loss of heat or the entrance of cool air from the exterior into the combustion chambers (1, 2), comprising a plurality of water cooled slidable valves (9).
4. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein each combustion chamber (1, 2) comprising a duct (3, 4), and each combustion chamber (1, 2) having: a combustion portion (6) vertically oriented, including a charge opening (7) at a superior end and an inferior end (8); and a gas and wire discharge portion (10) prolonging from the inferior end of the combustion portion (6), directly connected to the calciner (5), wherein the discharge portion (10) is inclined with respect to the combustion portion (6) towards the feeding duct (3, 4) in order to reach and connect to said feeding duct; water cooled valve means located at the inferior end of the combustion portion (6), allowing the flow of combustion gas and air through itself; and means (12) for driving the water

cooled valve means (9).

5. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1 wherein each feeding means (13, 14) comprising: a vertical conduct, having: a feeding aperture (14a) at a superior end, a discharge opening (15) directly and hermetically connected to the combustion chamber (6), an open receiving section (16), a middle charge chamber (17) and a discharge section (18); first valve means (19), located at the top of the open receiving section (16); means for driving the first valve means (21); cooled valve means, located at the bottom of the middle charge chamber (17); and means (22) for driving the cooled valve means.
6. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein each combustion chamber (1, 2) comprising a duct (3, 4), and each combustion chamber (1, 2) having: a combustion portion (6) vertically oriented, including a charge opening (7) at a superior end and an inferior end; and a gas and wire discharge portion (10) prolonging from the inferior end of the combustion portion (6), directly connected to the calciner (5), wherein the discharge portion (10) is inclined with respect to the combustion portion (6) towards the feeding duct (3, 4) in order to reach and connect to said feeding duct (3, 4); valve means allowing the flow of combustion gas and air through itself; and means for driving the valve means, wherein the valve means comprising a cooled grill type sliding retaining valve (9), comprised by a plurality of sliding rods (8a) connected by a horizontal connection member (8b), each rod (8a) passing through a perforation (8c) located at the inferior end of the combustion portion (6).
7. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein each combustion chamber (1, 2) comprising a duct, and each combustion chamber (1, 2) having: a combustion portion (6) vertically oriented, including a charge opening (7) at a superior end and an inferior end; and a gas and wire discharge portion (10) prolonging from the inferior end of the combustion portion (6), directly connected to the calciner (5), wherein the discharge portion (10) is inclined with respect to the combustion portion (6) towards the feeding duct (3, 4) in order to reach and connect to said feeding duct (3, 4); valve means allowing the flow of combustion gas and air through itself; and means for driving the valve means; wherein the valve means comprising a cooled grill type sliding retaining valve (9), comprised by a plurality of water cooled sliding rods (8a) connected by a horizontal connection member (8b), each rod (8a) passing through a perforation (8c) located at the inferior

- end of the combustion portion (6); and wherein the means for driving the valve means comprising a pneumatic piston (12) connected to an end of the horizontal connection member for pushing or retry the cooled retaining valve (9) in or out of the combustion chamber (1).
8. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein each feeding mean (13, 14) comprising: a vertical conduct, having: a feeding aperture (14a) at a superior end, a discharge opening (15) directly and hermetically connected to the combustion chamber (1, 2), an open receiving section (16), a middle charge chamber (17) and a discharge section (18); first valve means (19), located at the top of the open receiving section (16); means (20) for driving the first valve means; cooled valve means, located at the bottom of the middle charge chamber (17); means (22) for driving the second valve means; and wherein the cooled valve means comprising a cooled sliding gate (21) which can horizontally slide in for a closed position, and slide out for an opened position of the vertical conduct, located at the end of the middle charge chamber (17) and when closed, the gate completely isolates the superior sections of the vertical conduct from the discharge section (18) and combustion chamber (1, 2).
9. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein each feeding mean (13, 14) comprising: a vertical conduct, having a quadrangular shaped cross section and having: a feeding aperture (14a) at a superior end, a discharge opening (15) directly and hermetically connected to the combustion chamber (1, 2), an open receiving section (16), a middle charge chamber (17) and a discharge section (18); first valve means, located at the top of the open receiving section (16); means for driving the first valve means; cooled valve means, located at the bottom of the middle charge chamber (17); means for driving the second valve means; wherein the first valve means comprising a sliding quadrangular gate (19) which can horizontally slide in for a closed position, and slide out for an opened position of the vertical conduct, located at the top of the open receiving section (16) and when closed, the gate completely isolates the middle charge section (17) of the vertical conduct from the exterior; and wherein the cooled valve means comprising a water cooled sliding quadrangular gate (21) which can horizontally slide in for a closed position, and slide out for an opened position of the vertical conduct, located at the end of the middle charge chamber (17) and when closed, the gate completely isolates the superior sections of the vertical conduct from the discharge section (18) and combustion chamber (1, 2).
10. Apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein each feeding mean (13, 14) comprising: a vertical conduct, having: a feeding aperture (14a) at a superior end, a discharge opening (15) directly and hermetically connected to the combustion chamber (1, 2), an open receiving section (16), a middle charge chamber (17) and a discharge section (18); first valve means, located at the top of the open receiving section; means for driving the first valve means; and cooled valve means, located at the end of the middle charge chamber (17); means for driving the second valve means; and wherein the means for driving the first valve means and cooled valve means each comprising a pneumatic piston (20, 22) that pushes or withdraw a gate inside or out the vertical conduct.
11. An apparatus for recovering energy from waste materials by combustion using tertiary air as claimed in claim 1, wherein each combustion chamber (1, 2) comprising a duct (3, 4) having a quadrangular cross section, and each combustion chamber (1, 2) having: a combustion portion (6) vertically oriented, including a charge opening (7) at a superior end and three perforations (8c) horizontally aligned and located at an inferior end; and a gas and wire discharge portion (10) prolonging from the inferior end of the combustion portion (6), directly connected to the calciner (5), wherein the discharge portion (10) is inclined with respect to the combustion portion (6) towards the feeding duct (3, 4) in order to reach and connect to said feeding duct (3, 4) and having a fossil fuel entrance located near the connection with the calciner (5); a cooled grill type sliding retaining valve (9), comprised by four water cooled sliding rods (8a) connected by a horizontal connection member (8b), each rod passing through a perforation (8c) located at the inferior end of the combustion portion (6); means for sliding in and out the grill type sliding retaining valve (9) comprising a hydraulic or pneumatic piston (20, 22) connected to an end of the horizontal connection member for pushing or retry the retaining valve in or out of the combustion chamber; each feeding means (13, 14) comprising: a vertical conduct having a quadrangular cross section, having: a feeding aperture (14a) at a superior end, a discharge opening (15) directly and hermetically connected to the charge opening (7) of the combustion portion (6) of a combustion chamber (1, 2), an open receiving section (16), a middle charge chamber (17) and a discharge section (18); first valve means, comprising a first sliding quadrangular gate (19) which can horizontally slide in, for a closed position and out for an opened position of the vertical conduct, located at an end of the open receiving section (16), and when closed, the gate completely isolates the other sections of the vertical conduct from the exterior; means

- for sliding in and out the first sliding quadrangular gate, comprising a pneumatic piston (20) that pushes or withdraw the gate inside or out the vertical conduct; second valve means comprising a water cooled sliding quadrangular gate (21) which can horizontally slide in for a closed position and out for an opened position of the vertical conduct, located at the end of the middle charge chamber (17) and when closed, the gate completely isolates the superior sections of the vertical conduct from the discharge section (18) and combustion chamber (1, 2); and means for sliding in and out the cooled sliding quadrangular gate, comprising a pneumatic piston (22) that pushes or withdraw the gate (21) inside or out the vertical conduct.
12. An apparatus for recovering energy from waste materials by combustion using hot tertiary air as claimed in claim 1, further including delivering means, for delivering the waste material directly to the feeding means.
13. An apparatus for recovering energy from waste materials by combustion using hot tertiary air as claimed in claim 10, further including delivering means, for delivering the waste material directly to the open receiving section feeding aperture of the feeding means, comprising an horizontal conveyor belt (23) located at the same level of the feeding aperture (14) and an elevator (24) for elevating the waste material from the ground level to the conveyor belt level (23) and delivering the waste material to the conveyor belt (23).
14. An apparatus for recovering energy from waste materials as claimed in claim 1, wherein the waste material comprise whole tires or waste material packs.
15. A method for recovering energy from waste materials by combustion using tertiary air for using in rotary kilns having a calciner (5) and a tertiary air duct (3, 4) connected thereof comprising: burning waste material inside a combustion chamber (1, 2) formed into the calciner (5) tertiary air feeding duct (3, 4) using a fraction of tertiary air and retaining the material therein for a predetermined amount of time for allowing a complete decomposition of the combustible portion of the waste and a complete combustion of the waste; discharging the hot combustion gas to the tertiary air duct (3, 4) for its use as supplemental energy source by the rotary kiln; and discharging remaining material to the tertiary air duct for its incorporation to the cement clinker once a complete combustion of the waste material is achieved.
16. A method as claimed in claim 15, wherein the temperature of the tertiary air is from between about 650 degrees C to 900 degrees C.
17. A method as claimed in claim 15, wherein the time necessary for achieving a complete decomposition of the combustible portion (6) of the waste and a complete combustion of the waste is: from 80 to 120 seconds.
18. A method as claimed in claim 15, wherein the remaining material is discharged to the tertiary air duct (3, 4) by gravity.
19. A method as claimed in claim 15, wherein it is achieved a combustion temperature of from 1,200 degrees C to 1,400 degrees C.
20. A method as claimed in claim 15, wherein the complete combustion is achieved thanks to an excess of oxygen of more than a 300%.
21. A method as claimed in claim 15, wherein the waste material comprise whole tires or waste material packs.

Patentansprüche

1. Ein Gerät für die Rückgewinnung von Energie aus Abfallstoffen durch Verbrennung unter Verwendung von heißer Tertiärluft für den Einsatz in Drehöfen mit einem Kalzinierofen (5) und einem Tertiärluftkanal mit folgenden Teilen: eine oder mehrere Verbrennungskammern (1, 2), die im Tertiärluftkanal des Kalzinierofens (3, 4) gestaltet sind und jeweils wassergekühlte lösbare Rückhaltemittel (9) darin haben, um die Abfallstoffe in der Verbrennungskammer (1, 2) zurückzuhalten, bis eine komplette Verbrennung unter Verwendung eines Bruchanteils von Tertiärluft erzielt ist, wobei die wassergekühlten Rückhaltemittel (9) den Fluß von Verbrennungsgas und Luft durch sie selbst hindurch zulassen; Ein oder mehrere Zuführungsmittel (13, 14), von denen jedes mit einer Verbrennungskammer (1, 2) verbunden ist um der Verbrennungskammer (1, 2) Abfallstoffe zuzuführen und ferner Hitzeverlust oder den Eintritt kalter Luft von außen durch das Zuführungsmittel in die Verbrennungskammern (1, 2) zu vermeiden; Und wobei die Verbrennungskammer (1, 2) heißes Verbrennungsgas an den Kalzinierofen (5) für seinen Nutzen als zusätzliche Energiequelle durch den Drehofen liefert und das verbleibende Material für die Einarbeitung in den Zementklinker.
2. Ein Gerät für die Rückgewinnung von Energie aus Abfallstoffen durch Verbrennung unter Verwendung von Tertiärluft nach Anspruch 1, wobei das lösbare Rückhaltemittel der Verbrennungskammer (1, 2) ein glitterartiges wassergekühltes verschleißbares Rückhalteventil (9) umfaßt.

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13

Offenlegungstag: 19. September 1974

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Anstellungspriorität: —

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Unionspriorität

22

Datum: —

23

Land: —

31

Aktenzeichen: —

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Bezeichnung: Ofen mit Füllschacht zum Brennen oder Sintern von Zement, Kalk, Magnesit, Dolomit oder ähnlichen Stoffen

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Zusatz zu: —

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Ausscheidung aus: —

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Anmelder: Berger, Friedhelm, 4618 Kamen

Vertreter gem. § 16 PatG: —

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Als Erfinder benannt: Antrag auf Nichtnennung

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nach der OS-Schrift 1. 75d. 888. Ein Teil der KÜHLLUFT kann über Düsen 9, 9a, 9b auf die einfallende Gutschicht bzw. nach oben in den Kühler 8 eingeführt werden.

In der Decke der Brennkammer 4 kann im Bedarfsfalle ein Hilfsbrenner 7a mit abwärts gerichteter Flamme angeordnet sein. Damit lässt sich verhindern, dass die Flamme des Hauptbrenners 7 zu weit nach oben abgelenkt wird. Auch kann durch die Hilfsbrenner 7a im Bedarfsfalle ein Nachbrenner des Gutes erfolgen, wie weiter unten erläutert wird.

Die Rückwand des Füllschachts 3 ist z.B. parallel zur Böschungsfläche 5, oder auch anders geneigt, durch eine für die Feuerzase durchlässige Platte 10 abgeschlossen, hinter der ein kastenförmiger Gassammelraum 11 mit dem Boden 12 liegt. Aus diesem Kasten lässt sich ein regelbarer Teil der Feuerzase absaugen, während der Rest über eine Haube od.dgl. oberhalb des Füllschachtes durch das Schüttgut 6, das sich im Füllschacht 3 befindet, gezogen wird. Durch diese Massnahme lassen sich die Heisszase beliebig aufgeteilt, - je nach Anforderung des Sinterprozesses - durch die Gutschicht ziehen, wie es in Abb. 1 durch Pfeile dargestellt ist.

Maschinelle Einrichtungen werden dabei durch die über 1500 ° C heissen Gase nicht gefährdet. Damit ist die Steuerung des Sinterprozesses über die Gasseite gewährleistet. Die erfingungsgemäss geregelte Gutzuführung wird wie folgt erreicht:

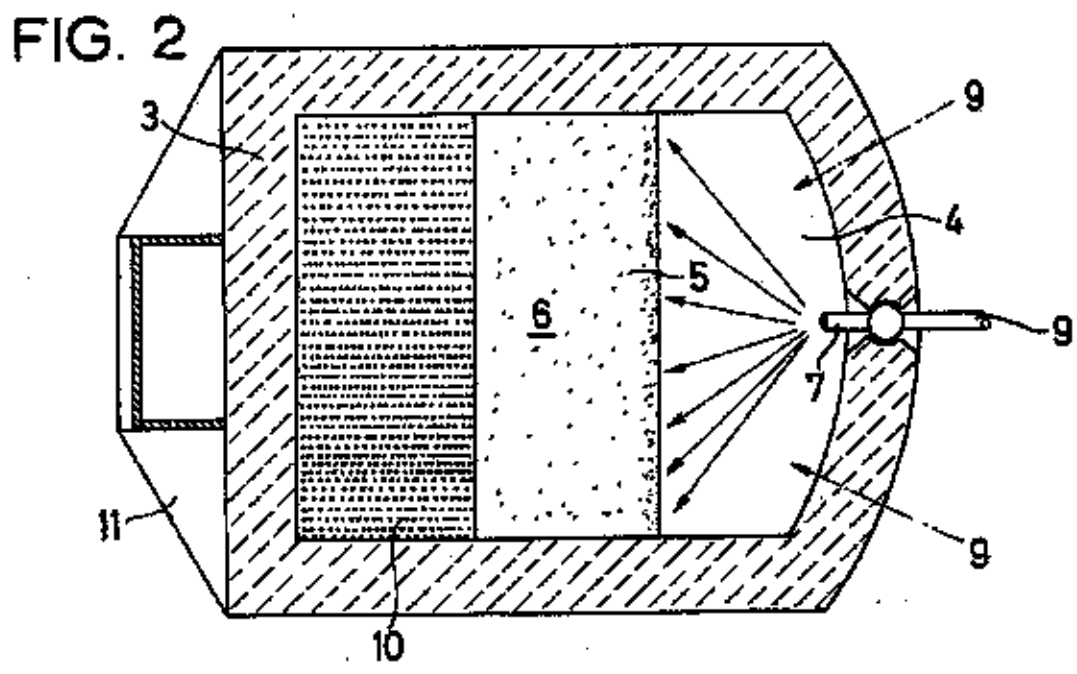
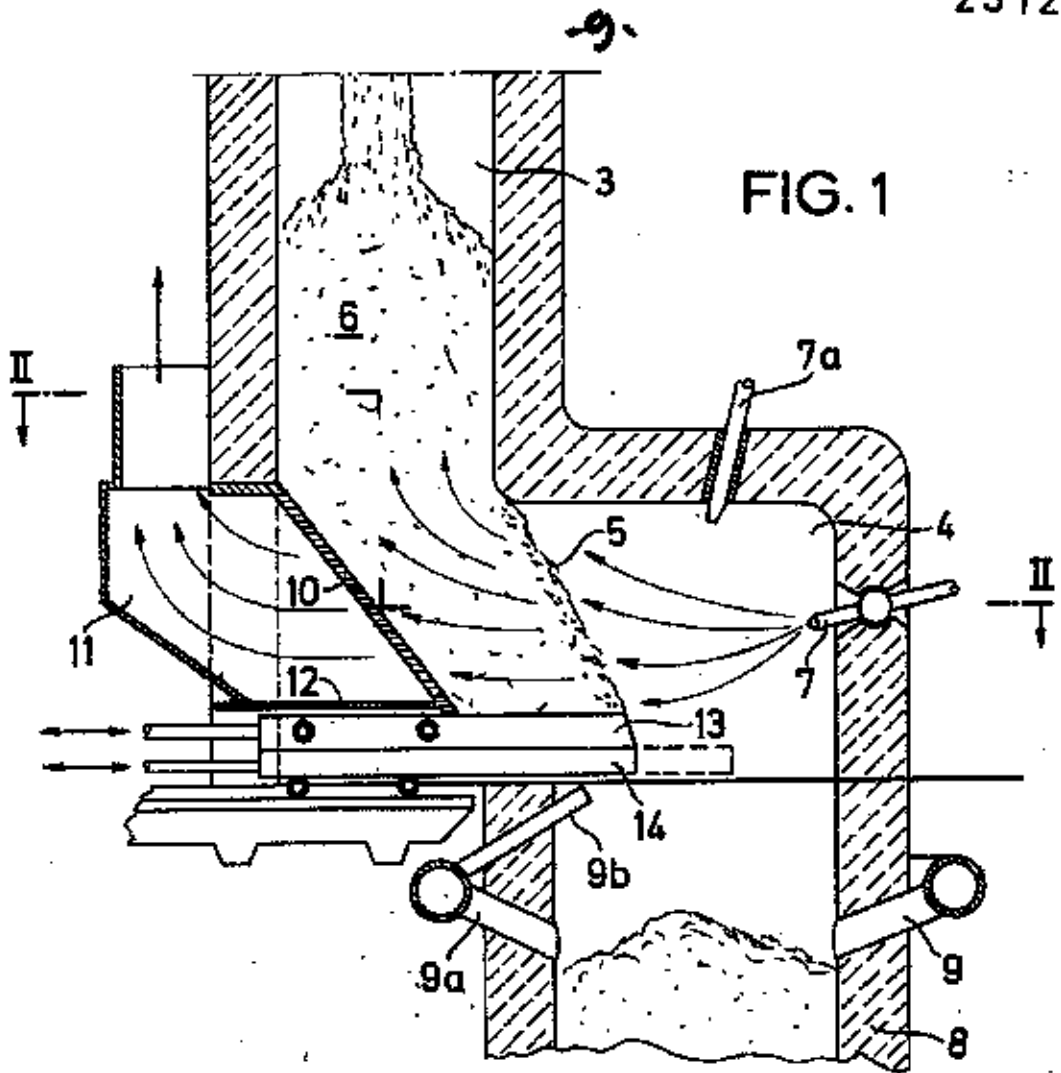
Den Boden des Füllschachts bildet eine, wenigstens im vorderen Teil verschiebbare Platte oder ein Schieber 13, der um ein bestimmtes Mass vor- und zurückbewegt werden kann, so dass die kargebrannte obere Schicht der Böschungsfläche 5 zum Absturz entweder in den darunter liegenden Kühler 8 oder aber auf einen zweiten darunter liegenden Schieber 14 zum Nachbrennen gebracht wird. Dieser zweite Schieber 14 wird von unten mit einem Teil der KÜHLLUFT für den Kühler 8 beaufschlagt, und verhindert eine zu hohe Temperatur dieses Schiebers 14 im ausgefahrenen Zustand.

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(54) Method of utilizing waste tires

(57) Waste tires are used as fuel in an apparatus for the production of cement by means of a rotary kiln by charging waste tires or crushed waste tire pieces to a position where the temperature of the exhaust gas in the apparatus is 600—1,400°C in an amount of not more than 60% of the total used fuel calculated as heat energy.

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SPECIFICATION
Method of utilizing waste tires

The present invention relates to a method of effectively utilizing waste tires as fuel in apparatus for producing cement.

5 Recently, the treatment of used waste tires has become a great problem with development of the automobile industry. Waste tires have been partially directly used effectively for fenders of ships and fish factories at sea but the amount of tires used in this way is very small. When waste tires are subjected to burning, public nuisance problems of black smoke, unpleasant odours, and the emission of nitrogen oxides and sulphur oxides occur.

10 The present inventors having studied the effective utilization of waste tires having a heat energy of about 8,000 kcal/kg, and as a result have developed the method according to the present invention.

The present invention provides a method of utilizing waste tires in an apparatus for producing cement by means of a rotary kiln, which comprises charging waste tires or crushed waste tire pieces as fuel to a position where the gas temperature in the apparatus is 600—1,400°C in an amount of not more than 60% of the total used fuel calculated as heat energy.

15 It is well known that, in the production of cement, combustible substances such as spoil are charged into the production apparatus for effectively utilizing the generated heat in the steps of preheating and calcining the starting materials of the cement or for overcoming the problem of nitrogen oxides, but the combustible substance in this case is a powder. By contrast, the waste tires or crushed waste tire pieces utilized in the present invention have a size of not less than 5 mm. The waste tires directly used without crushing are not limited in the size, if the tire can be charged into the rotary kiln. In general, tires for passenger cars, trucks, and buses are preferable. If waste tires are crushed to a size of less than 5 mm, the particles may be transported by gas flow and are not necessarily burnt at the desired zone, and the temperature of the exhaust gas may be raised and the heat energy not efficiently used, and the fan sucking the exhaust gas may be thermally damaged or agglomeration may occur in a suspension preheater resulting in clogging of the cyclone, and stable operation for a long period of time becomes difficult.

20 The charging of waste tires as such is more preferable than that of crushed waste tire pieces because finely crushed pieces are burnt near the back of the kiln while whole waste tires enter the inner portion of the rotary kiln and the burning zone is lengthened, so that the reducing state advantageous for reducing the amount of nitrogen oxides (NOx) can be maintained along a long zone. Also, in the case of crushed tire pieces, there is a danger of finely divided powder being formed, so that stable operation for a long time may be adversely affected as mentioned above. Furthermore, it is very difficult to crush a waste tire into a given shape by means of presently known crushers and the crushed pieces have an irregular shape and problems are liable to be caused in the transferring system into the kiln, but in the case of whole waste tires the transferring means presently generally used in a tire factory can be advantageously directly utilized.

25 When the waste tires or crushed waste tire pieces are charged into a zone where the temperature of the exhaust gas is higher than 600°C, they immediately start burning and concurrently a part thereof is subjected to dry distillation owing to the heating and generate reducing combustible substances. The combustible substances reduce and decompose nitrogen oxides generated from the main burner of the rotary kiln by using the starting materials for the cement as catalysts, and the production of cement wherein the exhaust gas is low in nitrogen oxides can be effected. When the waste tires or crushed waste tire pieces are charged into a zone where the temperature of the exhaust gas is lower than 600°C, if the crushed particles are fine in size, the particles are transferred to a low temperature zone by the exhaust gas flow, and when the particles are coarse they stay at that position and black smoke is generated due to incomplete combustion and unpleasant odours and nitrogen oxides and sulphur oxides due to nitrogen and sulfur contained in a waste tire itself are generated.

30 When a waste tire is charged toward a zone where the temperature of the exhaust gas is higher than 1,400°C, for example the burning zone at the front of the rotary kiln, it is expensive to obtain finely divided powder. Also, in the case of granular or massive crushed pieces, the burning speed is slow, so that it is difficult to maintain the temperature of the burning zone. In particular, in the case of massive crushed pieces or whole tires, the charging into the burning zone becomes difficult. Accordingly, as regards the apparatus for producing cement using a rotary kiln, in the case of the rotary kiln alone the waste tires are charged into the preheating zone or the calcining zone from the back or the side of the rotary kiln. In the case of an apparatus provided with a cyclone system of preheater or calcining furnace, the waste tires are charged into a position where the temperature of the exhaust gas is higher than 600°C in the accompanying installation, for example the standing duct at the back of the rotary kiln or the calcining furnace, in addition to the above described positions.

35 The amount of waste tires or crushed waste tire pieces charged does not hinder the production of the cement and is not more than 60% of the heat energy of the total used fuel. When this amount exceeds 60%, temperature stability at the burning zone in the rotary kiln becomes difficult to obtain and the quality of the cement is adversely affected and such an amount is therefore not preferable.

In general, a few percent of zinc oxide (ZnO) is compounded in tires during the production thereof.

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us a vulcanization promoting assistant. It has been reported in 5th Cement Chemistry International Symposium Essay, Vol. 2, P.444—453 that when more than 0.075% of ZnO is contained in cement, the setting of the cement is retarded. According to experiments, when ZnO is contained in an amount of more than 0.06%, the setting time defined in JIS R5201 is not satisfied and further the amount of unburnt carbon increases, so that coating of the preheater grows and the cyclone becomes clogged. Therefore, the amount of waste tires or crushed waste tires charged is preferably not more than 15%, more preferably 5—10%, of the heat energy of the total used fuel.

When steel is contained in the waste tires, steel is oxidized at the calcining zone and burning zone and effectively acts as a part of the starting material of the cement.

The present invention has the following advantages.

- (1) A large amount of waste tires can be utilized.
- (2) Since waste tires are used as fuel, the heat energy of the rubber itself can be effectively utilized.
- (3) It is expensive to obtain finely divided tire powder but in the method of the present invention roughly crushed pieces having a grain size of more than 5 mm can be utilized, and the obtaining of such crushed pieces is a simple process.
- (4) The quality of the obtained cement is not adversely affected.
- (5) Public nuisance due to burning of waste tires does not occur. Indeed, the amount of nitrogen oxides generated in the conventional production of cement can be reduced.
- (6) Waste tires can be used directly without crushing, so that this method is advantageous in view of the noise and cost of crushing.
- (7) Waste tires including steel can be directly used in the apparatus for producing cement.

The invention will be further described with reference to the following illustrative Examples.

EXAMPLE 1

Waste tires were charged from a feeder of starting material provided at the back of a wet system rotary kiln having a diameter of 3,450 mm and a length of 66,300 mm and provided with a boiler. The obtained results are shown in Table 1. The waste tires contained 20% of steel.

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(19)  **Europäisches Patentamt**
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(11) **EP 0 764 614 A2**

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(54) **Anlage und Verfahren zur Herstellung von Zementklinker**

(57) Die Erfindung betrifft eine Anlage sowie ein Verfahren zur Herstellung von Zementklinker aus Zementrohmaterial mit einer Vorbehandlungsstufe (1) für das Zementrohmaterial, einem Brennofen (2) zum Fertigbrennen des Zementklinkers, einer dem Brennofen mit der Vorbehandlungsstufe verbindenden Abgasleitung (3), einem Kühler (4) zum Kühlen des gebrannten Zementklinkers sowie einem an die Abgasleitung (3) angebundenen Reaktor zur Erzeugung eines Brenngases aus Abfallstoffen, insbesondere aus Altfällen. Der Reaktor ist als Vergasungsreaktor (5) ausgebildet und mit dem Kühler (4) über eine Tertiärluftleitung (6) derart verbunden, daß wenigstens ein Teil der Abluft des Kühlers als Vergasungsmittel im Reaktor verwendbar ist. Über eine Einrichtung (8) wird die dem Reaktor über die Tertiärluftleitung zugeführte Tertiärluftmenge in Abhängigkeit von der Füllhöhe der Abfallstoffe und/oder der Temperatur im Reaktor gesteuert.

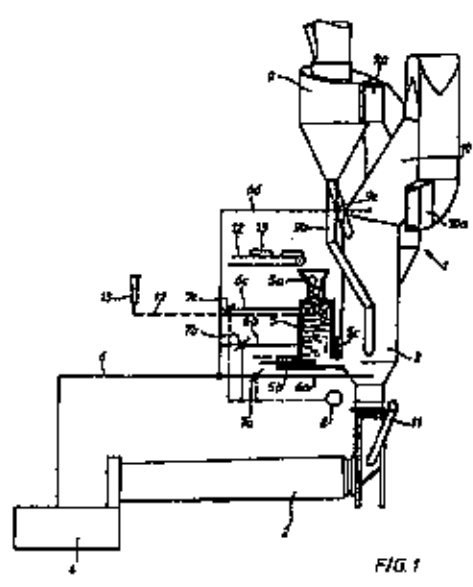


FIG. 1

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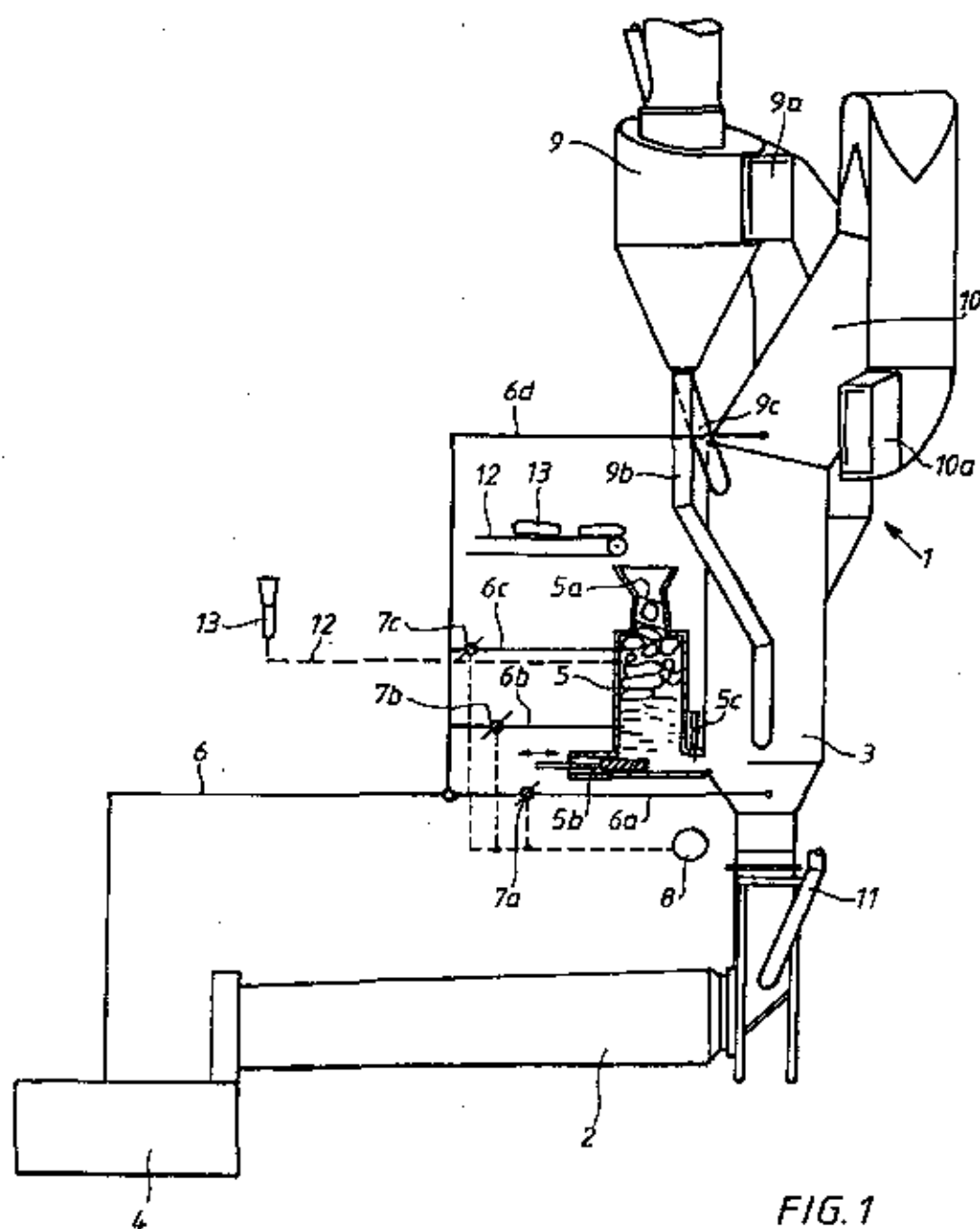


FIG. 1

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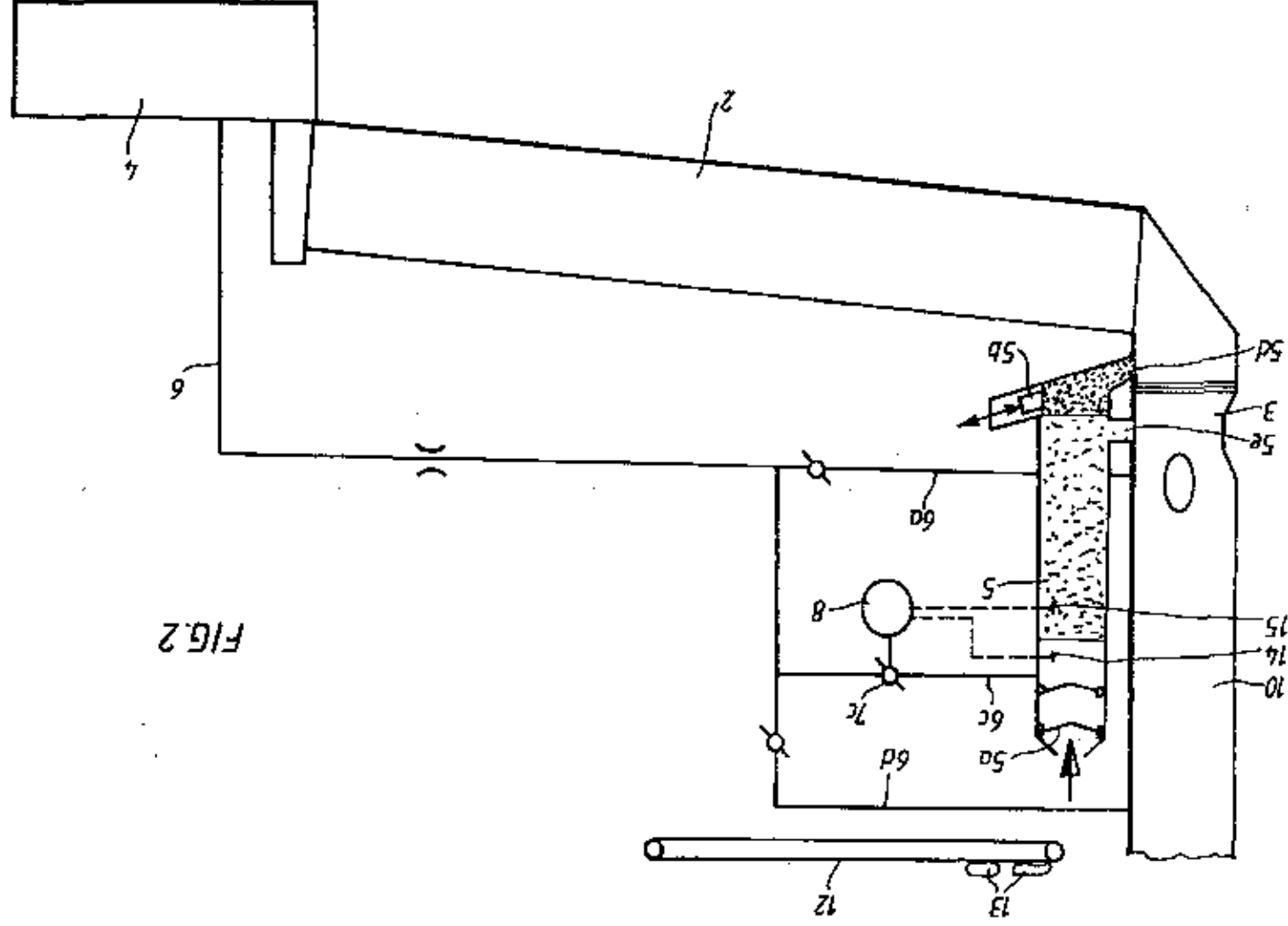


FIG. 2

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GARCIA-SECOVIA et al.(10) **Pub. No.: US 2002/0035804 A1**(43) **Pub. Date: Mar. 28, 2002**(54) **APPARATUS AND METHOD FOR
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secution application (CPA) filed under 37
CFR 1.53(d).(21) **Appl. No.: 09/389,881**(22) **Filed: Sep. 2, 1999****Publication Classification**(51) **Int. Cl.⁷ C10J 1/00; C10K 1/00; F23G 5/00**(52) **U.S. Cl. 48/197 R; 110/346; 110/248**(57) **ABSTRACT**

An apparatus and a method for fractionating alternative solid fuels, specially whole tires, into volatiles and coal, to be used as alternative fuels, and metal, the apparatus comprising: a feeding zone wherein the solid fuels are feed to the apparatus, a gasifying zone into which the solid fuels are processed, obtaining a gaseous fraction, coal and metal; cooled grills controlling the bed permeability and permanence time of the solid fuels at the gasifying zone; and a discharging zone into which the resultant coal and metal are discharged.

FIGURE 1

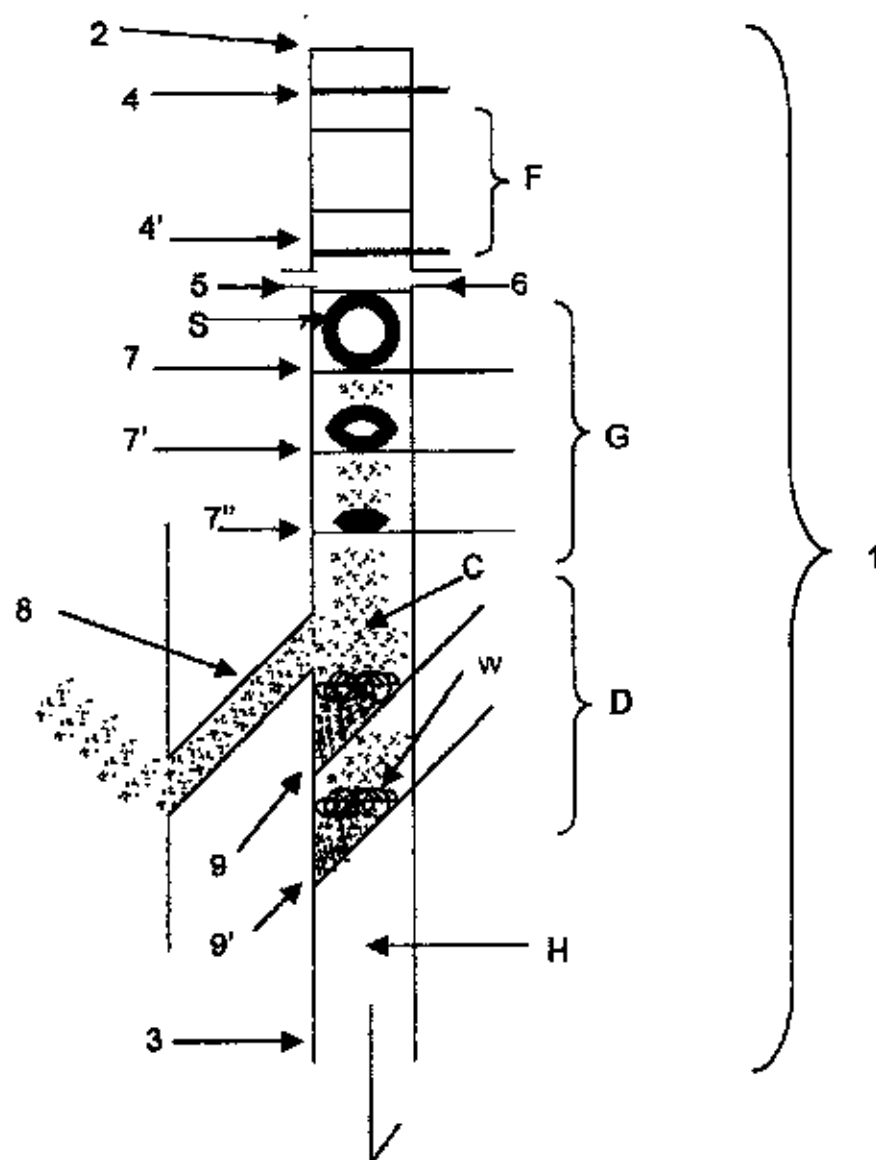


FIGURE 1

include means to control the permanence time of the solid fuel at the calcination point, to be optimized for each type of solid fuel.

[0031] It is still another objective of the present invention to provide an apparatus and method for fractionating alternative solid fuels, of the above disclosed nature which includes means for controlling permeability.

[0032] It is still a main objective of the present invention to provide an apparatus and method for fractionating alternative solid fuels, of the above disclosed nature, in which fuel substitution percentage achieved is higher than 40%, which is higher than the fuel substitution percentages achieved by the actual methods and apparatuses.

[0033] These and other objects and advantages of the apparatus and method for fractionating alternative solid fuels, of the present invention will become apparent to those persons having an ordinary skill in the art, from the following detailed description of the embodiments of the invention which will be made with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0034] FIG. 1 is a front view of the apparatus for fractionating alternative solid fuels of the present invention;

[0035] FIG. 2 is a diagram of a cement plant, including the apparatus for fractionating alternative solid fuels of the present invention in a first embodiment of use;

[0036] FIG. 3 is a diagram of a cement plant, including the apparatus for fractionating alternative solid fuels of the present invention in a second embodiment of use;

[0037] FIG. 4 is a diagram of a cement plant, including the apparatus for fractionating alternative solid fuels of the present invention in a third embodiment of use;

[0038] FIG. 5 is a diagram of a cement plant, including the apparatus for fractionating alternative solid fuels of the present invention in a fourth embodiment of use;

[0039] FIG. 6 is a diagram of a cement plant, including the apparatus for fractionating alternative solid fuels of the present invention in a fifth embodiment of use;

[0040] FIG. 7 is a diagram of a thermoelectrical plant, including the apparatus for fractionating alternative solid fuels of the present invention as another embodiment of use;

DETAILED DESCRIPTION OF THE INVENTION

[0041] The invention will now be described referring to a preferred embodiment thereof, illustrated in the accompanying drawings wherein the same signs and numbers, refer to the same parts of the shown figures.

[0042] Referring to FIG. 1, the apparatus for fractionating alternative solid fuel comprises:

[0043] gasifying means consisting of a main column 1 having a first end 2 and a second end 3, and including:

[0044] a feeding zone F, having:

[0045] valve means including one or more feeding valves

[0046] comprising gates 4, 4', located at the feeding zone F, in which the solid fuels S are fed, and which are opened and closed for a convenient time and sequence in order to feed the solid fuels S to the place wherein the combustion will take place;

[0047] driving means for the feeding valves (not shown) which could be hydraulic motors, to open (lifting) and close (lowering) said feeding valves 4, 4';

[0048] a gasifying zone G located below the feeding zone F, having:

[0049] input means for hot air 5 which is used for the combustion of the solid fuels S₁ coming from a suitable source (not illustrated) which could be, in case of applying the present invention to a rotary kiln for producing cement, the tertiary air duct or the clinker cooler;

[0050] input means 6 for cool air coming from a suitable source such as an air pump;

[0051] mesh means comprising one or more alternately introduced and withdrawn cooled grills 7, 7', 7'' having internal pipes (not shown), into which cool air or water is circulated by means of a pump, said cooled grills controlling the bed permeability and permanence time of the solid fuels S at the gasifying zone G and are able to be withdrawn in order to discharge the coal and solids, after the separation of volatile and solids is achieved, to a discharging zone D avoiding the formation of very hard agglomerates which are very difficult to remove;

[0052] driving means for the cooled grills (not shown) which operatively introduce or withdraw said cooled grills 7, 7', 7'';

[0053] a duct 8 into which the volatiles are discharged from the gasifying zone G for further use, said volatiles serving as supplemental fuel;

[0054] a discharging zone D located below the gasifying zone G having:

[0055] valve means including one or more discharging valves comprising gates 9, 9' which receive the coal C and solids, such as wire W, coming from the gasifier G and which are opened at a convenient time in order to discharge the coal and solids C from the apparatus; and

[0056] a discharging opening H located below the discharging valves 9, 9' to discharge the coal C and solids, such as wire W, from the apparatus.

[0057] It is to be understood that, the gasifying means can be a vertical column wherein the feeding zone, the gasifying zone and the discharging zone are placed in a downwardly sequence, or else, it can be a horizontal chamber wherein the feeding zone, the gasifying zone and the discharging zone are placed in a side by side fashion, and in this embodiment it would be needed a mechanical feeding device including an hydraulic cylinder and piston assembly (not shown).

[0058] The apparatus of the present invention can be used for fractionating continuously batches of supplemental fuel,

such as whole tires, so that when a first batch of burning material is placed at the feeding valves 4, 4' which are initially closed, a second batch may be already at the gasifying zone G, wherein the cooled grills 7, 7', 7'' are sequentially opened at predetermined times, depending on the characteristics—such as size—of the supplemental fuel being processed, thus controlling the bed permeability and permanence time, and avoiding the formation of agglomerates inside the apparatus. The grill cooling means (not shown) avoid that the pipes forming the grill lose mechanical properties due to overheating or corrosion.

[0059] When the last cooled grill is opened 7''—if the apparatus has more than one grill—, the resultant coal C and solids, such as wire W, are discharged to the discharge valve 9, which is opened at a convenient time as well as the other discharge valves 9'—in case that the apparatus has more than one discharge valve—, when a predetermined amount of coal C and solids W are obtained.

[0060] The last feeding valve 4' is opened discharging the supplemental fuel to the first cooled grill 7, as soon as this is emptied.

[0061] Therefore, the apparatus of the present invention can be fed with whole tires, without problems such as wire entangling, obtaining a complete separation of volatile, coal and wire.

[0062] Although it was mentioned that the apparatus of the present invention has an input of hot air 5, it is also suitable to operate without a hot air input when there is not available.

[0063] As it was mentioned, one of the applications of the present invention is at the cement industry, in which the installation of the present apparatus is at a rotary cement kiln or calciner, using whole or shredded tires as supplemental fuel.

[0064] Referring to FIG. 2, a first possible embodiment of use of the apparatus of the present invention R, at a rotary cement kiln, is by installing the apparatus at the back end of the cement kiln, feeding the apparatus with whole or shredded tires T, injecting air from the atmosphere A, taking hot air from the tertiary air duct 9—if the kiln has a tertiary air duct—, and discharging the volatiles V to the pre-calciner or calciner 10 to substitute primary fuel M, and discharging wire W and tire coal C to the kiln input 11 to substitute primary fuel. The wire is integrated to the clinker K, substituting part of the iron required in the form of an oxide. The main advantages of this form of use are that the volatiles are burned where it is required. Therefore there is less tendency to form hot points and agglomerates at the input of the kiln, than in the case in which all the alternative fuel is directly fed to the kiln.

[0065] Referring to FIG. 3, a second possible embodiment of use, is as described in the first one, but additionally discharging the wire W to the outside of the apparatus and of the rotary kiln 12, to containers or to a conveyor belt (not shown). This way of use is suitable for the production of white cement in which the iron oxide content is less than in the normal cement.

[0066] Referring to FIG. 4 a third possible embodiment of use, is as described in the second one, but discharging the tire coal C to the main burner 13. The main advantage of discharging the tire coal C to the main burner 13 is that a

higher percentage of primary fuel substitution can be achieved mainly because the tire coal C is burned in the main burner 13 after reaching the limit of energy amount substituted at the pre-calciner.

[0067] Referring to FIG. 5, a fourth possible embodiment of use consists on using the residual air from the clinker cooler 14 which is hotter than the atmosphere air, instead of using hot air from the tertiary air duct 9. The volatiles V are discharged and burned in the main burner 13 and the tire coal C is discharged to the calciner 10, achieving a higher percentage of primary fuel substitution. In this case, the wire W is discharged outside of the apparatus and of the rotary kiln 12, to containers or to a conveyor belt (not shown). Therefore it is possible the application of the recuperator R of the present invention at kilns without a pre-calciner.

[0068] Referring to FIG. 6, a fifth possible embodiment of use is as described in the fourth one, but discharging the tire coal C to the main burner 13. Therefore it is also possible the application of the recuperator R of the present invention at kilns without a pre-calciner.

[0069] Referring again to FIG. 1, a sixth possible embodiment of use is as described in the first one, but, instead of using whole or shredded tires, alternative solid fuels having similar or the same properties of the tires, are used, i.e., so that a residue similar to coal be obtained.

[0070] Although it has been mentioned that the apparatus of the present invention can be used at the cement industry, it can be used at any kind of industry having industrial kilns. For example, referring to the FIG. 7, it can be used at a thermoelectrical plant or any other industrial kiln, discharging the volatiles V and tire coal C to the main burner 13, and discharging the wire W to outside of the apparatus.

[0071] The method for fractionating alternative solid fuels, specially whole tires, according to the present invention comprises the steps of:

[0072] providing an apparatus including a gasifier wherein the solid fuels will be partially burned and the volatiles will be emitted;

[0073] feeding the alternative solid fuel to the gasifying zone of the apparatus;

[0074] providing cool air to the gasifier from the atmosphere and if possible hot air from a suitable source;

[0075] partially burning the alternative solid fuels into the gasifying zone until most of the volatiles have been emitted, coal with a minimum content of volatiles is obtained, and the non combustible solids are separated;

[0076] discharging the volatiles from the gasifier to an industrial kiln wherein the substitution of primary fuel will be made;

[0077] discharging the resultant coal and solids from the gasifier by gravity or any other known means to an industrial kiln wherein the substitution of primary fuel will be made or to a conveyor belt or to a container for further use.

[0078] Although it was described that it is provided hot air to the gasifier from a suitable source, it is suitable to make the combustion with cool air only.

[0079] Finally it must be understood that the apparatus and method for fractionating alternative solid fuels of the present

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(19) **United States**

(12) **Patent Application Publication**
Steffler et al.

(10) **Pub. No.: US 2003/0089282 A1**
(43) **Pub. Date: May 15, 2003**

(54) **PROCESS AND DEVICE FOR FEEDING
DISPERSIBLE SOLID FUELS INTO THE
CALCINATOR OF A CEMENT CLINKER
PRODUCTION LINE**

Publication Classification

(51) **Int. Cl.** **C04B 7/36**
(52) **U.S. Cl.** **106/739**

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(57) **ABSTRACT**

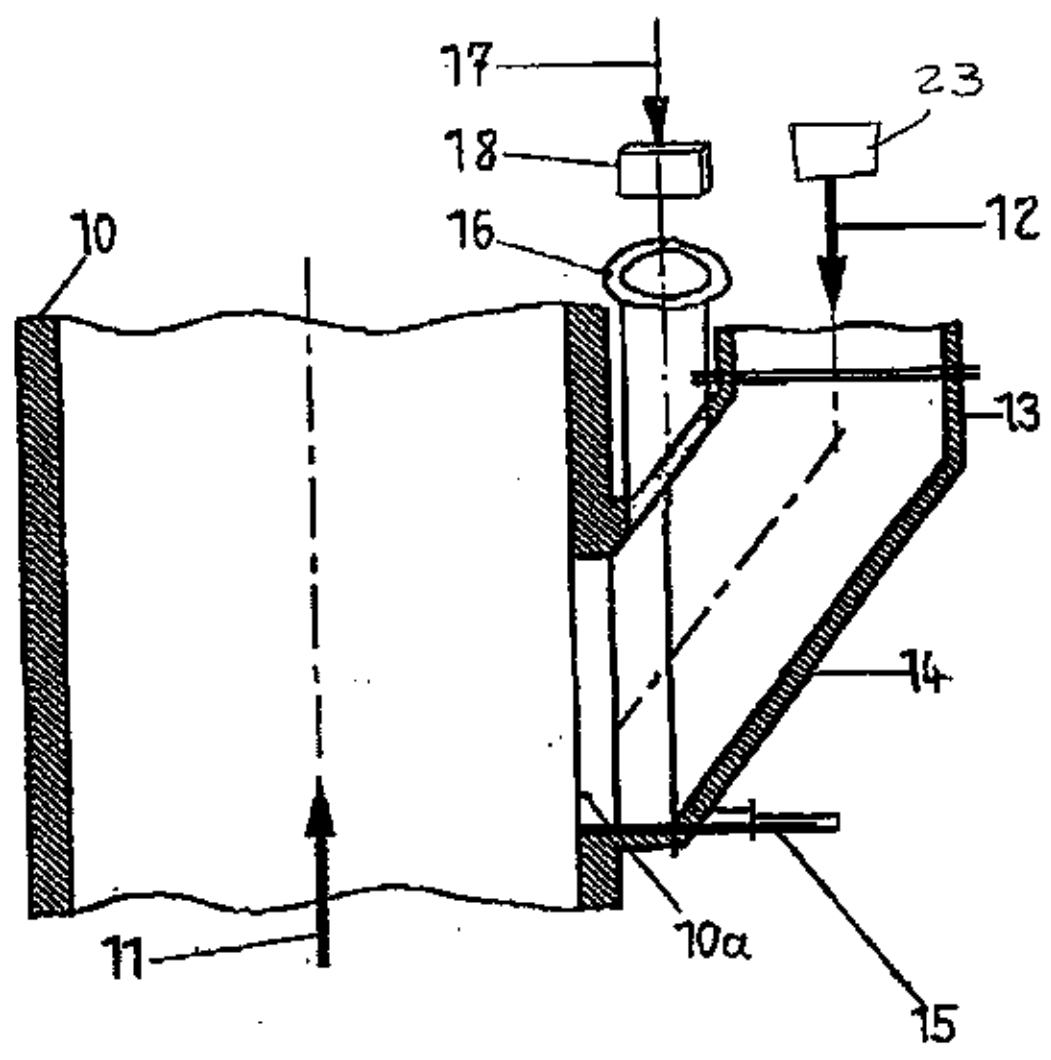
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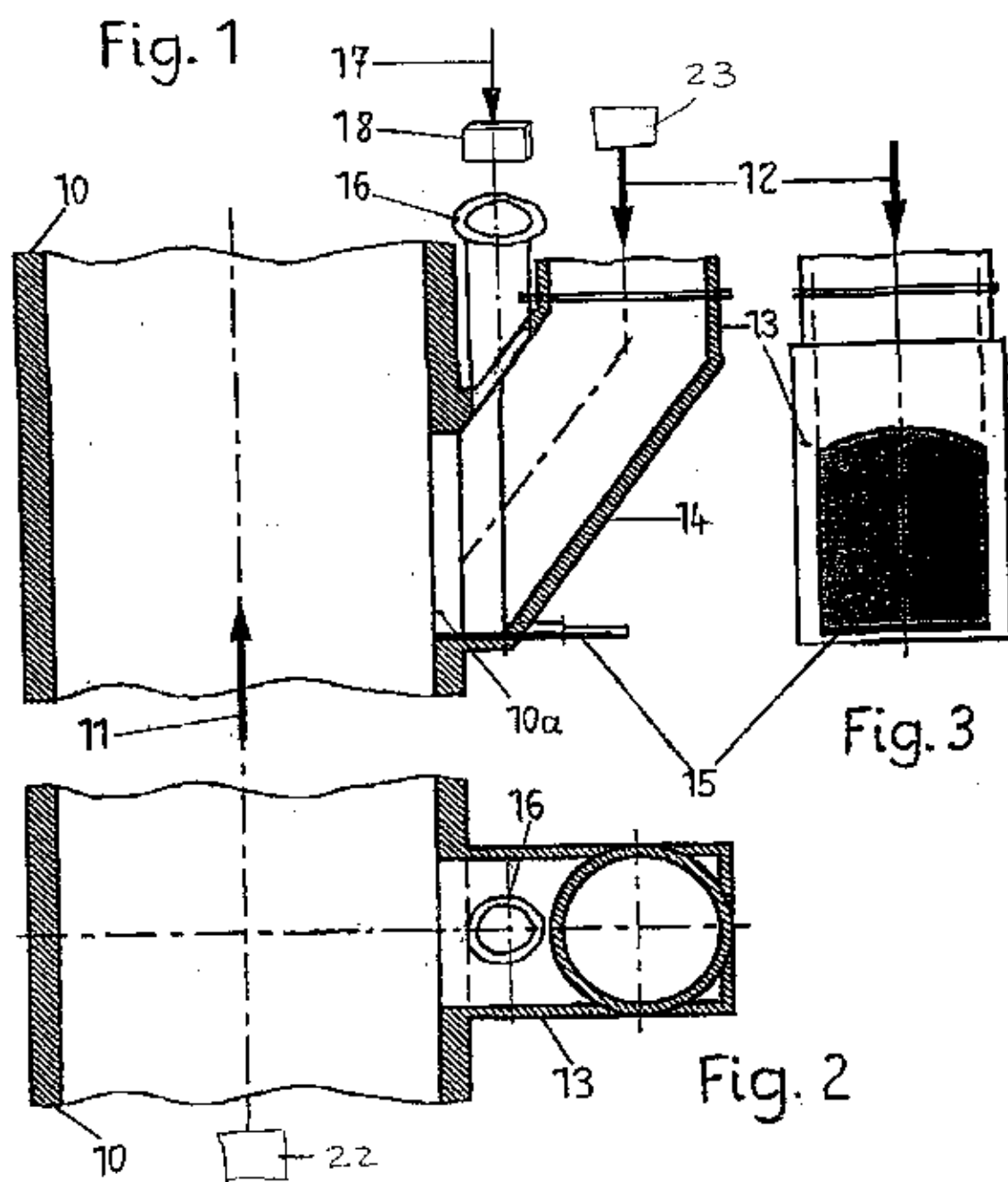
In order to make sure, for cement clinker production lines with blown injection of dispersible solid fuels such as, for example, coal dust, into the calcinator which is provided with fuel, that an open flame does not occur at the fuel injection point, it is proposed according to the invention that the fuel is fed into a meal intake box that has a sloping raw meal chute and deflector slide and is arranged on the outside of the calcinator and connected to it through a wall opening and the fuel is pre-mixed with the pre-heated raw meal there, and then introduced via the deflector slide into the reaction section of the calcinator in order to form a gas-raw meal-solid fuel-suspension that is uniformly distributed.

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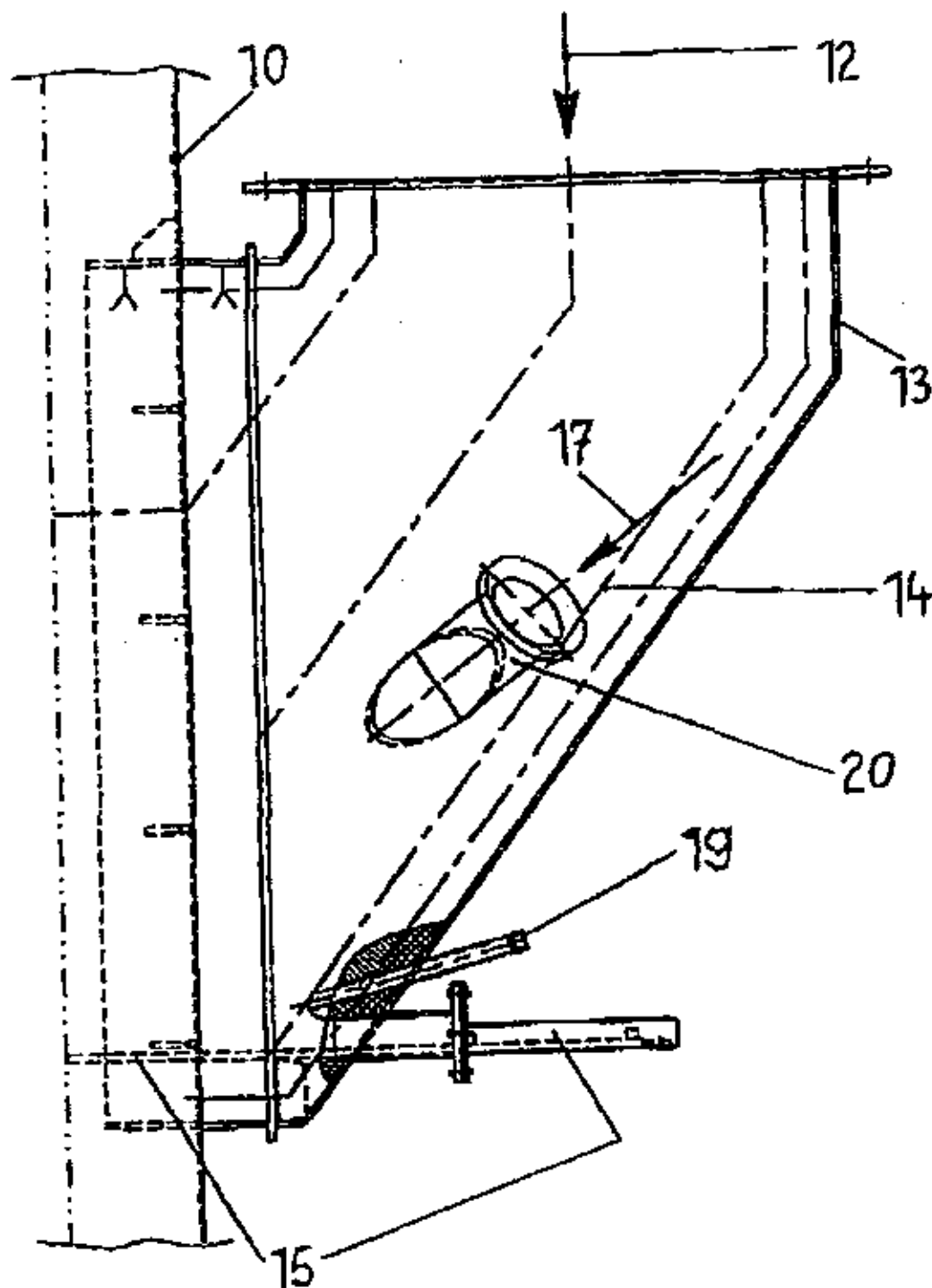


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Fig. 4

DS



[0023] As is apparent from the foregoing specification, the invention is susceptible of being embodied with various alterations and modifications which may differ particularly from those that have been described in the preceding specification and description. It should be understood that we wish to embody within the scope of the patent warranted hereon all such modifications as reasonably and properly come within the scope of our contribution to the art.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A process for feeding dispersible solid fuels into a calcinator of a system for manufacturing cement clinkers made of cement raw meal, which raw meal is preheated in a heat exchanger system, calcinated in the calcinator provided with the fuel and baked into cement clinker in a rotary tubular kiln, whereby the pre-heated cement raw meal is fed into the reaction section of the calcinator via a meal intake box that has a sloping raw meal chute and deflector slide and is arranged on the outside of the calcinator and connected to it through a wall opening. The steps comprising:

feeding the fuel into the meal intake box and pre-mixing the fuel with the pre-heated raw meal there into a mixture, and then introducing the mixture via the deflector slide into the reaction section of the calcinator in order to form a gas-raw meal-solid fuel-suspension that is uniformly distributed.

2. The process according to claim 1, wherein the fuel is transported pneumatically and a conveyance speed of the pneumatic transport of the fuel is reduced prior to entry into the meal intake box.

3. A device for feeding dispersible solid fuels into a calcinator of a system for manufacturing cement clinkers made of cement raw meal, which raw meal is preheated in a heat exchanger system, calcinated in the calcinator provided with the fuel and baked into cement clinker in a rotary tubular kiln, whereby a meal intake box that has a sloping raw meal chute and deflector slide is arranged on the outside of the calcinator and connected to it through a wall opening, and wherein the meal intake box has at least one nozzle for injecting the fuel in order to pre-mix the fuel with the pre-heated raw meal into a mixture prior to the introduction of the mixture into a reaction section of the calcinator.

4. The device according to claim 3, wherein the at least one nozzle for injecting the fuel is arranged one of above and to a side on the meal intake box.

5. The device according to claim 3, further including a conveyance line for pneumatically transporting the fuel to the meal intake box.

6. The device according to claim 3, further including a deflector disk positioned in the conveyance line for throttling a conveyance speed of the fuel prior to its injection into the meal intake box.

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(19) **United States**(12) **Patent Application Publication**
Garcia-Segovia et al.(10) Pub. No.: **US 2003/0150161 A1**(43) Pub. Date: **Aug. 14, 2003**(54) **APPARATUS AND METHOD FOR
FRACTIONATING ALTERNATIVE SOLID
FUELS****Publication Classification**(51) Int. Cl.⁷ **C10J 3/20**(52) U.S. Cl. **48/62 R; 48/61; 48/89; 48/119;
48/197 R; 48/197 FM; 422/184.1;
422/187; 422/188; 422/189;
422/198**(76) Inventors: **Armando Garcia-Segovia, Nuevo Leon
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New York, NY 10017-3612 (US)**(21) Appl. No.: **10/228,721**(22) Filed: **Aug. 26, 2002****Related U.S. Application Data**(63) Continuation-in-part of application No. 09/389,851,
filed on Sep. 2, 1999, now abandoned.(57) **ABSTRACT**

An apparatus and a method fractionate solid fuels, especially whole tires, into metal as well as volatiles and coal to be used as alternative fuels. The apparatus includes a feeding zone wherein the solid fuels are fed to the apparatus, a gasifying zone into which the solid fuels are processed, obtaining a gaseous fraction, coal, and metal; cooled grills controlling the bed permeability and permanence time of the solid fuels at the gasifying zone; and a discharging zone into which the resultant coal and metal are discharged, in which the solid fuel coal and solid and gaseous fractions follow a path inside the apparatus through the feeding zone, the gasifying zone and discharging zone, and in which the gases inside the apparatus follow a path that is co-current with the solid fuel fractions path inside the apparatus.

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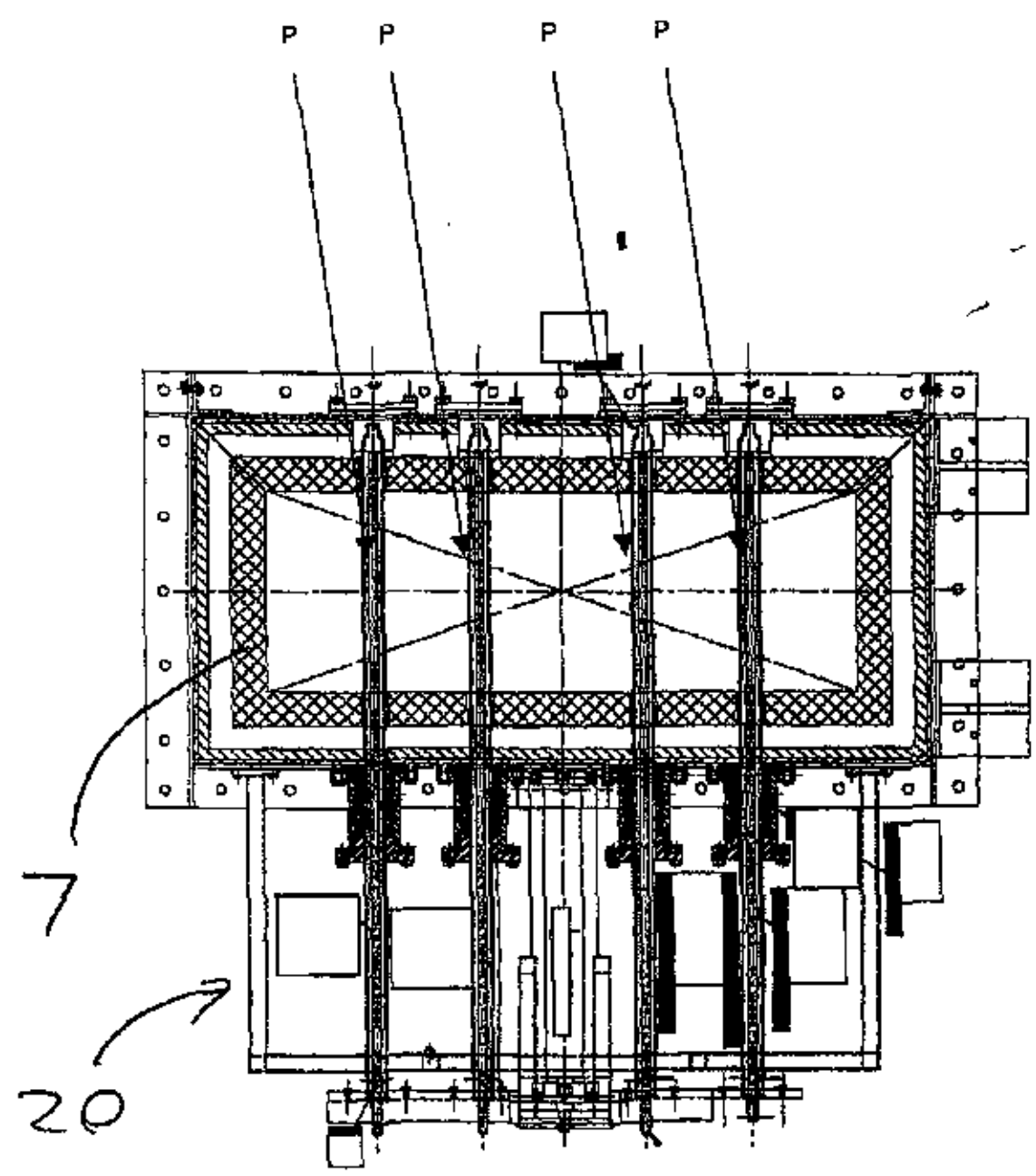


FIGURE 8

region; introducing at least a portion of said exhaust gas from said heating region into said heat-decomposing region to heat-decompose said combustible material and to generate a combustible gas therefrom; introducing said combustible gas from said heat-decomposing region into said preheating or calcinating region, and; burning said combustible gas in said preheating or calcinating region to preheat or calcinate said cement material.

[0032] If there were applied cooled grills (as in Kleen's patent) under the operating conditions of Ogawa's method, the kiln gas would flow countercurrent to the feeding path through the gasifying zone, thus causing low melting compounds carried by the kiln gas (Na_2O , Na_2SO_4 , K_2SO_4 , etc) to go up and solidify and form mineral deposits on the grill. Such deposits would avoid the movement of the cooled grill for discharging the wire.

[0033] Furthermore, since the hot kiln gas would reach the cooled grills, the wire would frequently melt on the grill and on the refractory walls.

BRIEF SUMMARY OF THE INVENTION

[0034] Applicant carried out several tests in bench scale models using countercurrent models and the melting of the wire happened twice as many times as the co-current model. Therefore, it is much easier to control the gasifier to minimize wire melting when it is operated with the air flowing concurrently with the solid fuel.

[0035] The change from countercurrent to co-current is very important since a person having an ordinary skill in the art would say that a countercurrent gasifier is kinetically and thermodynamically superior than a co-current one. However, in view of the results obtained by applicant's experiments, one can conclude that the co-current model has advantages over the prior art countercurrent model.

[0036] Since chemical engineers know that a countercurrent heat exchanger is more efficient than a co-current one, the fact that a co-current gasifier has advantages over a countercurrent one has to be proved by means of experimentation. The aforesaid experimentation shows that the development of the co-current concept and model is not obvious.

[0037] Therefore, if a person skilled in the art propose to combine Steinbiss's, Ogawa's and Kleen's designs in order to produce an apparatus for gasifying whole tires, the resulting design would not work properly because the countercurrent model causes the melting of the wire on the cooled grill. Also, the use of hot gas from the kiln, carrying low melting point compounds produce build ups on the cooled grills that causes a lot of operation problems.

[0038] Finally, it should be noted that:

[0039] 1. None of the apparatuses and methods disclosed in the Steinbiss, Kleen and Ogawa patents are capable of continuously fractionating whole tires while discharging the wire thereof, without entangling the wire inside the apparatus, and while achieving a fuel substitution of greater than 10%.

[0040] 2. None of the references disclose the capability of avoiding hot spots, reducing atmospheres and build-ups which are observed when the coal and wire are discharged in the kiln after the combustion of whole tires.

[0041] Note should also be taken that even considering the combination of the above referred patents, they do not teach, disclose or suggest how to achieve an apparatus for fractionating alternative solid fuels (especially whole tires) having the following characteristics:

[0042] 1. Having the capacity of continuously fractionating whole tires without wire entanglements due to the mesh which allows for the continuous discharge of wire from the apparatus.

[0043] 2. Wherein the mesh for controlling the residence time of the material to be burned at the gasifying zone have cooling means for cooling the surface of the gates and avoiding the melting of the material on the gate when burned.

[0044] 3. Capability of achieving a fuel substitution percentage of greater than 10%, without the formation of build-ups.

[0045] 4. Ability to avoid secondary effects, such as the formation of hot spots or reducing atmospheres.

[0046] 5. Easily adaptable to any type of industrial kiln.

[0047] Considering the above referred problems, applicants developed an apparatus and a method for fractionating alternative solid fuels, especially whole tires, into volatiles and coal, to be used as alternative fuels, and metal, which uses the co-current model.

[0048] Applicant's apparatus and method provide means to separate the residual carbon and volatile of burned solid fuels, as well as the wire produced by the combustion of the whole tires. Furthermore, there are included means to control the permanence time of the solid fuel at the gasifying zone of the apparatus, which can be optimized for each type of solid fuel.

[0049] Applicant's apparatus comprises a main column having a feeding zone, including one or more feeding valves; a hot air input, providing a hot air current that follows the same path as the solid fuels inside the gasifier; driving means are provided for opening and closing said feeding valves; a gasifying zone located below the feeding zone, having a cool air input coming from a suitable source such as an air pump; If possible an input for hot air which is used for the combustion of the solid fuels, coming from a suitable source; one or more alternately introduced and withdrawn cooled grills controlling the permeability and permanence time of the solid fuels at the gasifying zone; a gasifier duct in which the volatiles are discharged from the gasifying zone to the main burner or other suitable zone of the kiln or pre-heater wherein the apparatus of the present invention will be used; a discharging zone located below the gasifying zone having one or more discharging valves which receive the coal and solids coming from the gasifier and which are opened at a convenient time in order to discharge the coal and solids from the apparatus; and a discharging opening situated below the discharging valves.

[0050] Applicant's apparatus uses the co-current model in which the air follows the same direction as the solid fuels inside the gasifier, avoiding the return of hot air from the kiln carrying low melting point compounds which may solidify on the cooled grills and avoiding the melting of wire on the cooled grills and on the walls of the gasifier.

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D6

[0051] Applicant's method comprises: providing an apparatus including a gasifier wherein the solid fuels will be partially burned and the volatiles will be emitted; feeding the alternative solid fuel to the gasifying zone of the apparatus; providing a hot air current that follows the same path as the solid fuels inside the gasifier; providing cool air to the gasifier and if possible hot air from a suitable source; partially burning the alternative solid fuels into the gasifying zone until most of the volatiles have been emitted, coal with a minimum content of volatiles is obtained, and the non combustible solids are separated; discharging the volatiles from the gasifier for further use; and discharging the resultant coal and solids from the gasifier by gravity or any other known means.

[0052] With applicant's apparatus and method, the fuel substitution percentage achieved can be higher than 40%, which is higher than the fuel substitution percentages achieved by the actual known methods and apparatuses.

[0053] It is therefore a main objective of the present invention, to provide an apparatus and a method for fractionating alternative solid fuels that uses the air flow co-current model inside the gasifier.

[0054] It is also a main objective of the present invention to provide an apparatus and method for fractionating alternative solid fuels, of the above disclosed nature, which provide means to separate the volatiles and the residual coal, to be used as alternative fuels, and the non combustible solids, produced by the partial combustion of the solid fuels.

[0055] It is another objective of the present invention to provide an apparatus and method for fractionating alternative solid fuels, of the above disclosed nature, which provide means to separate the wire produced by the combustion of whole tires.

[0056] It is also a main objective of the present invention to provide an apparatus and method for fractionating alternative solid fuels, of the above disclosed nature, which include means to control the permanence time of the solid fuel at the calcination point, to be optimized for each type of solid fuel.

[0057] It is still another objective of the present invention to provide an apparatus and method for fractionating alternative solid fuels, of the above disclosed nature which includes means for controlling permeability.

[0058] It is still a main objective of the present invention to provide an apparatus and method for fractionating alternative solid fuels, of the above disclosed nature, in which fuel substitution percentage achieved is higher than 40%, which is higher than the fuel substitution percentages achieved by the actual methods and apparatuses.

[0059] These and other objects and advantages of the apparatus and method for fractionating alternative solid fuels, of the present invention will become apparent to those persons having an ordinary skill in the art, from the following detailed description of the embodiments of the invention which will be made with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0060] FIG. 1 is a front view of the apparatus for fractionating alternative solid fuels of the present invention.

[0061] FIG. 2 is a diagram of a cement plant, including the apparatus for fractionating alternative solid fuels of the present invention in a first embodiment of use.

[0062] FIG. 3 is a diagram of a cement plant, including the apparatus for fractionating alternative solid fuels of the present invention in a second embodiment of use.

[0063] FIG. 4 is a diagram of a cement plant, including the apparatus for fractionating alternative solid fuels of the present invention in a third embodiment of use.

[0064] FIG. 5 is a diagram of a cement plant, including the apparatus for fractionating alternative solid fuels of the present invention in a fourth embodiment of use.

[0065] FIG. 6 is a diagram of a cement plant, including the apparatus for fractionating alternative solid fuels of the present invention in a fifth embodiment of use.

[0066] FIG. 7 is a diagram of a thermoelectrical plant, including the apparatus for fractionating alternative solid fuels of the present invention as another embodiment of use.

[0067] FIG. 8 is a top view of the mesh/grill of the present invention showing the cooling means.

DETAILED DESCRIPTION OF THE INVENTION

[0068] The invention will be described referring to a preferred embodiment thereof, illustrated in the accompanying drawings wherein the same signs and numbers, refer to the same parts of the shown figures.

[0069] Referring to FIG. 1, the apparatus for fractionating alternative solid fuel includes:

[0070] gasifying means having a main column 1 having a first end 2 and a second end 3, and including:

[0071] a feeding zone F, having:

[0072] valve means including one or more feeding valves comprising gates 4, 4', located at the feeding zone F, in which the solid fuels S are fed, and which are opened and closed for a convenient time and sequence in order to feed the solid fuels S to the place wherein the combustion will take place;

[0073] driving means for the feeding valves (not shown) which could be hydraulic motors, for opening and closing said feeding valves 4, 4';

[0074] a gasifying zone G located below the feeding zone F, having:

[0075] input means for hot air 5 which is used for the combustion of the solid fuels S, coming from a suitable source (not illustrated) which could be, in case of applying the present invention to a rotary kiln for producing cement, the tertiary air duct or the clinker cooler, with such input means providing a hot air current that is co-current with the path that follow the solid fuels inside the apparatus;

[0076] input means 6 for cool air coming from a suitable source such as an air pump;

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[0077] retaining means comprising one or more alternately introduced and withdrawn cooled mesh and/or grills 7, 7', 7" having internal pipes P as cooling means, such as mesh 7 with pipes P shown in FIG. 8; and

[0078] driving means 20, such as motors and/or pumps, are capable of substantially and/or totally introducing and/or withdrawing the mesh and/or grills, such as grill 7 in FIG. 8, into the pathway of the materials, with substantial and/or total withdrawal allowing the processed tires to pass through the pathways of the apparatus unobstructed and to avoid build-up and/or clogging of material in the pathways, with cool air or water is circulated into the pipes P by means of a pump, said cooled grills controlling the bed permeability and permanence time of the solid fuels S at the gasifying zone G and are able to be withdrawn in order to discharge the coal and solids, after the separation of volatile and solids is achieved, to a discharging zone D avoiding the melting of wire or any matter on the grills, with the driving means 20 for the cooled grills, as shown in FIG. 8, which operatively introduce or withdraw said cooled grills 7, 7', 7";

[0079] a duct 8 into which volatiles are discharged from the gasifying zone G for further use, said volatiles serving as supplemental fuel;

[0080] a discharging zone D located below the gasifying zone G having:

[0081] valve means including one or more discharging valves comprising gates 9, 9' which receive the coal C and solids, such as wire W, coming from the gasifier G and which are opened at a convenient time in order to discharge the coal and solids C from the apparatus; and

[0082] a discharging opening H located below the discharging valves or gates 9, 9' to discharge the coal C and solids, such as wire W, from the apparatus.

[0083] It is to be understood that the gasifying means may be a vertical column wherein the feeding zone, the gasifying zone and the discharging zone are placed in a downwardly sequence, or else, it can be a horizontal chamber wherein the feeding zone, the gasifying zone and the discharging zone are placed in a side by side fashion, and in this embodiment it would be needed a mechanical feeding device including an hydraulic cylinder and piston assembly (not shown).

[0084] The apparatus of the present invention, operating at a temperature between about 900° C. and about 1150° C., can be used for fractionating continuously batches of supplemental fuel, such as whole tires, so that when a first batch of burning material is placed at the feeding valves 4, 4' which are initially closed, a second batch may be already at the gasifying zone G, wherein the cooled grills 7, 7', 7" are sequentially opened at predetermined times, depending on the characteristics, such as size, of the supplemental fuel being processed, thus controlling the bed permeability and permanence time, and avoiding the formation of agglomer-

ates inside the apparatus. The grill cooling means (not shown) avoid that the pipes forming the grill lose mechanical properties due to overheating or corrosion.

[0085] When the last cooled grill is opened 7", if the apparatus has more than one grill, the resultant coal C and solids, such as wire W, are discharged to the discharge valve 9, which is opened at a convenient time as well as the other discharge valves 9', in case that the apparatus has more than one discharge valve, when a predetermined amount of coal C and solids W are obtained.

[0086] The last feeding valve 4' is opened discharging the supplemental fuel to the first cooled grill 7, as soon as this is emptied.

[0087] Therefore, the apparatus of the present invention can be fed with whole tires, without problems such as wire entangling, obtaining a complete separation of volatile, coal and wire.

[0088] Although it was mentioned that the apparatus of the present invention has an input of hot air 5, it is also suitable to operate without a hot air input when there is not available.

[0089] As it was mentioned, one of the applications of the present invention is at the cement industry, in which the installation of the present apparatus is at a rotary cement kiln or calcinator, using whole or shredded tires as supplemental fuel.

[0090] Referring to FIG. 2, a first possible embodiment of use of the apparatus of the present invention R, at a rotary cement kiln, is by installing the apparatus at the back end of the cement kiln, feeding the apparatus with whole or shredded tires T, injecting air from the atmosphere A, taking hot air from the tertiary air duct 19, if the kiln has a tertiary air duct, and discharging the volatiles V to the pre-calcinator or calcinator 10 to substitute primary fuel M, and discharging wire W and tire coal C to the kiln input 11 to substitute primary fuel. The wire is integrated to the clinker K, substituting part of the iron required in the form of an oxide. The main advantages of this form of use are that the volatiles are burned where it is required. Therefore there is less tendency to form hot points and agglomerates at the input of the kiln, than in the case in which all the alternative fuel is directly fed to the kiln.

[0091] Referring to FIG. 3, a second possible embodiment of use, is as described in the first one, but additionally discharging the wire W to the outside of the apparatus and of the rotary kiln 12, to containers or to a conveyor belt (not shown). This way of use is suitable for the production of white cement in which the iron oxide content is less than in the normal cement.

[0092] Referring to FIG. 4, a third possible embodiment of use, is as described in the second one, but discharging the tire coal C to the main burner 13. The main advantage of discharging the tire coal C to the main burner 13 is that a higher percentage of primary fuel substitution can be achieved mainly because the tire coal C is burned in the main burner 13 after reaching the limit of energy amount substituted at the pre-calcinator.

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