April 29, 1969 C. BARGERO 3,441,226

CYLINDRICAL MILL FOR GRINDING CEMENT

Filed July 18, 1966 Sheet 1 of 3

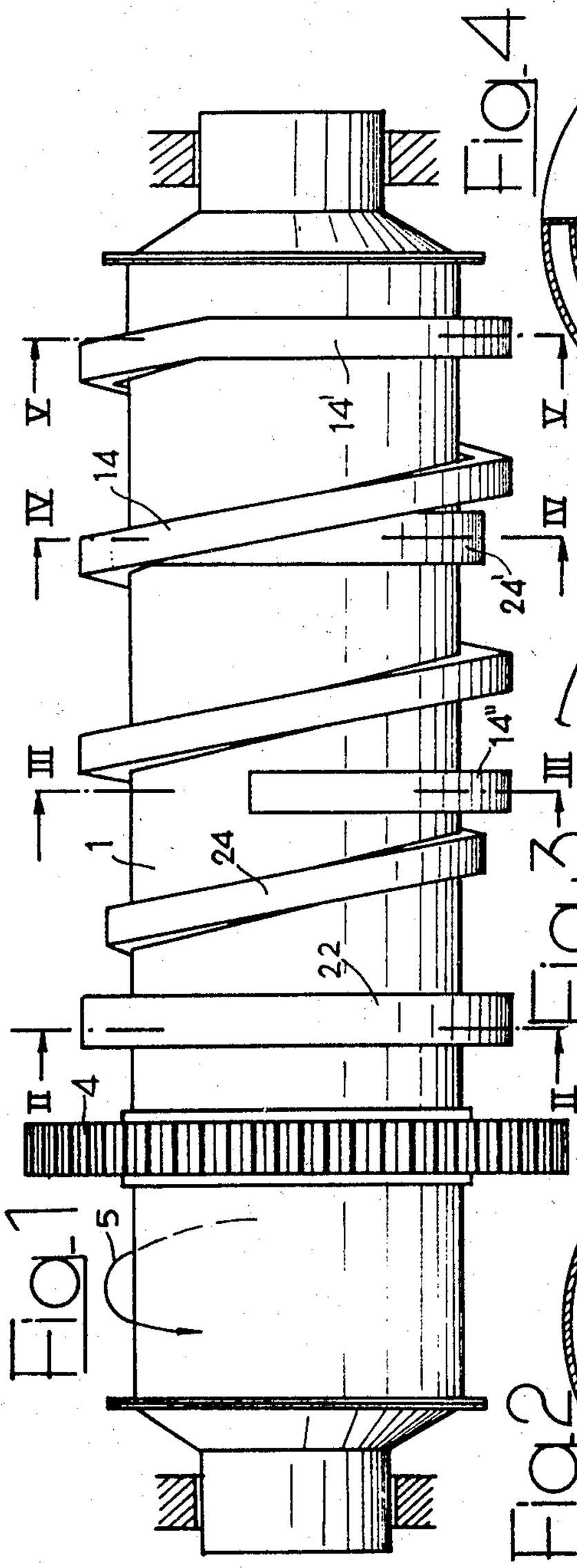


Fig 1

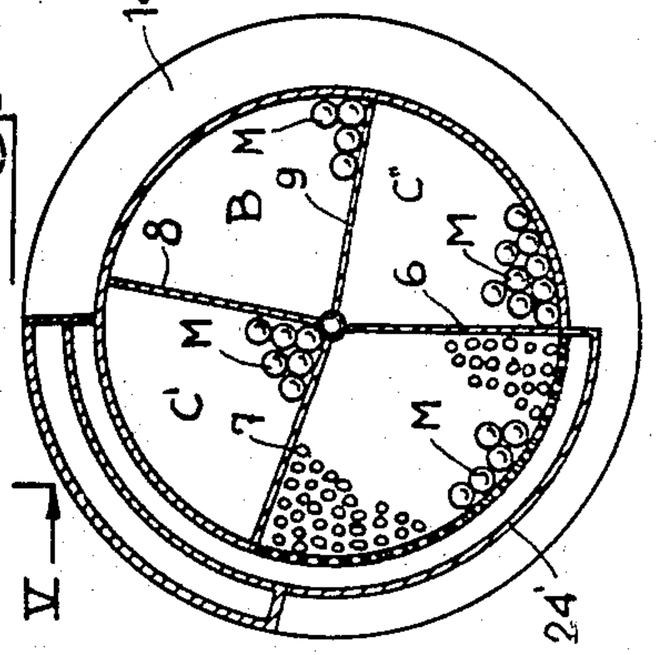


Fig 4

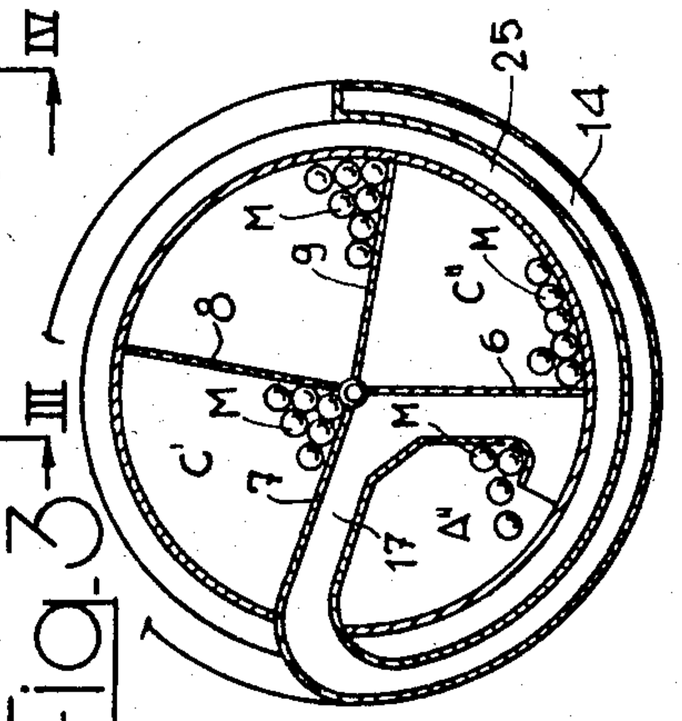


Fig 3

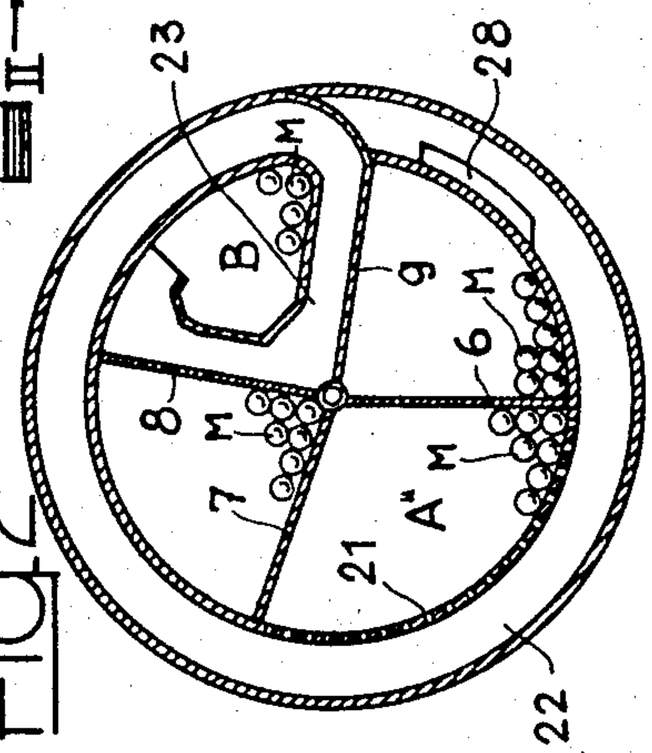


Fig 2

CYLINDRICAL MILL FOR GRINDING CEMENT

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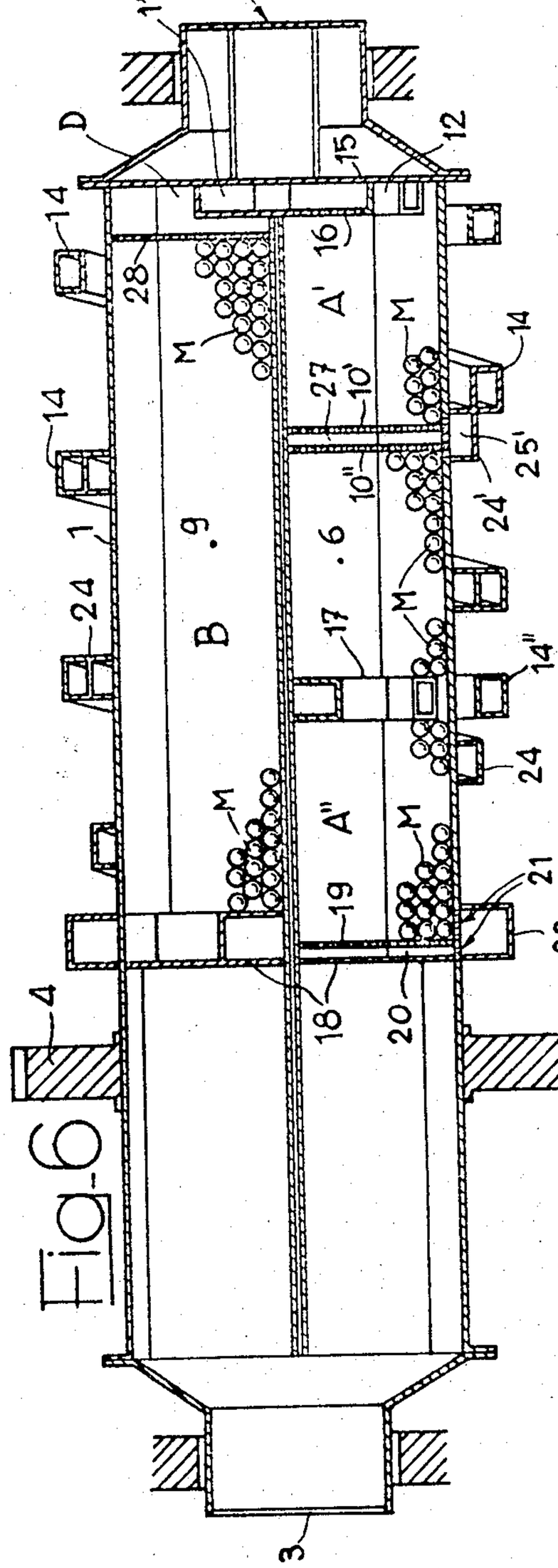


Fig-6

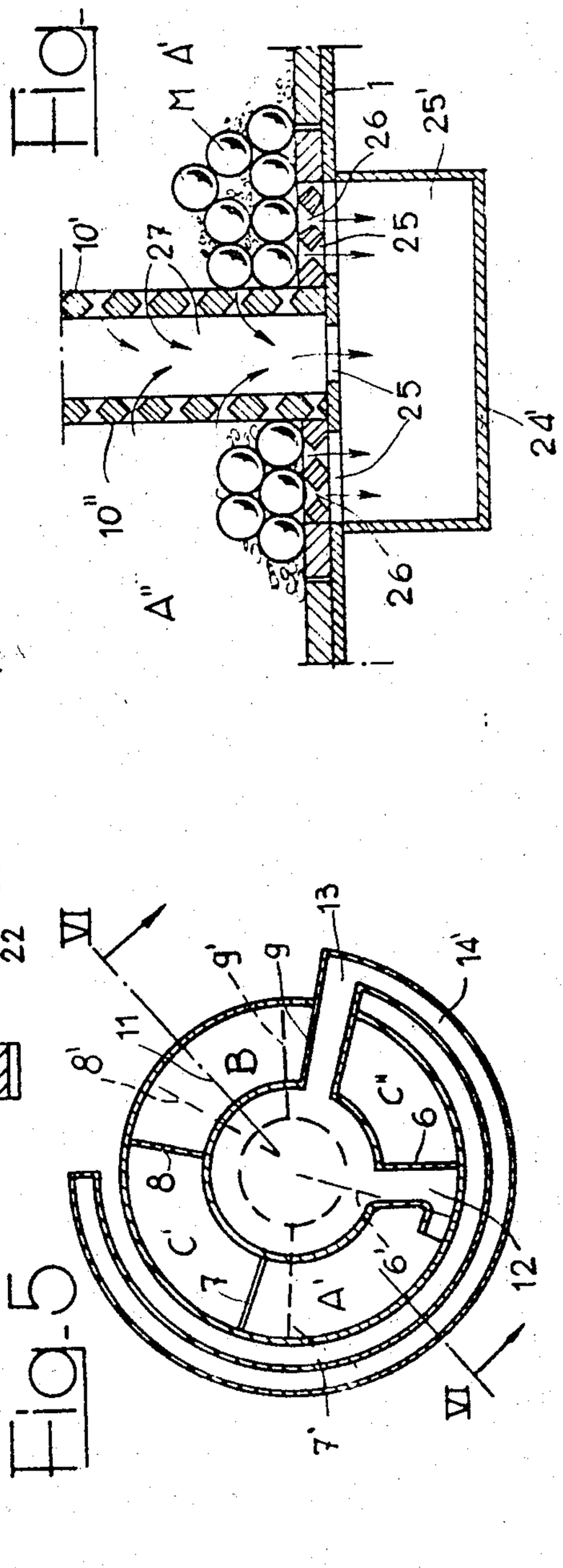
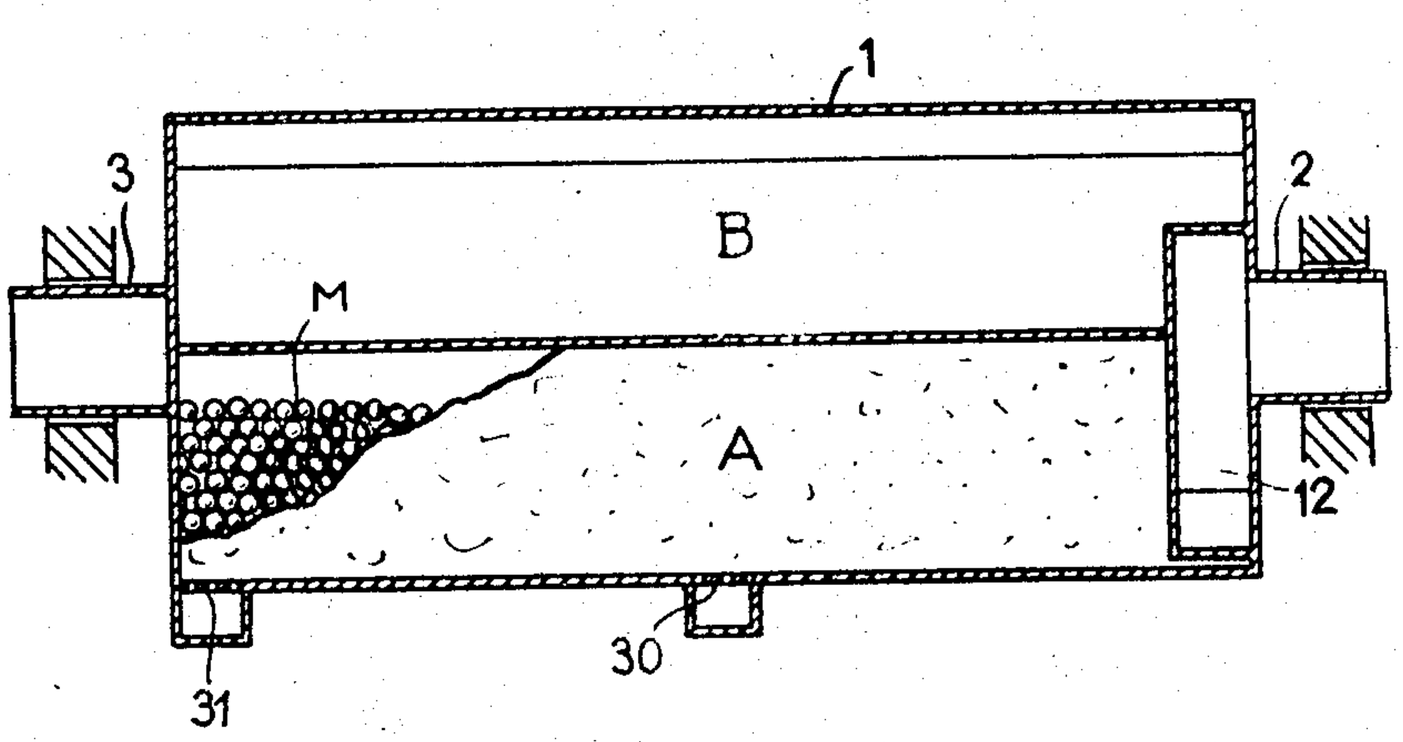


Fig-4

Fig-5

CYLINDRICAL MILL FOR GRINDING CEMENT

Fig-8



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CYLINDRICAL MILL FOR GRINDING CEMENT

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5 Claims

ABSTRACT OF THE DISCLOSURE

A cylindrical horizontally rotatable cement mill is provided with a plurality of longitudinally extending members having grinding implements therein. The first longitudinal chamber, to which the material is fed from an end inlet opening, is divided into two compartments by means of a transverse partition. Feed channels are formed from the inlet opening into the end of the closest compartment and from the inlet to the midportion of the most remote compartment for better utilization of the grinding implements within the first chamber.

The invention relates to a cylindrical mill for grinding cement and similar materials.

Mills are already known for this purpose, wherein the inside of a rotary hollow cylinder is subdivided by radial longitudinal walls into a plurality of longitudinal chambers which contain grinding bodies. These bodies are adapted to gradually crush and refine the material as the latter travels through the various chambers in the mill between a feed opening and a discharge. Generally the material is transferred from one chamber to another through conduits, each conduit connecting with the chamber from which the material is to be drawn through suitably dimensioned holes and opening into the chamber to which the material is to be transferred.

In known mills of this kind one longitudinal chamber receives at one of its ends the material to be ground from the inlet opening of the mill. This latter opening is usually in the form of a conduit of circular or annular cross section coaxial with the mill. In practice it is found that the yield of such mills is unsatisfactory, chiefly because the grinding bodies situated furthest from the inlet opening are hardly used. An increase in yield, with the diameter of the mill and the speed of rotation remaining the same, is obtainable only at the expense of a considerable increase in length of the mill. This is costly and of course necessitates a considerable increase in the power required for rotating the mill.

It is an object of the present invention to provide a mill of the type referred to above, but one in which the yield in ground material is considerably increased, although the overall size of the rotary hollow cylinder and the power necessary for driving the latter remain substantially the same as in prior mills.

A further object is to provide a cylindrical mill for grinding cement clinker or the like material, the mill comprising a hollow rotary cylinder subdivided by radial longitudinal walls into a plurality of longitudinal chambers each containing grinding bodies and each interconnected for the passage of material from one chamber to another before passage thereof to a mill outlet, one of the said chambers being a preliminary grinding chamber into which raw material is fed from a mill inlet, such feeding being by way of direct feed means at a point closely adjacent the said mill inlet and also by way of further feed means provided at at least one further point along the chamber length.

Preferably the said longitudinal chambers include, in addition to the said preliminary grinding chamber, an intermediate chamber and refining chambers.

Advantageously, the said preliminary grinding chamber comprises a first compartment situated near the mill inlet and a further and second compartment separated from the first by a spaced pair of transverse radial foraminated walls.

These and other objects and advantages of the invention will be clear from the following description, given with reference to the accompanying drawings, which are by way of example and in which:

FIGURE 1 is an elevational view of a mill according to the invention;

FIGURES 2, 3, 4 and 5 are sectional views taken along the lines II—II, III—III, IV—IV and V—V, respectively, of FIG. 1;

FIGURE 6 is a sectional view on line VI—VI of FIG. 5;

FIGURE 7 is a longitudinal sectional view showing on an enlarged scale a constructional detail of the mill; and

FIGURE 8 is a diagrammatical longitudinal sectional view of a mill of known type.

Corresponding parts are provided with the same reference numerals throughout the figures.

The mill shown on FIGS. 1 to 7 of the drawings comprises a hollow cylindrical body defined by a wall **1**, one end of which body is provided with an inlet opening **2** and the other end of which is provided with an outlet **3**. The body wall **1** has secured thereto near the outlet **3***a* toothed rim **4** meshing with a drive gear (not shown) adapted to rotate the mill in the direction of the arrow **5**.

The inside of the mill is subdivided, by longitudinally extending radial walls **6**, **7**, **8** and **9**, into four sections, each containing grinding bodies M. The walls **6**, **7** are arranged at an angle of about 108° with respect to each other, the walls **8** and **9** at an angle of about 90° with respect to each other and the walls **7**, **8** and **6**, **9** at angles of about 81° with respect to each other, respectively. As will be evident from FIG. 5 in particular, the radial walls **6**, **7** define, together with the cylindrical body wall **1**, a preliminary and longitudinally extending grinding chamber which connects with the inlet **2** in a manner to be described hereafter. As will be seen from FIG. 6, this chamber is subdivided into two compartments A′, A″ by a pair of radial transverse walls **10′**, **10″**.

The radial longitudinal walls further define an intermediate chamber B diametrically opposite the preliminary grinding chamber A′, A″, and also define two refining chambers C′, C″ each situated between the two first mentioned longitudinal chambers and in connection with the outlet **3**. The intermediate chamber B connects on one side with the two compartments A′, A″ of the preliminary grinding chamber and on its other side with the two refining chambers C′, C″. The various chambers are so interconnected that when the material to be ground, such as cement clinker, is fed through the inlet **2** it travels through the preliminary grinding chamber A′, A″ and enters the intermediate chamber B in a precrushed condition. It then passes to the refining chambers C′, C″ and issues in a finely ground condition through the outlet **3**.

The inlet **2** terminates (FIGS. 5 and 6) internally in a distributing slide **11** in the form of a flattened cylinder which is connected by a radial conduit **12** with the compartment A′ of the preliminary grinding chamber and by a radial conduit **13** with the initial circular section **14′** of an external conduit arrangement, said section **14′** of which connects with an external helical conduit **14**. The conduit **12** is arranged adjacent the end wall **15** of the

mill and is foraminated on its opposite side at **16** to constantly afford an upward draft through the mill.

As indicated above the initial circular section **14'** of the conduit arrangement leads into a helical conduit section **14** and this leads into a further circular conduit section **14''** which is connected to feed material into compartment A'' through an opening in the mill body **1** by means of a conduit **17** which follows the internal walls **7, 6** (FIG. 3) of the mill and terminating in the region of the mill body wall **1.**

The aggregate arrangement of conduits **14', 14, 14''** is so proportioned that the conduit **17** is located substantially in the middle plane of the compartment A'' of the preliminary grinding chamber (see FIG. 6). The compartment A'' is terminated at its end remote from the inlet **2** by a radial end wall **18** as is also the intermediate chamber B. A foraminated wall **19** is arranged within the compartment A'' spaced slightly apart from the wall **18** and this wall **19** defines with the said wall **18** a small chamber **20** in the form of a circular section. The latter connects through a foraminated section **21** (FIGS. 2 and 6) in the mill wall **1** with a circular external conduit **22** connecting in turn through an opening in the wall **1** (FIGS. 1, 2, 3 and 6) with an internal radial conduit **23** generally similar to the above described conduit **17.** The conduit **23** is arranged to feed material into the intermediate chamber B near the wall **18** thereof. The widths of the foraminated wall section **21** and of the conduit **22** are larger than the width of the chamber **20** inclusive of the thickness of the wall **19.** As a result of this feature the material in the compartment A'' of the preliminary grinding chamber is able, after it has been sufficiently crushed, to reach the conduit **22** either directly or indirectly by first travelling through the holes in the wall **19** and chamber **20.** Furthermore, the ground material in the compartment A' of the preliminary grinding chamber and part of the material ground in the compartment A'' of the said chamber reaches an initial circular section **24'** of an external helical conduit **24** either directly through an opening **25** (FIG. 7) in the wall **1** which is covered by wire net **26** or indirectly by travelling first through holes provided in the previously referred to walls **10'** and **10''** and then through a chamber **27** laterally confined by the said walls. For a chosen distance the external helical conduit **24** extends adjacent the outer wall surface beneath the helical conduit **14** and opens at **28** (FIG. 2) into the circular conduit **22** previously referred to. In this way the material conveyed by the conduit during rotation of the mill is discharged through the radial conduit **23** into the intermediate chamber B. The latter chamber terminates in a foraminated wall **28** spaced slightly apart from the end wall **15** of the mill (at the inlet end thereof) and confines with the said wall a chamber D connecting with the refining chambers C' and C'' in a manner known per se (not shown) and adapted and arranged to feed the said chamber evenly with material and afford a constant upward draft through the mill.

As shown by FIG. 6, the length of the preliminary and intermediate grinding chambers A', A'' and B, respectively is smaller than the mill length. The chambers C', C'', however, are of the same length as the mill and of greater width over their section between the wall **19** and outlet **3** (as shown by broken lines **6', 7', 8', 9'** in FIG. 5).

As will be evident from the above description, the use of a mill according to the invention avoids the drawback prevalent in known mills such as that illustrated in FIG. 8, and wherein there is a deficient exploitation of the activity of the grinding bodies M situated between the intermediate drawing-off point **30** and the drawing-off point **31** at the end of the mill near the outlet **3.**

Various modifications to the present invention are of course possible, within the scope of the appended claims.

What I claim is:

1. A cylindrical mill for grinding material such as cement comprising: a hollow rotatable cylinder journaled for rotation about a substantially horizontal axis and having inlet and outlet openings at opposite ends thereof, a plurality of radial longitudinally extending walls secured in and dividing said cylinder into a plurality of longitudinal grinding chambers one of which is a preliminary grinding chamber, grinding means disposed in each of said chambers, first feed means connecting said inlet opening with said grinding chamber at the end thereof adjacent said inlet, and second feed means connecting said inlet opening with said preliminary grinding chamber intermediate the ends thereof.

2. A cylindrical mill as set forth in claim **1** further comprising divider wall means disposed transversely of said preliminary grinding chamber intermediate the end thereof to divide said chamber into a first compartment adjacent said inlet opening and a second compartment remote from said inlet opening.

3. A cylindrical mill as set forth in claim **2** wherein said divider wall means is comprised of two foraminous closely spaced apart walls.

4. A cylindrical mill as set forth in claim **3** further comprising cylindrical distribution means coaxially located within said cylindrical mill adjacent the inlet opening, said second feed means being connected to said cylindrical distribution means and arranged to feed material into said second compartment at a point substantially in the middle region thereof.

5. A cylindrical mill as set forth in claim **4** further comprising radial conduit means located internally of said cylindrical mill and connecting said cylindrical distribution means to said first compartment.

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U.S. Cl. X.R.

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