

[54] **LIFTING WALL CONSTRUCTION FOR A TUBE MILL OR THE LIKE**

[75] Inventor: **Theodor Lutke-Cossmann**, Vorhelm, Germany

[73] Assignee: **Polysius AG**, Neubeckum, Germany

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[58] Field of Search..... 241/170, 171, 181, 153, 241/70-72, 76, 78, 79.2, 79.3

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*Primary Examiner*—Granville Y. Custer, Jr.  
*Assistant Examiner*—Howard N. Goldberg  
*Attorney, Agent, or Firm*—Learman & McCulloch

[57] **ABSTRACT**

A tube mill material lifting wall comprises a pair of spaced apart discs each of which is composed of individual, apertured segments, confronting segments being joined at their outer ends and having lifting blades therebetween for delivering material to a conical transfer opening at the center of one of the discs. The segments of the disc having the transfer opening are radially longer than those of the other disc and are gripped at their radially inner ends by clamping rings which permit relative radial movement of the segments.

**8 Claims, 4 Drawing Figures**

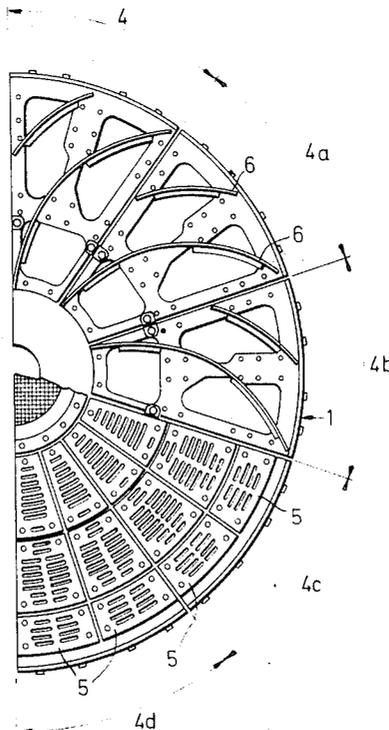




Fig.3

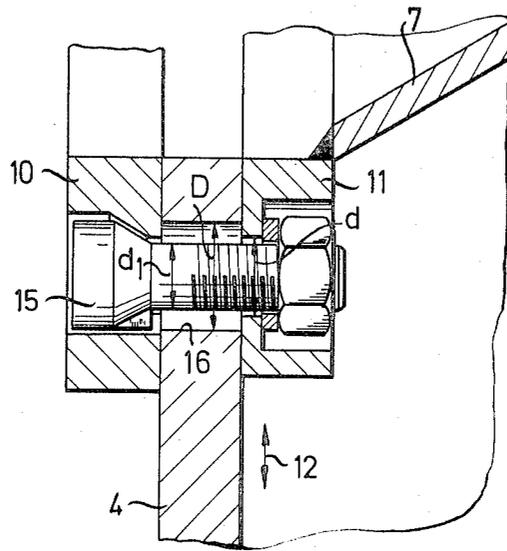
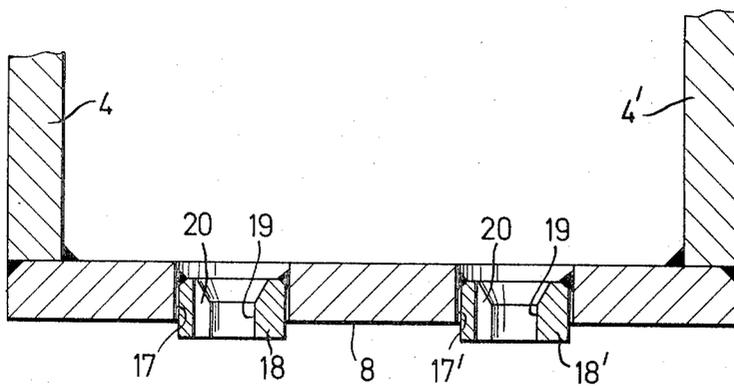


Fig.4



## LIFTING WALL CONSTRUCTION FOR A TUBE MILL OR THE LIKE

This invention relates to a lifting wall for incorporation in a tube mill or the like, and comprising two circular discs disposed at a distance from each other and built up of segments, for supporting plates having apertures, and including lifting blades affixed between the support discs and with a ground material transfer cone lying coaxially in the lifting wall.

Lifting walls are in general incorporated as intermediate and/or end walls in tube mills, drum mills, ball mills, etc. The ground material passes through plates provided with apertures, and behind these plates is fed by the lifting blades and the transfer cone through a central aperture to the next grinding chamber or out of the mill.

Lifting walls of various constructions are already known. In one system the individual support discs are formed by a number of rings concentric with each other and connected together by the lifting blades and by the apertured plates. In another known construction the support discs are formed of individual segments which in general consist of at least one lifting blade together with its corresponding inner and outer circular ring portions. The plates with apertures are screwed on to these circular ring segments and extend over two or more of the neighboring segments to produce a rigidly formed support disc.

In known tube mills the material is frequently ground at high temperatures, so that the lifting walls in particular are subjected to considerable thermal expansions, usually working against each other. Because of the construction of the known lifting walls as described above, the thermal expansions cause internal stresses which very frequently result in breakage of the lifting walls and hence to the mill becoming inoperative.

The object of the invention is therefore to provide a lifting wall of the type described in such manner that stresses due to differing thermal expansions are kept away from the lifting wall.

According to the invention this object is achieved in that the apertured plates are each connected to only one segment, and the segments of the two support discs are connected in pairs by a connecting web affixed to the tube mill casing to form a member with a U-cross section, and are gripped in the area of the transfer cone in such manner that adjacent segments are slidably movable in the radial direction independently of each other.

When, with the lifting wall formed in accordance with the invention, parts of the tube mill casing for instance are deformed by heat or other causes, the individual segments affixed to this part of the casing can move freely in the radial direction of the lifting wall. In this case the individual segments with their corresponding lifting blades and the apertured plates move as independent units. Consequently hardly any stresses can occur in the lifting wall, so that breakages of said wall caused in this manner are precluded.

One embodiment of the invention is described in more detail below in relation to the drawings. In these:

FIG. 1 is a partial view (semi-circle) of a lifting wall in accordance with the invention, with part of the apertured plate uncovered;

FIG. 2 is a side view of the lifting wall, partly in section;

FIGS. 3 and 4 are enlarged views of details (III and IV of FIG. 2) of the above lifting wall.

FIGS. 1 and 2 show a lifting wall 1 in accordance with the invention, which can for instance be incorporated as a separating wall between two grinding chambers in a tube mill. This lifting wall 1 has as main components two annular and spaced-apart support discs 2 and 3 (see FIG. 2). Each support disc 2, 3 in this embodiment is formed of ten apertured ring elements, of which only five segments 4, 4a, 4b, 4c, 4d, forming a half-circle are shown in FIG. 1. At one side of the lifting wall (on the support disc 2) there are screwed on plates provided with apertures, in this case formed as slotted plates 5, while on the other side of the lifting wall armour plates 5' are mounted in the same way on the support disc 3. Arcuate lifting blades 6 are disposed in the space between the support discs 2 and 3 in such manner that they convey towards the center of the lifting wall 1 the ground material which has passed through the slotted plates 5 into this intermediate space. At the center of the lifting wall 1 a transfer cone 7 is disposed so that it conveys the ground material, received from the lifting blades 6, into the next grinding chamber in the tube mill (not shown).

In this lifting wall 1 provided by the invention, confronting segments, e.g., 4 and 4' of the two support discs 2 and 3 are connected in pairs by a connecting web affixed to the casing of the tube mill (not shown) to form a member with a U-cross-section. The segments, e.g., 4 and 4', are welded to their connecting web 8 so that they form a rigid unit. The segments 4, 4a-4d of the support disc 2 are longer radially than those of support disc 3, i.e., the free ends of the U-shaped cross-section are nearer to the longitudinal center axis 9 of lifting wall 1. These inner free ends of the segments of support disc 2 are jointly engaged by two clamping rings 10, 11 and gripped in such manner that adjacent segments are slidably movable independently of each other in the radial direction (see double arrow 12 in FIG. 2). In order that both support discs 2, 3 may maintain a position parallel to each other, the corresponding pairs of segments (e.g., 4, 4') of the support discs are fixedly joined together adjacent the free ends of the segments by spacer elements, e.g., spacer struts 13.

In this embodiment the transfer cone 7 is affixed to the inner clamping ring 11 by its larger diameter end side 7'. Since the smaller diameter end side 7'' of the transfer cone 7 lies in the area of the plane of support disc 3, and the segments (e.g., 4') of this support disc are, as already stated, shorter than those of support disc 2, an annular gap 14 is formed between the free ends of the segments in support disc 3 and the transfer cone 7, and it is via this gap that the space between the support discs 2 and 3 communicates with the adjacent grinding chamber.

As seen especially from FIG. 1, the slotted plates 5 and correspondingly also the rear armour plates 5' are each connected to only one segment, e.g., 4, 4a, 4b, 4c or 4d, so that with a U-shaped double segment (e.g., 4, 4' and 8) they form a rigid unit, which on the one hand is affixed independently to the tube mill casing (not shown) and on the other hand is gripped in the two clamping rings 10, 11 so that it can slide in the direction of double arrow 12.

FIG. 3 shows on a larger scale how the free ends of a segment of support disc 2 is held between the clamp-

ing rings 10 and 11 so that it can slide. The outer clamping ring 10 and the inner clamping ring 11 are connected together by machine screws 15, of which only one is shown. Between the two clamping rings is the free end of a segment, e.g., 4, provided with at least one hole 16 whose diameter D is considerably greater than the diameter d of the screw bores in the clamping rings 10, 11 or the diameter  $d_1$  of the machine screw 15. The diameter D of the segment hole 16 is preferably made large enough to produce sufficiently large play for the case where the individual segments move independently of each other in the clamping rings 10, 11. The disposition of the clamping rings 10, 11 also ensures that the segments 4, 4a-4d of the support disc 2 and thus the entire lifting wall 1 are held in one plane.

When a lifting wall 1 thus formed in accordance with the invention is incorporated for instance in a tube mill, and deformations of the mill casing occur due to differential heating (which is very frequently the case for instance with heated mills and with inoperative mills with hot ground material), the adjacent segment units (e.g., 4, 4' and 8) with their corresponding lifting blades 6 and the plates 5 and 5' move independently of each other in the radial direction (double arrow 12). In this way no internal stresses can arise in the lifting wall 1 through these deformations, so that breakages in the lifting walls caused thereby (as is the case with known constructions) can no longer occur.

To achieve good wall stability with the lifting wall provided by the invention, it is extremely important that the screw positions disposed at the periphery of the lifting wall have adequate support at the inside of the mill casing. In the lifting wall 1 according to the invention, the connecting webs 8 of the individual pairs of segments are screwed to the tube mill casing. For this purpose it is desirable if, as shown in FIG. 4, holes 17, 17' are provided in the connecting web 8 to take the screws, and attachment discs 18, 18' are inserted in said holes with a slight play. These attachment discs 18 have central bores 19 which are for instance formed with a groove 20 so that they can take the fixing screws (not shown) without being rotatable.

When the lifting wall 1 is inserted in the mill casing, the fixing screws are first tightened, then the individual pairs of segments in the lifting wall are aligned, and finally the attachment discs 18, 18' are welded to the connecting webs 8 for the pairs of segments. This method ensures that all the screwing positions of the lifting wall lie completely on the mill casing, so achiev-

ing the high wall stability desired.

It will naturally be understood that the lifting wall can also be formed in different fashion within the scope of the invention, for instance as an end wall (exit wall) in a tube mill or the like, together with a number of segments differing from that in this invention.

I claim:

1. A lifting wall construction for a tube mill or the like comprising a plurality of pairs of segments arranged in confronting, spaced apart relation and together forming a pair of spaced apart circular discs, the segments forming one of said discs having a greater radial length than the segments forming the other of said discs; means connecting the confronting segments of each pair of segments to one another at their radially outer ends; clamp means slidably connecting the greater length segments to one another at their radially inner ends, the radially inner ends of the shorter segments defining a discharge opening at the center of the disc formed by such shorter segments; and lifting blades interposed between said discs for delivering material to said transfer opening, said slidable clamp means enabling independent radial movement of adjacent pairs of said segments.

2. A construction according to claim 1 wherein said clamp means comprises a pair of clamp rings clampingly engaging opposite sides of the longer segments, and means for urging said rings into clamping engagement with the segments of said one of said discs.

3. A construction according to claim 2 wherein the means for urging said rings into said clamping engagement comprise screws joining said rings.

4. A construction according to claim 3 wherein said screws pass through openings in said longer segments, said openings having a diameter larger than that of said screws.

5. A construction according to claim 1 including means forming a cone at said transfer opening.

6. A construction according to claim 1 wherein the means connecting confronting segments comprises a web having at least one radial opening therein for the accommodation of a screw.

7. A construction according to claim 6 wherein said radial opening accommodates an attachment disc of a size to fit loosely in said opening.

8. A construction according to claim 1 including an apertured plate carried by each segment of one of said discs and an armour plate carried by each segment of the other of said discs.

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