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Remarks:

Amended claims in accordance with Rule 86 (2) EPC.

(54) **Inner lining for rotary drum mills**

(57) Inner lining for rotary drum mills (2), which lining comprises at least one metal section bar (1) suitable for being fixed to the inner surface of a rotary drum (2), wherein the upper portion of the section bar (1) is shaped for forming a head suitable for being press-fitted into a complementary groove made in an elastomeric member (3), so as to fix the latter onto the inner surface of the rotary drum (2), while the lower portion of the section bar is shaped for forming a neck narrower than the head, so

that two lips (3a) arranged along the lower edges of the groove of the elastomeric member (3) are comprised between the head of the section bar (1) and the inner surface of the rotary drum (2), wherein the section bar (1) comprises a canal (1a) which is open downwards and is shaped with two opposing ribs (1b) which protrude inwards along the lower edges of the canal (1a) for retaining a fixing member (4) which can be inserted into the canal (1a) from an end of the section bar (1).

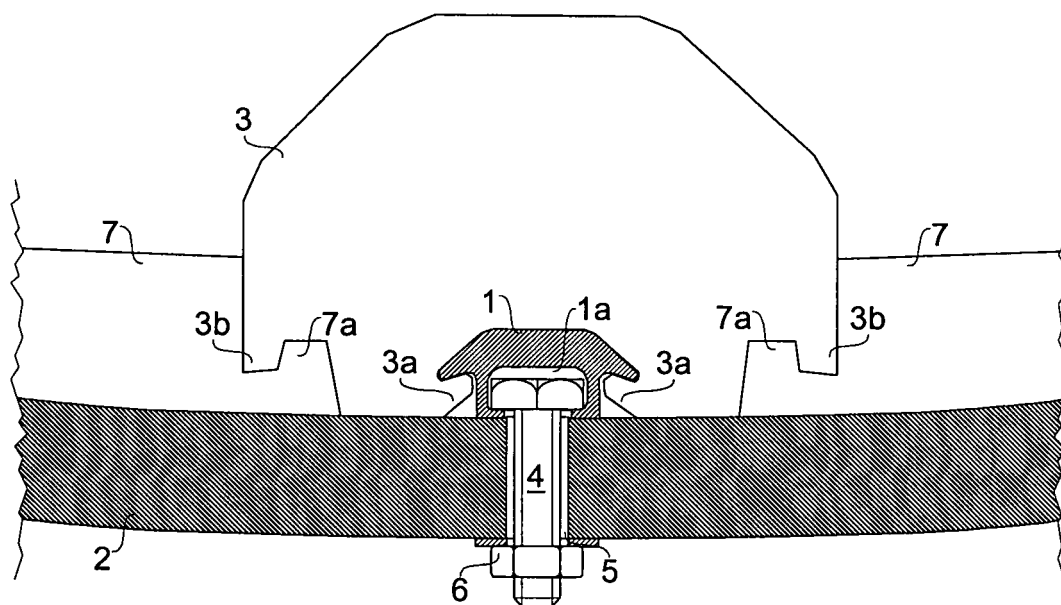


Fig. 2

Description

[0001] The present invention relates to an inner lining for rotary drum mills, and in particular an inner lining comprising a plurality of elastomeric members which can be easily substituted. The present invention also relates to a mill provided with said inner lining.

[0002] EP-A-1479442 discloses an inner lining for rotary drum mills, which lining comprises a plurality of elastomeric bars and panels which are press-fitted onto section bars fixed to the inner surface of the drum, in particular by means of welding. With this arrangement, the assembling and the substitution of the elastomeric members is simpler with respect to the other linings, wherein the elastomeric members are fixed with screws and threaded plates to the surface of the rotary drum, which is thus perforated. For press-fitting the elastomeric members also onto this old kind of drum, said section bars must be welded onto its inner surface, with consequent times and costs which do not make the conversion advantageous.

[0003] It is therefore an object of the present invention to provide a lining free from said disadvantages. Said object is achieved with a lining and a mill, the main features of which are disclosed in claims 1 and 18, while other features are disclosed in the remaining claims.

[0004] Thanks to their particular shape, the section bars of the lining according to the present invention can be fixed to a rotary drum of the old kind by exploiting the existing holes, so that the elastomeric members can be press-fitted also into this drum, with low conversion times and costs. The section bars are easily bolted to the rotary drum, since the screws, by sliding along their particular canals, can be arranged exactly in correspondence with the existing holes, apart from their mutual distance which may vary according to the drum model. With this arrangement, the section bars can be fixed by a single person placed inside the drum, without the help of another person outside, which is instead necessary for screwing the elastomeric members with the old system.

[0005] The section bars of the lining according to the present invention are preferably arranged along the generatrices of the rotary drum, so that they can be as long as the whole drum, i.e. from 2 to 10 m. In this case, several elastomeric members can be press-fitted onto a single section bars, thereby simplifying the fixing of both the section bars and the elastomeric members.

[0006] The elastomeric members comprise particular elastomeric bars which can be fixed onto the section bars, rest firmly on the inner surface of the drum and are shaped for being coupled with particular elastomeric panels, so as to further simplify the assembly and the maintenance of the lining according to the present invention.

[0007] The elastomeric bars are arranged along generatrices of the rotary drum and are higher than the elastomeric panels, so as to improve the milling efficiency of the mill.

[0008] The particular flattened dimensions of the sec-

tion bars allow a higher consumption of the elastomeric bar before its substitution, so as to reduce the maintenance costs and times.

[0009] Further advantages and features of the lining according to the present invention will become clear to those skilled in the art from the following detailed and non-limiting description of an embodiment thereof with reference to the attached drawings, wherein:

- figure 1 shows a partial view of a portion of the lining applied to a mill;
- figure 2 shows a view sectioned along plane II-II of figure 1; and
- figure 3 shows an enlarged view of the section bar of the lining of figure 1.

[0010] Referring to figures 1 to 3, it is seen that the lining according to the present invention comprises in a known way at least one metal section bar 1 suitable for being fixed to the inner surface of a rotary drum 2 of a mill. In particular, a plurality of section bars 1 are fixed in the rotary drum 2 at regular distances. The upper portion of the section bar 1 is shaped for forming a head suitable for being press-fitted into a complementary groove made in an elastomeric member 3, so as to fix the latter onto the inner surface of the rotary drum 2. The lower portion of the section bar is shaped for forming a neck narrower than the head, so that two lips 3a arranged along the lower edges of the groove of the elastomeric member 3 are comprised between the head of the section bar 1 and the inner surface of the rotary drum 2.

[0011] According to the invention, the section bar 1 comprises a canal 1a which is open downwards and is shaped with two opposing ribs 1b which protrude inwards along the lower edges of canal 1a for retaining a fixing member, in particular the head of a screw 4, which can be inserted into canal 1a from an end of the section bar 1. Screw 4 crosses a hole 5 made in the rotary drum 2 and is locked by a nut 6 screwed outside the rotary drum 2, so that the section bar 1 is pulled by screw 4 against the inner surface of the rotary drum 2. The head of the section bar 1 is shaped for forming at least two lateral fins 1c inclined downwards with an angle α comprised between 30° and 50° for improving the press-fitting of the elastomeric member 3. Lips 3a of the elastomeric member 3 are instead inclined upwards, so as to carry out with the lateral fins 1c a shape coupling which pulls the elastomeric member 3 against the inner surface of the rotary drum 2. The elastomeric member 3 is in particular an elastomeric bar arranged along a generatrix of the rotary drum 2. The lower lateral portions of the elastomeric member 3 are shaped for forming a rib 3b turned downwards and a groove open downwards. The lateral edges of elastomeric panels 7 are shaped for obtaining a groove open upwards and a rib 7a turned upwards which carry out a shape coupling with rib 3b and the groove, respectively, of the lower lateral portions of an elastomeric bar 3. The elastomeric panels 7 are arranged

on the inner surface of the rotary drum 2 between two elastomeric bars 3 and are retained against this surface by the lateral portions of the elastomeric bars 3, which are arranged on the lateral edges of the elastomeric panels 7. Width W1 of canal 1a is preferably comprised between 18 and 30 mm, width W2 of the section bar 1 is preferably comprised between 40 and 60 mm, distance D between ribs 1b of the section bar 1 is preferably comprised between 16 and 20 mm, height H of the section bar 1 is preferably comprised between 20 and 30 mm and the length of the section bar 1 is preferably comprised between 2 and 10 m. Furthermore, the elastomeric bars 3 are preferably shorter than the section bar 1 and higher than the elastomeric panels 7.

[0012] Possible modifications and/or additions may be made by those skilled in the art to the hereinabove disclosed and illustrated embodiment of the invention while remaining within the scope of the following claims.

Claims

1. Inner lining for rotary drum mills (2), which lining comprises at least one metal section bar (1) suitable for being fixed to the inner surface of a rotary drum (2), wherein the upper portion of the section bar (1) is shaped for forming a head suitable for being press-fitted into a complementary groove made in an elastomeric member (3), so as to fix the latter onto the inner surface of the rotary drum (2), while the lower portion of the section bar is shaped for forming a neck narrower than the head, so that two lips (3a) arranged along the lower edges of the groove of the elastomeric member (3) are comprised between the head of the section bar (1) and the inner surface of the rotary drum (2), **characterized in that** the section bar (1) comprises a canal (1a) which is open downwards and is shaped with two opposing ribs (1b) which protrude inwards along the lower edges of the canal (1a) for retaining a fixing member (4) which can be inserted into the canal (1a) from an end of the section bar (1).
2. Lining according to the previous claim, **characterized in that** said fixing member is the head of a screw (4) suitable for crossing a hole (5) made in the rotary drum (2) and for being locked by a nut (6) screwed outside the rotary drum (2), so that the section bar (1) is pulled by the screw (4) against the inner surface of the rotary drum (2).
3. Lining according to one of the previous claims, **characterized in that** the head of the section bar (1) is shaped for forming at least two lateral fins (1c) inclined downwards.
4. Lining according to the previous claim, **characterized in that** said lateral fins (1c) of the section bar (1) are inclined downwards with an angle (a) comprised between 30° and 50°.
5. Lining according to claim 3 or 4, **characterized in that** the lips (3a) of the elastomeric member (3) are inclined upwards, so as to carry out a shape coupling with said lateral fins (1c).
6. Lining according to one of the previous claims, **characterized in that** the elastomeric member (3) is an elastomeric bar arranged along a generatrix of the rotary drum (2).
7. Lining according to the previous claim, **characterized in that** the elastomeric bar (3) is shorter than the section bar (1).
8. Lining according to claim 6 or 7, **characterized in that** the lower lateral portions of the elastomeric bar (3) are shaped for forming a rib (3b) turned downwards and a groove open downwards.
9. Lining according to one of claims 6 to 8, **characterized in that** elastomeric panels (7) are arranged beside the elastomeric bar (3).
10. Lining according to the previous claim, **characterized in that** the elastomeric bar (3) is higher than the elastomeric panels (7).
11. Lining according to claim 9 or 10, **characterized in that** the lateral edges of the elastomeric panels (7) are shaped for obtaining a groove open upwards and a rib (7a) turned upwards which carry out a shape coupling with the rib (3b) and the groove, respectively, of the lower lateral portions of an elastomeric bar (3).
12. Lining according to one of claims 9 to 11, **characterized in that** the elastomeric panels (7) are retained against the inner surface of the rotary drum (2) by the lateral portions of elastomeric bars (3).
13. Lining according to one of the previous claims, **characterized in that** the width (W1) of the canal (1a) of the section bar (1) is comprised between 18 and 30 mm.
14. Lining according to one of the previous claims, **characterized in that** the width (W2) of the section bar (1) is comprised between 40 and 60 mm.
15. Lining according to one of the previous claims, **characterized in that** the distance (D) between the ribs (1b) of the section bar (1) is comprised between 16 and 20 mm.
16. Lining according to one of the previous claims, **char-**

acterized in that the height (H) of the section bar (1) is comprised between 20 and 30 mm.

17. Lining according to one of the previous claims, **characterized in that** the length of the section bar (1) is comprised between 2 and 10 m. 5
18. Rotary drum mill (2), **characterized in that** it comprises an inner lining according to one of the previous claims. 10

6. Lining according to one of the previous claims, **characterized by** comprising elastomeric member (3) which is an elastomeric bar arranged along a generatrix of the rotary drum (2).

Amended claims in accordance with Rule 86(2) EPC.

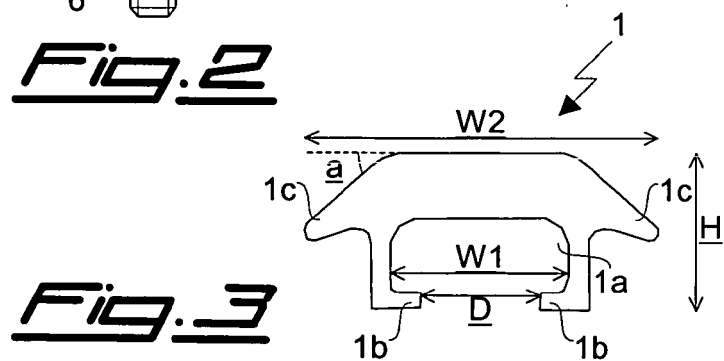
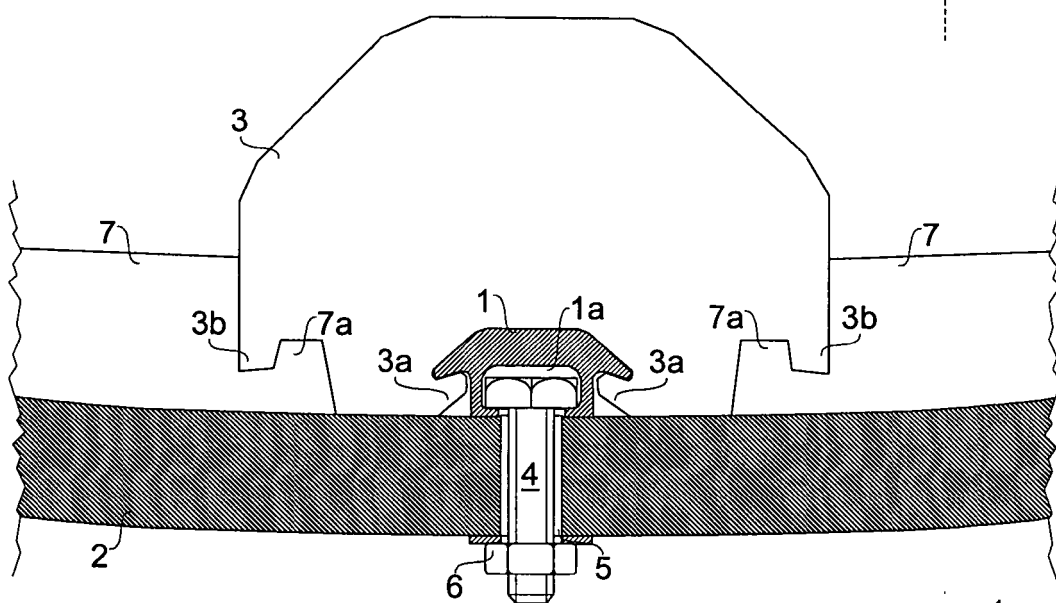
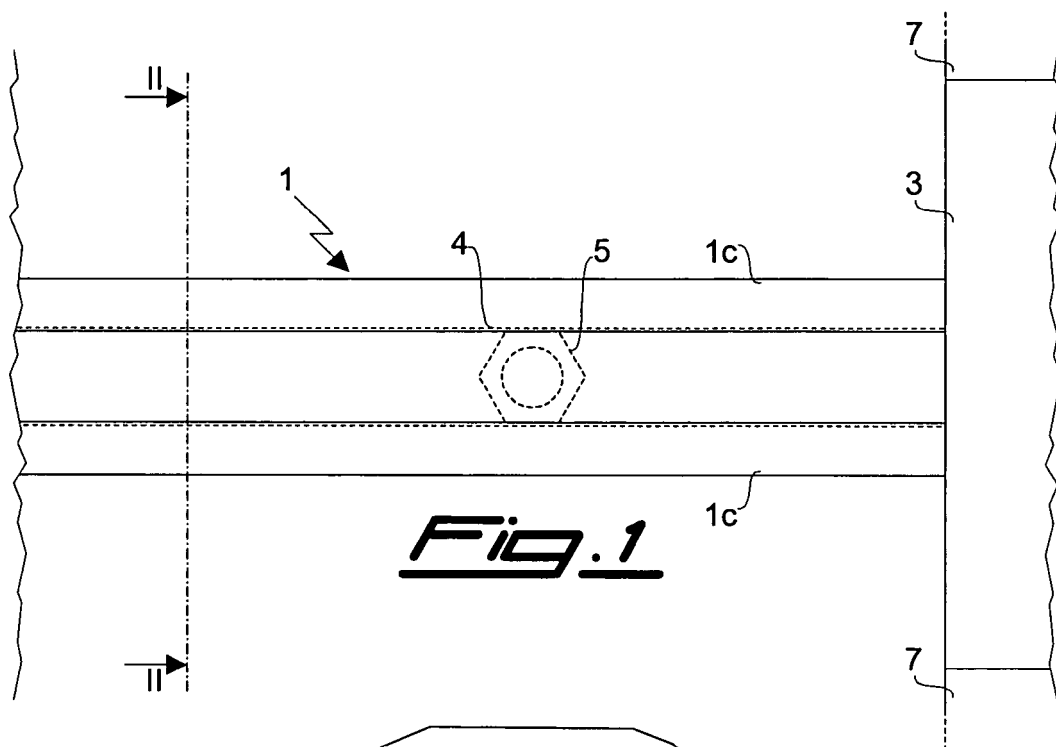
1. Inner lining for rotary drum mills (2), which lining comprises at least one metal section bar (1) suitable for being fixed to the inner surface of a rotary drum (2), wherein the upper portion of the section bar (1) is shaped for forming a head suitable for being press-fitted into a complementary groove made in an elastomeric member (3), so as to fix the latter onto the inner surface of the rotary drum (2), while the lower portion of the section bar is shaped for forming a neck narrower than the head, so that two lips (3a) arranged along the lower edges of the groove of the elastomeric member (3) are comprised between the head of the section bar (1) and the inner surface of the rotary drum (2), **characterized in that** the section bar (1) comprises a canal (1a) which is open downwards and is shaped with two opposing ribs (1b) which protrude inwards along the lower edges of the canal (1a) for retaining a fixing member (4) which can be inserted into the canal (1a) from an end of the section bar (1). 15
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2. Lining according to the previous claim, **characterized by** comprising a fixing member which is the head of a screw (4) suitable for crossing a hole (5) made in the rotary drum (2) and for being locked by a nut (6) screwed outside the rotary drum (2), so that the section bar (1) is pulled by the screw (4) against the inner surface of the rotary drum (2). 35
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3. Lining according to one of the previous claims, **characterized in that** the head of the section bar (1) is shaped for forming at least two lateral fins (1c) inclined downwards. 45

4. Lining according to the previous claim, **characterized in that** said lateral fins (1c) of the section bar (1) are inclined downwards with an angle (a) comprised between 30° and 50°. 50

5. Lining according to claim 3 or 4, **characterized by** comprising an elastomeric member (3) having lips (3a) inclined upwards, so as to carry out a shape coupling with said lateral fins (1c). 55





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 06 42 5020

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	US 3 580 520 A (THOMAS LEROY MYERS) 25 May 1971 (1971-05-25) * the whole document *	1-3,5,6, 18 8-17	INV. B02C17/22
A	----- EP 1 479 442 A (B & B S.R.L) 24 November 2004 (2004-11-24) * the whole document *	1,8-18	
			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 22 June 2006	Examiner Kopacz, I
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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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 06 42 5020

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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22-06-2006

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 3580520	A	25-05-1971	NONE	

EP 1479442	A	24-11-2004	NONE	

REFERENCES CITED IN THE DESCRIPTION

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