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DUAL FED MILL

Filed April 18, 1932

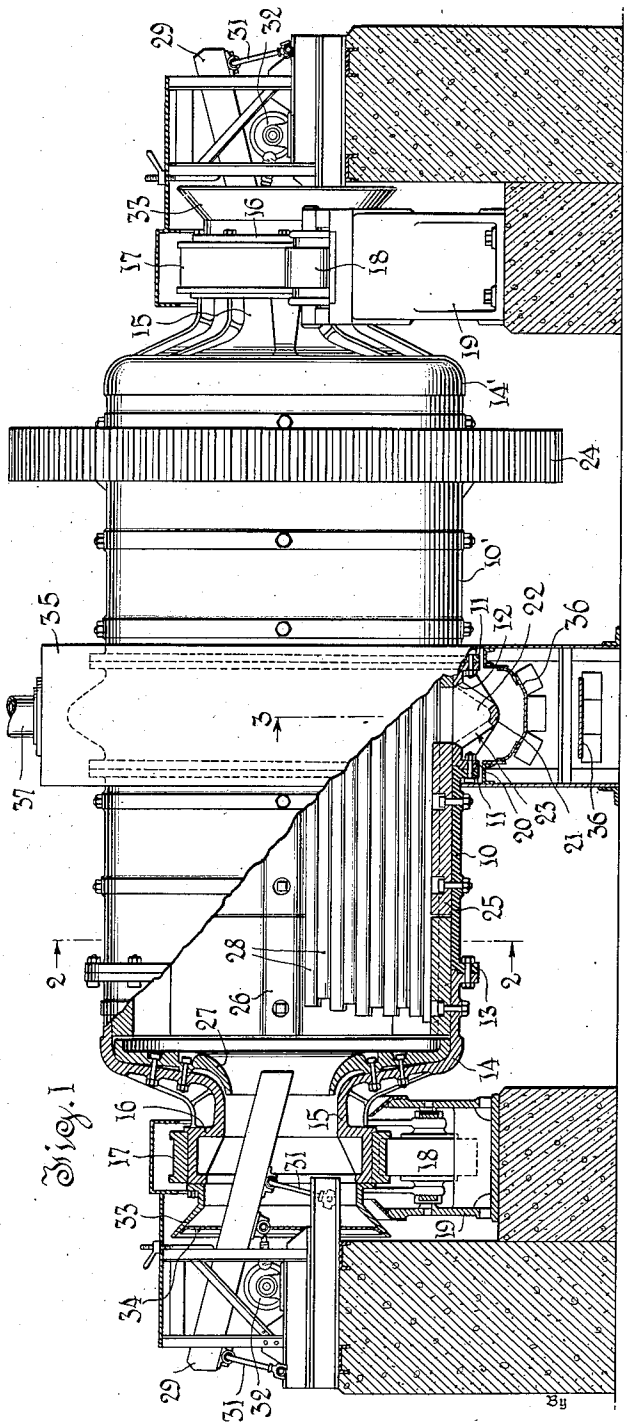


Fig. 1

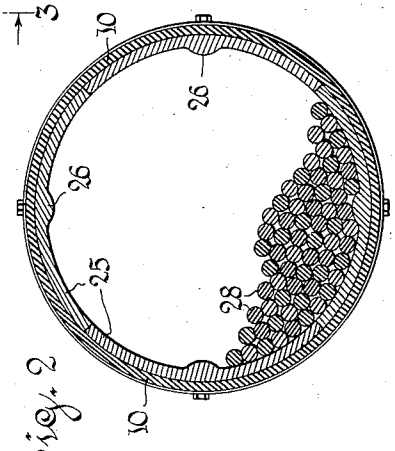


Fig. 2

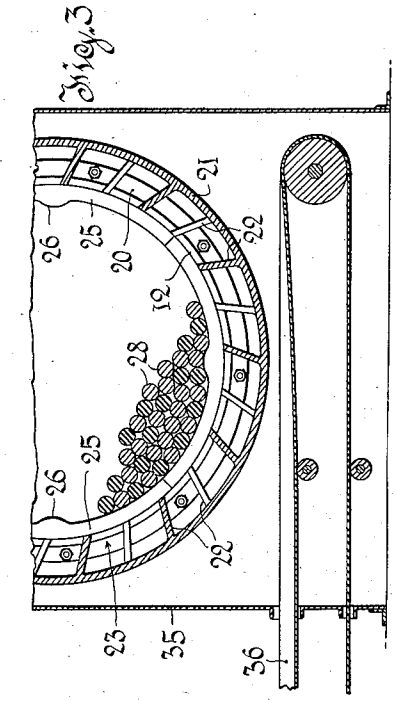


Fig. 3

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DUAL-FED MILL

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5 Claims. (Cl. 83—9)

The present invention relates to rod mills and more particularly to a mill designed to grind dry material such as coke, cement clinker and similar material. Specifically, the invention comprises a cylindrical rod mill having large hollow trunnions at each end thereof, through which the material is fed into the mill, and a central peripheral discharge passage extending circumferentially around the cylinder to provide egress for the ground material.

In the operation of revolving grinding mills it is recognized that an ideal mill is one in which the material is fed axially at one end thereof and discharged peripherally at the other end of the mill. The degree of grinding and flow gradient depend largely on the length of the mill, a short mill effecting coarse grinding and steep flow gradient while a long mill produces finer particles and a more gradual angle between the inlet and outlet of the mill. It is, of course, impractical to employ rods in a cylinder having an open end since they would quickly work out of the open end.

While mills having peripheral discharge opening have previously been proposed it has been necessary in all of these to provide screens in the cylinder wall or screened partitions where grinding media other than rods are used. These parts quickly wear out and it is often necessary to dismantle the mill to effect repairs.

In the present invention the advantages of axial feed with peripheral discharge in a rod mill having no screen elements are utilized by combining, in effect, two such mills with the open ends adjacent each other to form an annular discharge passage intermediate the closed ends of the mill. A suitable bridging ring, having openings therein, connects the two cylindrical portions of the mill.

There is also combined with the present mill feeding means designed to feed a constant supply of material at each end of the mill. Dry material does not readily flow and must be fed directly and positively into the grinding chamber. A vibratory feeder is employed for this purpose. The material is so fed that a definite relation of ingress and egress with respect to the crushing capacity of the rods is maintained, insuring efficient coordination of the feeding and crushing means and rapid transit of the material through the mill.

The invention is further described in detail hereinafter and is illustrated in the accompanying drawing in which,—

Fig. 1 is a longitudinal elevation, partly in section, of a preferred embodiment of the invention.

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1; and

Fig. 3 is a partial section taken on line 3—3 of Fig. 1.

In the drawing the mill comprises two aligned cylindrical sections 10, 10', having flanges 11, to which a bridging ring 12 is secured. These sections are also provided with flanges 13, to which heads 14, 14', are fastened. The heads have axial tubular extensions 15, forming intake openings, and trunnion portions 16, the latter being surrounded by bearing rings 17 supported by rollers or bearings 18 journaled in frames 19 at each end of the mill. Bridge ring 12 consists of continuous flanged sides 20 and a central annulus 21 connected by a plurality of spaced webs 22, preferably inclined with respect to radial planes passing through them, as indicated in Fig. 3, so that relatively large openings 23 are provided at each side of the annulus. A gear 24 is suitably secured to the mill whereby the same is revolved by means well known in the art. Thus, the several parts constitute a continuous cylindrical mill having a head and intake at each end and a central peripheral opening for discharge of ground material.

Bolted to the inner walls of the cylinders are liners 25, having longitudinal ribs 26, and wear plates 27 are fastened on the inside surface of heads 14, 14'. The grinding is effected by the usual type of cylindrical metal rods 28 adapted to roll freely on the liners and on each other, and having a length substantially equal to that of the mill so that they bridge the central discharge openings and grind material to each side thereof.

At each end of the mill is a vibratory chute 29 supported by pitmen 31 and oscillated by an eccentric 32. This chute is rapidly oscillated to feed the dry material forwardly into the mill. Any suitable form of conveyor or hopper may be employed to deposit material on the chute. An outwardly flared annular member 33 is attached to each of the trunnions and cooperating with these members at each end of the mill is a stationary diaphragm 34 having an opening through which the chute projects. The diaphragm fits into the flared end to prevent dust from escaping from the grinding chamber through the trunnions.

Surrounding the central discharge passage is a dust-proof casing 35 having a suitable opening near the bottom thereof to permit passage of a belt conveyor 36 on to which ground material is

discharged. A pipe 37 connects casing 35 with a suction fan whereby dust is drawn from the casing and subsequently recovered in a separator. The material carried away by conveyor 36 is screened and the oversize returned to chutes 29 by any convenient conveying means to be passed again through the grinding rods.

From the foregoing description of the apparatus and its operation it will be seen that the mill is capable of grinding dry material rapidly and that ingress and egress of material is coordinated with rod capacity to insure maximum grinding efficiency without excessive disintegration of the material. The discharge openings are relatively large and capable of passing coarse as well as fine material for subsequent screening. This obviates the necessity of employing screens in the mill itself. The rods are so arranged that a substantial portion of the material introduced into the mill is ground in a comparatively short time and the discharge passage, being centrally located, rapidly relieves the mill of material fed at each end thereof.

The embodiment illustrated is a preferred one but it is intended that such changes as come within the principle of operation be made without departing from the broad idea involved.

What is claimed is:

1. A revoluble grinding mill comprising a cylinder having a peripheral discharge passage intermediate its ends and being imperforate except for said passage; a head at each end of said cylinder, at least one of said heads having an axial opening therein; a plurality of longitudinally disposed rods in said cylinder, said rods bridging said discharge passage and coacting with the cylinder to grind material therein; and means for feeding material through said axial opening.

2. A revoluble grinding mill comprising a cylinder having a circumferential discharge passage substantially mid-way its ends and being imperforate except for said passage; a head at each end of said cylinder having an axial opening therein; a plurality of longitudinally disposed rods in said cylinder, said rods bridging said discharge passage and coacting with the cylinder to grind material therein; and means for feeding material into each of said axial openings.

3. A revoluble grinding mill comprising a cylinder having a peripheral discharge passage midway its ends and being imperforate except for said passage; a head at each end of said cylinder having an axial opening therein; a plurality of longitudinally disposed rods in said cylinder, said rods bridging said discharge passage, extending substantially from one to the other of said heads and coacting with the cylinder to grind material therein; and means for feeding material into each of said axial openings.

4. A revoluble grinding mill comprising a pair of aligned cylinders; an annular bridging member connecting said cylinders, said bridging member having a plurality of openings therethrough; a head secured to the unconnected end of each cylinder, said head having an axial opening therein; a plurality of longitudinally disposed rods in said cylinder and extending substantially from one to the other of said heads; means for feeding material into each of said axial openings; and means for removing material discharged through the bridging member.

5. A revoluble grinding mill comprising a pair of similar aligned cylinders; an annular bridging ring connecting said cylinders, said ring having continuous flanged sides and spaced connecting webs to provide a substantially open circumferential opening between the connected ends of the cylinders; a head secured to the unconnected end of each cylinder, said head having an axial opening therethrough; a plurality of loose longitudinally disposed rods in said cylinder and extending substantially from one to the other of said heads; means for feeding material into each of said axial openings; and means disposed beneath said bridging ring for removing material discharged through the ring.

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