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(54) **MILL FOR CERAMIC MATERIALS**

(57) A mill for grinding a material, comprising: a hollow body (2), rotating around an axis of rotation (X) and equipped with a loading opening (2a), concentric to the axis of rotation (X), and an unloading opening (2b), con-

centric to the axis of rotation (X). The mill comprises a loading grille (3), arranged inside the hollow body (3) and located in front of the loading opening (2a), having a plurality of through openings (31).

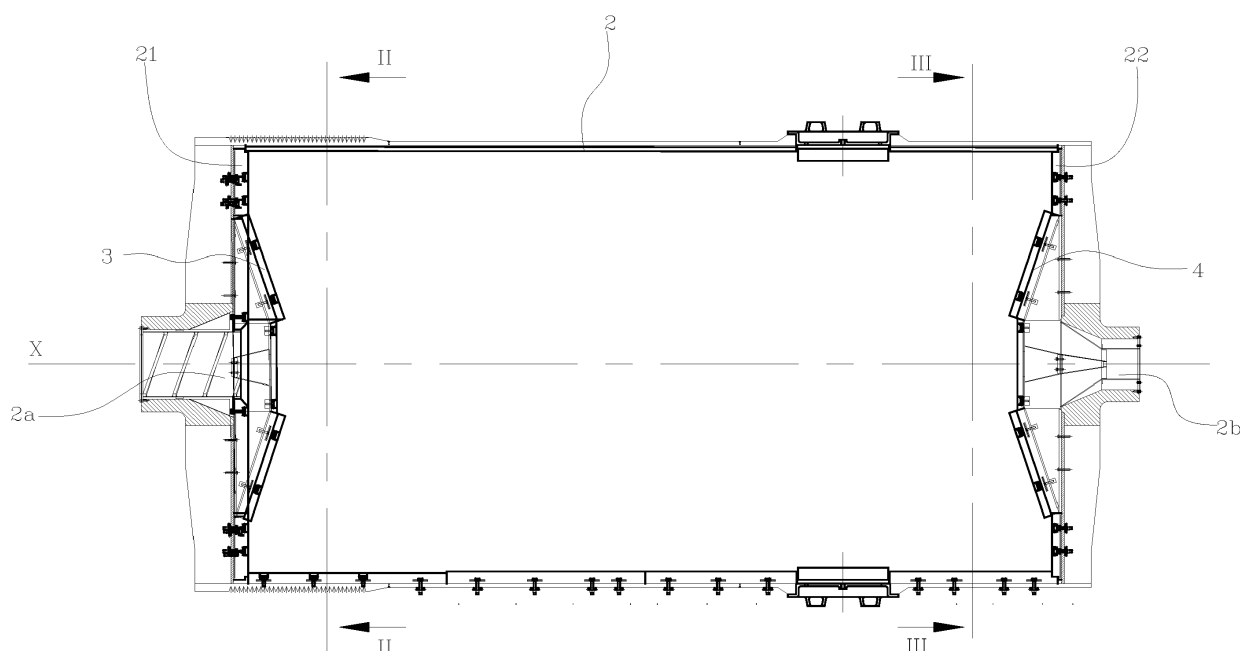


Fig.1

Description

[0001] The present invention relates to a mill for grinding at least one material used in the ceramics industry, e.g. clay ceramics.

[0002] The invention relates in particular to a mill comprising a rotating hollow body, which defines a volume in which grinding bodies are arranged immersed in a liquid, typically water. The grinding bodies have the function of grinding the material introduced into the volume itself, following the rotation of the mill about an axis of rotation and during such rotation.

[0003] The best performing mills perform their grinding action in a continuous cycle. In essence, the introduction of the material to be ground and the extraction of the ground material are carried out concentrically to the axis of rotation of the mill, so that the hollow body can be kept in continuous rotation.

[0004] During operation of the mill, the grinding bodies are cyclically dragged upwards by the rotation of the hollow body and fall down once it reaches a position of maximum height. During these movements, the grinding bodies can accidentally enter the loading opening or unloading opening of the mill, causing occlusions or, in any case, exiting from the mill.

[0005] To limit this drawback, the mills are filled up to a level lower than that of the loading and unloading openings of the mill. This involves a considerable imbalance of the total mass of the mill with respect to the axis of rotation of the hollow body, and a consequent increase in the energy consumption required to keep the mill in rotation. On the other hand, it is not currently possible to raise the filling level of the mill, as in doing so the number of hollow bodies which tend to escape from the mill through the loading and unloading openings greatly increases.

[0006] The object of the present invention is to overcome the drawbacks of the currently available mills, preventing the grinding bodies from escaping from the mill.

[0007] Characteristics and advantages of the present invention will more fully emerge from the following detailed description of an embodiment of the invention, as illustrated in a non-limiting example in the accompanying figures, in which:

- figure 1 shows a schematic sectional view of a mill according to the present invention, on a section plane which contains the axis of rotation (X) of the mill;
- figure 2 shows a sectional view on the plane II-II of figure 1;
- figure 3 shows a sectional view on the plane III-III of figure 1.

[0008] The mill according to the present invention comprises a hollow body (2), rotating around an axis of rotation (X). The hollow body (2) has a cylindrical shape, concentric with the axis of rotation (X), and is equipped

with a loading head (21) and an unloading head (22) which close the hollow body (2) at its ends. The two heads (21,22) are arranged substantially transverse to the axis of rotation (X). Motor means, not shown, are arranged to drive the hollow body (2) in rotation through a transmission. The motor means and the transmission required for driving the rotation of the hollow body (2) are well known in the industry, and will therefore not be described in further detail.

[0009] The hollow body is equipped with a loading opening (2a), concentric to the axis of rotation (X), and an unloading opening (2b), concentric to the axis of rotation (X). The loading opening (2a) is formed through the loading head. Supply means, not shown, can be connected to the loading opening (2a) for supplying the material to be subjected to grinding inside the hollow body (2). The unloading opening (2b) is formed through the unloading head (22), to allow the outflow of the ground material. The unloading opening (2b) can be connected to a duct which carries the ground material to a subsequent destination.

[0010] As is known, the material to be ground is fed to the hollow body (2) in an aqueous suspension. A plurality of grinding bodies are also arranged inside the hollow body (2) which, cyclically rising and falling inside the hollow body (2) due to the rotation of the latter, carry out the grinding of the material.

[0011] Advantageously, the mill according to the present invention comprises a loading grille (3), arranged inside the hollow body (2) and located in front of the loading opening (2a), having a plurality of through openings (31).

[0012] The mill further comprises an unloading grille (4), arranged inside the hollow body (3) and located in front of the unloading opening (2b), having a plurality of through openings (41).

[0013] The two grilles (3,4), equipped with through openings (31,41), allow the flow of the aqueous suspension, while they do not allow the passage of the grinding bodies, which cannot therefore enter into the loading and unloading openings (2a, 2b). In addition, thanks to the presence of the two grilles (3,4), the filling level of the hollow body (2), namely the level of the aqueous suspension containing the material to be ground, can be raised to above the axis of rotation (X), i.e. to above the level of the loading and unloading openings (2a, 2b), allowing a substantial reduction of the energy required for the rotation of the hollow body (2). Without the grilles (3,4) this condition would be substantially impossible, because the partial floating of the grinding bodies in the aqueous suspension would accentuate the tendency of the latter to enter into the loading and unloading openings (2a, 2b). The two grilles (3,4) instead retain the grinding bodies inside the hollow body (2).

[0014] In the embodiment shown, the loading grille (3) is associated with the loading head (21), in a frontal position with respect to the loading opening (2a). The loading grille (3) is substantially concentric to the loading

opening (2a). Preferably, the loading grille (3) has a concave conformation. The concavity of the loading grille (3) is turned towards the loading opening (2a), so that a central area of the loading grille (3) is maintained at a certain distance from the loading head (21), to favour the inflow of material through the loading opening (2a). For example, the loading grille (3) has a truncoconical conformation, concentric to the loading opening (2a). A base flange of the loading grille (3) is associated with the loading head (21), while the apex portion is placed in front of the loading opening (2a). This conformation is particularly effective to allow the inflow of material and, simultaneously, to keep the grinding bodies at a distance from the loading opening (2a).

[0015] In the embodiment shown, the unloading grille (4) is associated with the unloading head (22), in a frontal position with respect to the unloading opening (2b). The unloading grille (4) is substantially concentric to the unloading opening (2b). Preferably, the unloading grille (4) has a concave conformation. The concavity of the unloading grille (4) is turned towards the unloading opening (2b), so that a central area of the unloading grille (4) is maintained at a certain distance from the unloading head (22), to favour the outflow of material through the unloading opening (2b). For example, the unloading grille (4) has a truncoconical conformation, concentric to the unloading opening (2b). A base flange of the unloading grille (4) is associated with the unloading head (22), while the apex portion is placed in front of the unloading opening (2b). This conformation is particularly effective to allow the outflow of material and, simultaneously, to keep the grinding bodies at a distance from the unloading opening (2b).

[0016] The mill according to the present invention provides important advantages.

[0017] The presence of the loading grille (3), which prevents the entry of the grinding bodies in the loading opening (2a), makes it possible to raise the level of filling of the mill well above the axis of rotation (X). This raise in level reduces the eccentricity of the total mass of the mill, i.e. brings the centre of the hollow body and the mass contained therein (2) closer to the axis of rotation (X), so that the energy needed for the rotation of the hollow body (2) is drastically reduced compared to the currently available mills. The raising of the filling level in the hollow body (2) also makes it possible to reduce the processing time. The use of the unloading grille (4) makes it possible to increase the advantages of the invention, insofar as it excludes the possibility that the grinding bodies can enter into the unloading opening (2b).

(2b), concentric to the axis of rotation (X); **characterised in that** it comprises a loading grille (3), arranged inside the hollow body (3) and located in front of the loading opening (2a), having a plurality of through openings (31).

2. The mill according to claim 1, comprising a loading head (21), concentric to the axis of rotation (X), through which the loading opening (2a) is arranged; the loading grille (3) is associated to the loading head (21).
3. The mill according to claim 1, wherein the loading grille (3) has a concave conformation, and wherein the concavity of the loading grille (3) is facing towards the loading opening (2a).
4. The mill according to claim 3, wherein the loading grille (3) is truncoconical.
5. The mill according to claim 4, wherein the loading grille (3) is concentric to the loading opening (2a).
6. The mill according to claim 1, comprising an unloading grille (4), arranged inside the hollow body (2) and located in front of the unloading opening (2b), having a plurality of through openings (41).
7. The mill according to claim 6, comprising an unloading head (22), concentric to the axis of rotation (X), through which the unloading opening (2b) is arranged; the unloading grille (4) is associated to the unloading head (22).
8. The mill according to claim 6, wherein the unloading grille (4) has a concave conformation, and wherein the concavity of the unloading grille (4) is facing towards the unloading opening (2b).
9. The mill according to claim 8, wherein the unloading grille (4) is truncoconical.
10. The mill according to claim 9, wherein the unloading grille (4) is concentric to the unloading opening (2b).

Claims

1. A mill for grinding a material, comprising: a hollow body (2), rotating around an axis of rotation (X) and provided with a loading opening (2a), concentric to the axis of rotation (X), and an unloading opening

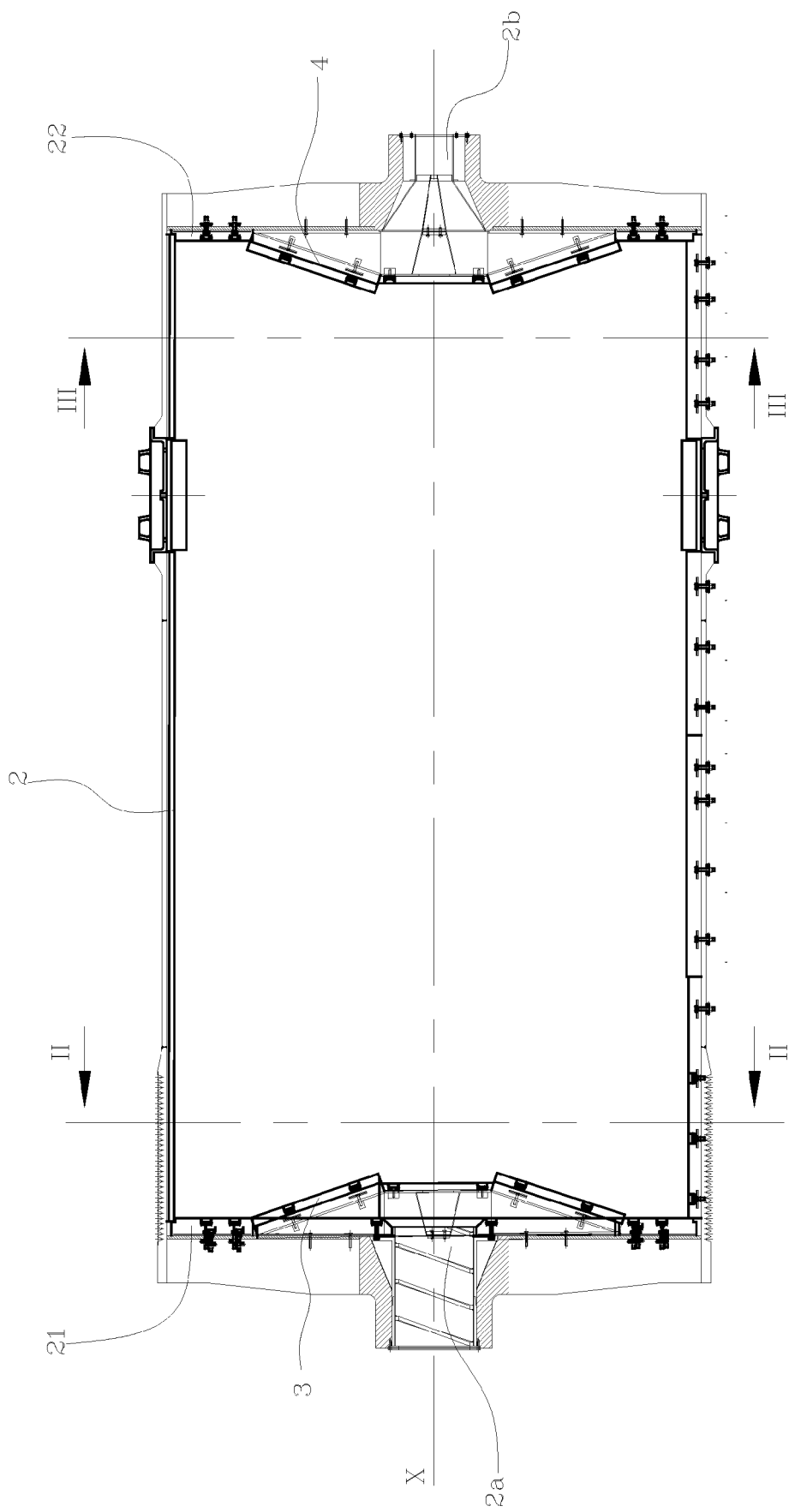


Fig. 1

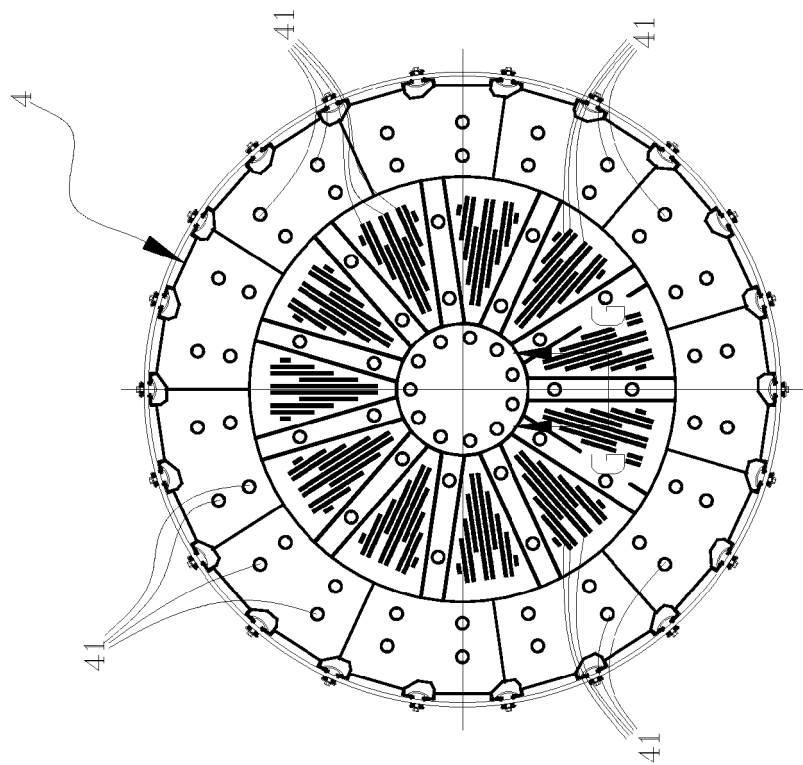


Fig.3

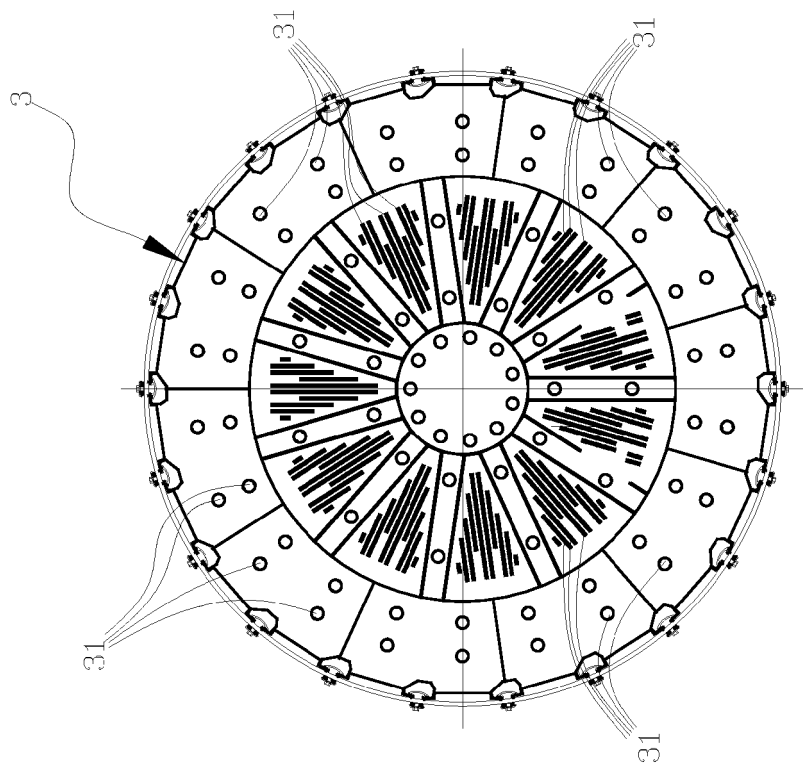


Fig.2



EUROPEAN SEARCH REPORT

Application Number
EP 19 16 1067

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2015/059591 A1 (DAZZI MARIO [IT]) 30 April 2015 (2015-04-30)	1-3,5-8, 10	INV. B02C17/18
Y	* pages 1,2,4 - page 8, paragraph 15; figures 4-7 *	4,9	
Y	EP 0 219 740 A2 (REIMBOLD & STRICK [DE]) 29 April 1987 (1987-04-29) * column 6, lines 29-52; figures 1,2 *	4,9	
			TECHNICAL FIELDS SEARCHED (IPC)
			B02C
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 15 July 2019	Examiner Iuliano, Emanuela
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 O : 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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ON EUROPEAN PATENT APPLICATION NO.**

EP 19 16 1067

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2015059591 A1	30-04-2015	EP 3060344 A1	31-08-2016
		WO 2015059591 A1	30-04-2015

EP 0219740 A2	29-04-1987	AT 43798 T	15-06-1989
		AU 581777 B2	02-03-1989
		BR 8604966 A	14-07-1987
		CA 1244393 A	08-11-1988
		CN 85106019 A	25-02-1987
		CN 86106362 A	08-04-1987
		DD 250062 A5	30-09-1987
		DE 3536454 A1	16-04-1987
		DE 3663778 D1	13-07-1989
		EP 0219740 A2	29-04-1987
		ES 2001716 A6	01-06-1988
		FI 863754 A	13-04-1987
		GR 3000094 T3	29-11-1990
		JP S6287257 A	21-04-1987
		ZA 8607607 B	24-06-1987

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82