Abstract: Described is a roller mill (1) for grinding particulate material such as cement raw materials, cement clinker and the like, said roller mill (1) comprising a grinding table (3), a set of rollers rotateable about a vertical shaft (5), said set of rollers comprising a number of rollers (4) rotating about separate roller shafts (6), which are connected to the vertical shaft (5), and a nozzle ring (7) for directing gases into the roller mill (1), said nozzle ring (7) enclosing the grinding table (3), and means (8) for regulating the gas flow through the nozzle ring (7). The roller mill is peculiar in that at least some of the regulation means (8) are arranged to rotate together with the set of rollers. In order to ensure optimum regulation of the gas flow through the nozzle ring in relation to the uneven load imposed by the material, thereby optimizing the roller mill operation in terms of capacity, grinding efficiency and energy consumption, the position of at least some of the regulation means for regulating the gas flow through the nozzle ring relative to the set of rollers remains the same at all times. The gases which are introduced into the mill via the nozzle ring will, therefore, always exhibit the same flow pattern in relation to the set of rollers.

Title: A ROLLER MILL
A ROLLER MILL

The present invention relates to a roller mill for grinding particulate material such as cement raw materials, cement clinker and the like, said roller mill comprising a grinding table, a set of rollers rotatable about a vertical shaft, said set of rollers comprising a number of rollers rotating about separate roller shafts, which are connected to the vertical shaft, and a nozzle ring for directing gases into the roller mill, said nozzle ring enclosing the grinding table, and means for regulating the gas flow through the nozzle ring.

Roller mills comprising a grinding table and a therewith interactively operating and rotating set of rollers are known. Also known are roller mills comprising a nozzle ring enclosing the grinding table. Roller mills comprising a combination of these characteristics are not known to the applicant filing the present patent application, however, such are considered to be obvious.

In connection with the operation of roller mills of the kind mentioned in the introduction, it is reasonable to assume that the material which is ejected from the table will be unevenly distributed across the circumference of the grinding table, and that the load on the nozzle ring therefore will be high in some areas and low in other areas. At the same time, it is reasonable to assume that the areas with high and low load, respectively, on the nozzle ring will move constantly with the rotating set of rollers. This uneven distribution of the load imposed by the material on the nozzle ring is envisaged to necessitate adjustment of the gas flow through the nozzle ring for optimizing the mill performance in terms of capacity, grinding efficiency and energy consumption.

It is the object of the present invention to provide a roller mill by means of which the aforementioned disadvantages are reduced.

This is obtained by means of a roller mill of the kind mentioned in the introduction and being characterized in that at least some of the regulation means are arranged to rotate together with the set of rollers.
Hence it will be possible ensure optimum regulation of the gas flow through the nozzle ring in relation to the uneven load imposed by the material, thereby optimizing the roller mill operation in terms of capacity, grinding efficiency and energy consumption. This is aschbable to the fact that the position of at least some of the regulation means for regulating the gas flow through the nozzle ring relative to the set of rollers remains the same at all times, and the fact the gases which are introduced into the mill via the nozzle ring will, therefore, always exhibit the same flow pattern in relation to the set of rollers.

In principle, the regulation means may be rotated using any appropriate means. However, it is preferred that the regulation means are connected to the vertical shaft to which the set of rollers is also connected. This will ensure that the set of rollers and the regulation means rotate at exactly the same angular velocity. In an alternative embodiment, the regulation means may, by use of appropriate means, be connected for example to the roller shafts or other parts of the rollers close to the nozzle ring.

The regulation means may in the circumferential direction be divided into sections, each of which may be configured in a number of different ways. For optimum utilization of the gases introduced into the roller mill through the nozzle ring and to minimize the fall-through of material through the nozzle ring it is preferred that some of the sections of the regulation means are blanked off. Hence it will be possible to introduce the gases into the roller mill at the exact locations where the greatest material load is imposed on the nozzle ring. It is preferred that the sections of the regulation means located immediately opposite each roller are blanked off since the lowest material load will typically be imposed on these sections, and since the wear rate on the rollers is hereby significantly reduced.

All or some of the sections of the regulation means may be configured with lamellae or other forms of guiding faces which direct the gas into the roller mill at different angles relative to the vertical plane. Hence the regulation means may for
example be configured with sections comprising rear-facing, forward-facing or vertical lamellae and possibly blanked-off sections.

In addition, as a supplement to the rotatable regulation means, stationary regulation means may be provided in the nozzle ring. These stationary regulation means may also be configured with sections comprising rear-facing, forward-facing or vertical lamellae.

The invention will now be explained in further details with reference to the drawing, being diagrammatical, and where

Fig. 1 shows a sectional view of a roller mill according to the invention viewed from the top, and

Fig. 2 shows a sectional view of a roller mill according to the invention viewed from the side.

In Fig. 1 is seen a sectional view of a roller mill 1 which comprises a horizontal grinding table 3 and a set of rollers 4 interacting therewith, said rollers being connected to and rotating about a vertical shaft 5. The rollers 4 rotate about separate roller shafts 6 which are connected to the vertical shaft 5. The roller mill also comprises a nozzle ring 7 which encloses the grinding table 3 and means 8 for regulating the gas flow through the nozzle ring 7 and into the roller mill 1.

According to the invention at least some of the regulation means 8 are arranged to rotate together with the rollers 4, thereby ensuring that the position of the regulation means 8 relative to the rollers 4 remains the same at all times and that gases directed into the mill 1 via the nozzle ring 7 always exhibit the same flow pattern relative to the rollers 4. In this way the gas flow through the nozzle ring 7 can be regulated in optimum manner relative to the non-uniform load imposed by the material, allowing the performance of the roller mill 1 to be optimized in terms of capacity, grinding efficiency and energy consumption.
In the embodiment shown in Fig. 2, the regulation means 8 are connected to the vertical shaft 5 by means of rods 9 so that the rotation of the rollers 4 and the regulation means 8 occurs at exactly the same angular velocity. The regulation means 8 may alternatively be connected to for example the roller shafts 6 or other parts of the rollers 4 close to the nozzle ring 7.

In the shown embodiment, see in particular Fig. 1, the regulation means 8 are divided into sections in the circumferential direction, and the sections which are located immediately opposite each roller 4 are blanked off since the load imposed by the material is typically lowest on these sections, and since the wear on the rollers is hereby significantly reduced. The other sections of the regulation means 8 are configured with rear-facing, forward-facing or vertical lamellae 10 which direct the gases into the roller mill at different angles relative to the vertical plane.

In addition, the shown roller mill comprises stationary regulation means 11, which are arranged in the nozzle ring 7 and being configured with sections comprising rear-facing, forward-facing or vertical lamellae.
Claims

1. A roller mill (1) for grinding particulate material such as cement raw materials, cement clinker and the like, said roller mill (1) comprising a grinding table (3), a set of rollers rotatable about a vertical shaft (5), said set of rollers comprising a number of rollers (4) rotating about separate roller shafts (6), which are connected to the vertical shaft (5), and a nozzle ring (7) for directing gases into the roller mill (1), said nozzle ring (7) enclosing the grinding table (3), and means (8) for regulating the gas flow through the nozzle ring (7), characterized in that at least some of the regulation means (8) are arranged to rotate together with the set of rollers.

2. A roller mill according to claim 1, characterized in that the regulation means (8) are connected to the vertical shaft (5).

3. A roller mill according to claim 1, characterized in that the regulation means (8) are connected to the roller shafts (6).

4. A roller mill according to claim 1, characterized in that the regulation means (8) in the circumferential direction are divided into sections.

5. A roller mill according to claim 4, characterized in that that some of the sections of the regulation means (8) are blanked off.

6. A roller mill according to claim 4, characterized in that the sections of the regulation means (8) located immediately opposite each roller (4) are blanked off.

7. A roller mill according to claim 4, characterized in that at least some of the sections of the regulation means (8) are configured as lamellae (10) or other forms of guiding faces which direct the gas into the roller mill at different angles relative to the vertical plane.
8. A roller mill according to claim 4, **characterized in** that the sections of the regulation means (8) are configured with sections comprising rear-facing, forward-facing or vertical lamellae.

9. A roller mill according to claim 1, **characterized in** that it comprises stationary regulation means (11) in the nozzle ring (7).

10. A roller mill according to claim 9, **characterized in** that the stationary regulation means (11) are configured with sections comprising rear-facing, forward-facing or vertical lamellae.
A. CLASSIFICATION OF SUBJECT MATTER

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

A. C15/00 B02C15/14

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B02C

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No</th>
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<td>A</td>
<td>DE 34 09 710 A1 (APPARATE VERFAHREN ENG AVE [CH]) 20 September 1984 (1984-09-20) page 7, lines 12-36; figure 1</td>
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D. Further documents are listed in the continuation of Box C

* Special categories of cited documents

A: document defining the general state of the art which is not considered to be of particular relevance

E: earlier document but published on or after the international filing date

L: document which may throw doubts on novelty claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O: document referring to an oral disclosure, use, exhibition or other means

P: document published prior to the international filing date but later than the priority date claimed

* T: later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X: document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y: document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

X: document member of the same patent family

Date of the actual completion of the international search: 9 December 2008

Date of mailing of the international search report: 05/01/2009

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<td>DE 3409710</td>
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