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(54) **Title**: CALCINER EXHAUST GAS FILTER CAKE DRYING PROCESS

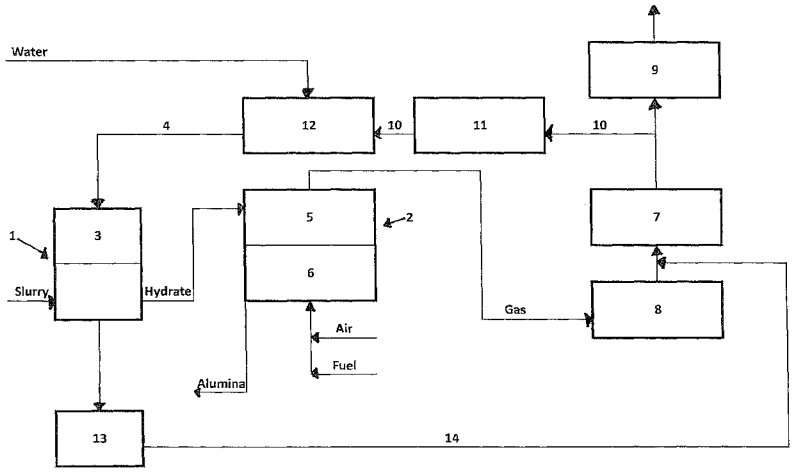

Figure 1

(57) **Abstract**: A description is given of a method as well as a plant for dewatering a filter cake in a vacuum filter (1) subject to simultaneous supply of steam-laden gases, where the filter cake is subsequently calcined in a calciner system (2) through heat exchange with hot exhaust gases. The method and plant are peculiar in that the steam-laden gases comprise hot exhaust gases from the subsequent calciner system. It is hereby obtained that the filter cake can be dewatered at significantly lower costs to essentially the same residual moisture as attainable for known devices. This is due to the fact that the need for specialized processing equipment for producing steam is eliminated by utilization of hot exhaust gases from the calciner system.

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Calciner Exhaust Gas Filter Cake Drying Process

The present invention relates to a method for dewatering a filter cake in a vacuum filter subject to simultaneous supply of steam-laden gases where the filter cake is subsequently calcined in a calciner system through heat exchange with hot exhaust gases. The invention further relates to a plant for carrying out the method according to the invention.

It is generally known practice to use vacuum filters of different kinds for dewatering a filter cake where the filter cake is located on one side of a filter membrane and water is extracted from the filter cake and subsequently through the membrane by means of a vacuum provided on the other side of the filter membrane. Normally atmospheric air, possibly preheated, is used to extract the water from the filter cake. So for alumina production, for example, it will be possible to attain a filter cake having a moisture content of about 7 per cent. In order to further reduce the moisture content and hence the energy requirements for the subsequent calcination process, it is furthermore known practice to supply steam rather than atmospheric air to the vacuum filter, whereby the condensation heat from the steam when being brought into contact with the colder filter cake will heat up moisture being trapped either physically or due to surface tensions (capillary forces) in the filter cake, thus reducing the viscosity of such moisture and facilitating its extraction from the filter cake. As a consequence hereof, the moisture content of the filter cake can be further reduced to a level around 5 per cent. However, the disadvantage associated with the use of steam is that the steam production process will involve significant costs, both with respect to process equipment and operationally.

It is the object of the present invention to provide a method as well as a plant for dewatering a filter cake subject to simultaneous supply of steam-laden gases whereby it will essentially be possible to attain the degree of dewatering attainable by means of known devices, but at lower costs.

This is obtained by a method of the kind mentioned in the introduction and being characterized in that the steam-laden gases comprise hot exhaust gases from the subsequent calciner system.

It is hereby obtained that the filter cake can be dewatered at significantly lower costs to essentially the same residual moisture as attainable for known devices. This is due to the fact that the need for specialized processing equipment for producing steam is eliminated by utilization of hot exhaust gases from the calciner system.

The exhaust gases from the calciner system will typically have a relative humidity of approximately 50 per cent and therefore contain less potential condensation heat than saturated steam traditionally used. Therefore, it may be advantageous to add a fluid in the form of filtrate, water or the like into the exhaust gases from the calciner system before they are introduced to the vacuum filter.

The plant for carrying out the method comprises a vacuum filter for dewatering of filter cake subject to simultaneous supply of steam-laden gases as well as a calciner system for calcination of filter cake through heat exchange with hot exhaust gases and being characterized in that it further comprises means for conveying hot exhaust gases from the calciner system to the vacuum filter.

The plant may further comprise means for introducing filtrate, water or similar fluid into the exhaust gases from the calciner system before they are fed to the vacuum filter.

The invention will now be explained in further details with reference to the drawing, being diagrammatical, with its only figure showing an embodiment of a plant for carrying out the method according to the invention.

In the figure is seen a block diagram of a plant for manufacturing alumina, with said plant comprising a vacuum filter 1 and a calciner system 2. The vacuum filter may be constituted by a so-called horizontal Pan Filter which is marketed by FLSmidth A/S, and which by using a horizontally rotating table provides

continuous filtration, washing and dewatering of the processed filter cake, but in principle the vacuum filter 1 may be constituted by any suitable vacuum filter, such as a belt vacuum filter. The vacuum filter 1 comprises a steam casing 3 over the section of the filter which is designed for carrying out final dewatering of the filter cake so that steam-laden gases via a duct 4 can be introduced to this section. The shown calciner system 2 comprises a cyclone preheater 5 and a calciner 6 in which the dewatered filter cake from the vacuum filter 1 while suspended in hot gases is preheated and calcined into alumina. The calcined alumina is subsequently cooled in a not shown cooler system. The gases are drawn through the calciner system 2 by means of a fan 7 and dedusted in a filter apparatus 8, such as an electrostatic precipitator, a bag filter or a similar apparatus, before they are vented to a stack 9.

In order to reduce the costs for manufacturing steam-laden gases, it is proposed according to the invention that use is made of the hot exhaust gases from the calciner system 2. The exhaust gases may be extracted directly from a location in the calciner system per se, but in order to limit the amount of exhaust gas pollutants fed to the vacuum filter 1 it is preferred that the exhaust gases are extracted via a duct 10 from a location after the filter apparatus 8 by means of a separate fan 11.

The gases extracted via the duct 10 which typically have a relative humidity of approximately 50 per cent may be fed directly into the vacuum filter 1. In cases where it is desirable to ensure a higher relative humidity in the exhaust gases before they are fed to the vacuum filter, a filtrate, water or similar fluids may be added. This may for example take place in a compartment 12, as shown.

As an option, the exhaust gases from the vacuum filter 1 may via a vacuum filter pump 13 be directed to the suction side of the fan 7 through a duct 14.

Patent claims

1. A method for dewatering a filter cake in a vacuum filter (1) subject to simultaneous supply of steam-laden gases where the filter cake is subsequently calcined in a calciner system (2) through heat exchange with hot exhaust gases, **characterized in that** the steam-laden gases comprise hot exhaust gases from the subsequent calciner system.

2. A method according to claim 1, wherein a fluid is added in the form of filtrate, water, or similar fluid to the hot exhaust gases from the subsequent calciner system (2) before the hot exhaust gases are fed to the vacuum filter (1).

3. A method according to claim 1, wherein said hot exhaust gases from the subsequent calciner system (2) pass through a filter apparatus (8) such as a de-duster, electrostatic precipitator, or bag filter before the hot exhaust gases are fed to the vacuum filter (1).

4. A method according to claim 1, wherein said hot exhaust gases from the subsequent calciner system (2) are conveyed by means (4,7,10,11) for directing hot exhaust gases from the calciner system (2) to the vacuum filter (1).

5. A method according to claim 1, wherein means (12) for adding filtrate, water, or similar fluid to the hot exhaust gases from the calciner system (2) is provided to increase a relative humidity of the hot exhaust gases from the calciner system (2), saturate the hot exhaust gases, or increase condensation heat before the hot exhaust gases are fed to the vacuum filter (1).

6. A plant for dewatering a filter cake in a vacuum filter (1) subject to simultaneous supply of steam-laden gases where the filter cake is subsequently calcined in a calciner system (2) through heat exchange with hot exhaust gases, **characterized in that** it further comprises means (4,7,10,11) for directing hot exhaust gases from the calciner system (2) to the vacuum filter (1).

7. A plant according to claim 6, further comprising means (12) for adding filtrate, water, or similar fluid to the hot exhaust gases from the calciner system (2) before the hot exhaust gases are fed to the vacuum filter (1).

8. A plant according to claim 6, further comprising a filter apparatus (8) such as a de-duster, electrostatic precipitator, or bag filter which is configured to limit the amount of hot exhaust gas pollutants fed to the vacuum filter (1).

9. A plant according to claim 6, further comprising means (4,7,10,11) for directing hot exhaust gases from the calciner system (2).

10. A plant according to claim 10, wherein said means (4,7,10,11) for directing hot exhaust gases from the calciner system (2) to the vacuum filter (1) comprises one or more ducts (4,11) or fans (7,11)

11. A plant according to claim 6, further comprising means (12) for adding filtrate, water, or similar fluid to the hot exhaust gases from the calciner system (2) before the hot exhaust gases are fed to the vacuum filter (1), wherein the means (12) for adding filtrate, water, or similar fluid increases a relative humidity of the hot exhaust gases, saturates the hot exhaust gases, or increases condensation heat of the hot exhaust gases before the hot exhaust gases are fed to the vacuum filter (1).

12. A plant according to claim 6, further comprising means (12) for adding filtrate, water, or similar fluid to the hot exhaust gases from the calciner system (2), a filter apparatus (8) between said vacuum filter (1) and calciner system (2), and a vacuum filter pump (13) configured to direct exhaust gasses from the vacuum filter (1) downstream of said filter apparatus (8).

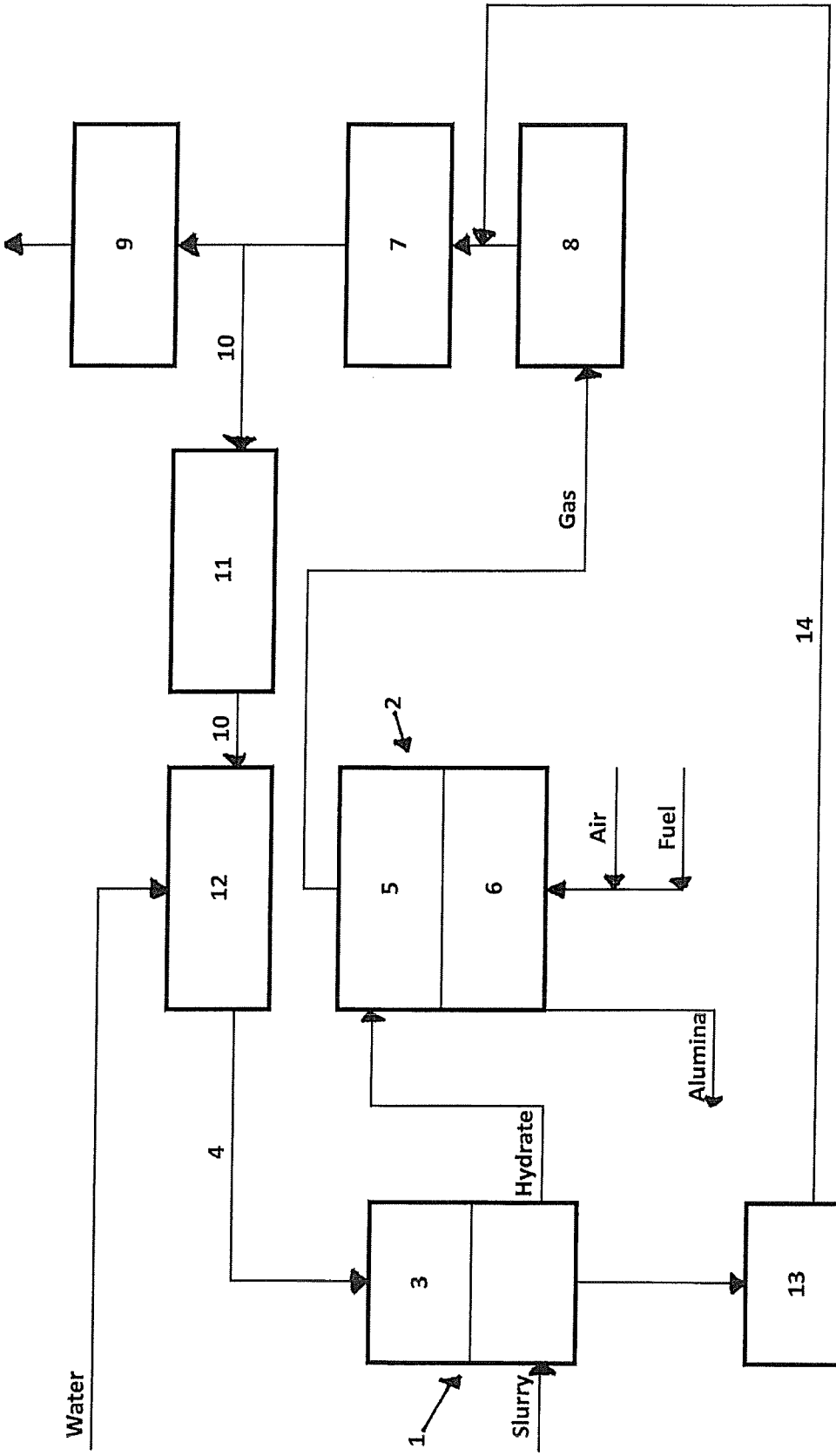
9
7
8
10
11
Gas
14
10
2
12
5
6
Air
Fuel
Alumina
4
Hydrate
3
13
Water
1
Slurry

Figure 1

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2011/001979

A. CLASSIFICATION OF SUBJECT MATTER
INV. B01D29/84 B01D33/66 F26B3/06
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B01D F26B

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 1 465 880 A (QUIGLEY CO) 2 March 1977 (1977-03-02) page 2, lines 15-33	1-13
X	DE 198 00 881 A1 (METALLGESELLSCHAFT AG [DE]) 15 July 1999 (1999-07-15) column 1, lines 52-60 column 3, lines 25-31	1-13
X	US 4 299 560 A (NAKAMURA NORIO ET AL) 10 November 1981 (1981-11-10) abstract; figures 1-3	1-13
A	US 5 527 458 A (GEHRMANN DIETRICH [DE] ET AL) 18 June 1996 (1996-06-18) the whole document	1-13

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
7 December 2011	15/12/2011

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

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