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 ROTARY BEATER MILL WITH CYLINDRICAL SEPARATOR
 STRUCTURE ADJACENT THE MILL OUTLET
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FIG. 1

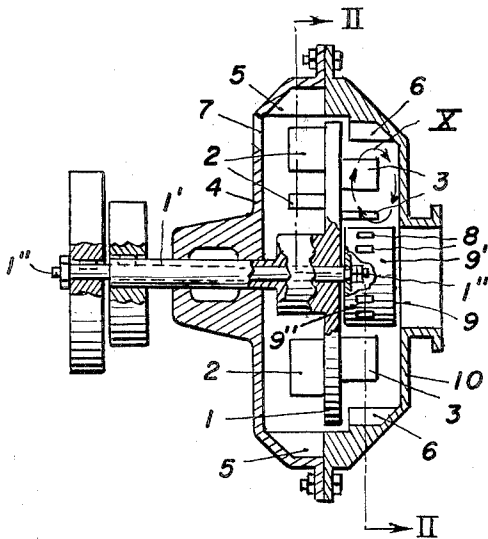


FIG. 2

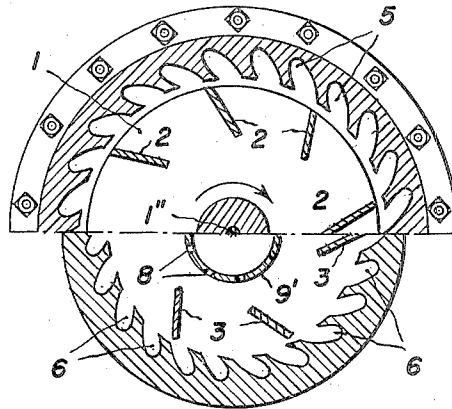


FIG. 3

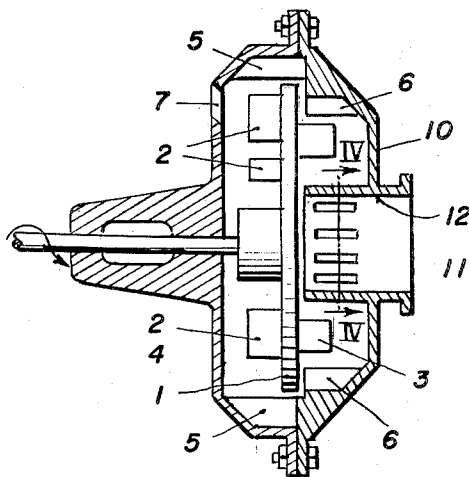
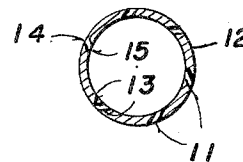


FIG. 4



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ROTARY BEATER MILL WITH CYLINDRICAL
SEPARATOR STRUCTURE ADJACENT THE
MILL OUTLET

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6 Claims. (Cl. 241—39)

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The present invention relates to crushers comprising a rotor provided with beaters such as hammers, pins, blades or the like revolving in a casing having at least one inlet opening for the raw material and one outlet opening for the crushed material.

An object of the invention is to arrange the outlet so as to reduce to the utmost the proportion of incompletely crushed material that tends to escape together with the material brought to the desired grade of fineness. To that end, according to this invention, the outlet openings for the crushed material are provided in a hollow member arranged within the casing of the crusher, closer to the rotor axis than the beaters and connected with the outside through the rear wall of the casing.

Thus, the material is compelled to move out of the apparatus no longer in a longitudinal or in a tangential direction as in the usual crushers, but in radial directions converging towards the axis of rotation. It follows that the particles of material in proximity to the outlet openings are subjected on the one hand to centrifugal force and on the other hand to the urge of the outgoing air. By varying the rotational speed of the rotor and the depression behind the outlet, it is possible to influence the size of the particles that will be in a state of equilibrium between the two above mentioned forces and, consequently, to regulate the size of the particles which are allowed to escape.

The outlet member is preferably in the shape of a hollow cylinder having its wall provided with longitudinal openings or slits, whose sectional area is small in comparison to the total surface of the cylinder, whereby a high outlet speed is ensured. Said member may rotate at the same speed as the rotor, or at a lower speed, or it may be stationary. It is possible practically to do away with friction and shocks between the material to be evacuated and the outlet member when causing said member to rotate at a speed lower than that of the rotor and corresponding to the speed of rotation of the material in proximity to the outlet.

The accompanying drawing shows two embodiments of the invention as applied to a crusher with peripheral chambers.

Fig. 1 is a diametral section of one embodiment, parts thereof being broken away.

Fig. 2 is a section on line II—II of Fig. 1.

Fig. 3 is a diametral section of another embodiment.

Fig. 4 is a section on line IV—IV of Fig. 3.

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The crusher illustrated in Figs. 1 and 2 comprises a rotor formed of a disc 1 provided with beaters 2, 3, arranged respectively on each side of the disc. The rotor revolves in a stator 4 having along its inner periphery a number of chambers 5, 6 into which the material is propelled by the beaters 2, 3 respectively.

The material to be crushed is fed into the apparatus through an inlet opening 7 facing one side of the disc 1. It leaves the crusher through outlet openings on the other side of the disc.

The openings 8 are provided in a cylindrical member 9 which can rotate with the disc 1 and is situated nearer its axis than the beaters 3. The cylinder 9 extends to near the rear wall 10 and its inside is connected with the outside of the crusher through a hole in the rear wall. The portion of the cylinder 9 in which the openings 8 are provided extends at least between two diametral planes passing respectively through the outer and the inner ends of the beaters 3. It is also apparent in Fig. 1 that the openings 8 extend parallel to the rotor axis. The arrangement of the outlet openings 8 in a cylinder coaxial with the rotor favors a selection between the finer particles which are carried with the outgoing air and the coarser particles which, on account of their size, are sent back towards the periphery of the stator under the influence of the rotation of the rotor.

In Figs. 3 and 4 is shown another embodiment of the crusher according to the invention in which the outlet openings for the crushed material are provided in a stationary cylinder 12 which may therefore be considered as having a backward rotary motion relatively to the rotor. This stationary cylinder 12 is also situated nearer to the rotor axis than the beaters 3. It extends to near the disc 1 and is connected with the outside of the crusher through the rear wall 10. The openings 11 also extend in a direction parallel to the axis. Their sides 13 are inclined, as shown in Fig. 4, so that their outer edge 14 projects forwardly, in the direction of rotation, relatively to their inner edge 15.

Instead of being stationary or fixed to the disc 1, the outlet member may also be rotated at a lower speed than the rotor, so as to create the most favorable conditions for the evacuation of the material without objectionable friction or shock. From Fig. 1 it can clearly be seen that the rotation of the outlet member 9 may be effected at any suitable relative speed with respect to the rotor 1 by rigidly mounting the member 9 on a shaft 1' which is separate from and ro-

tatably journaled within the shaft 1' for the rotor. These shafts are concentric with respect to one another and may be driven in any desirable manner to effect the desired difference in rotative speed of the rotor and the outlet member.

It will also be seen that the openings 8 in the outlet member 9 are separated by relatively broad unapertured portions 9'' and extend substantially between two diametrical planes passing respectively through the outer and inner ends of the beater plates 3.

The openings in the outlet member 9 are so limited in length that a substantial area of the outlet member is left unapertured and this in combination with the lateral free space 9' left between the lateral ends of the beater plates 3 and the side wall 10 of the stator provides new and improved, as well as highly useful results. It can be seen that the outlet member 9 comprises a zone 9'' which includes the outlets 8 and is surrounded by the beaters 3, and an unapertured zone 9' which is surrounded by the lateral free space left between the lateral free ends of beater plates 3 and the side wall 10. By virtue of this arrangement the unapertured zone 9' of the outlet member 8 intercepts, on the one hand, the bigger particles, projected against it from the crushing chambers 6, causing such bigger particles to rebound towards the beaters 3, and on the other hand it causes the portion of the recycling current *x*, which moves radially inwards along the side wall 10 to move axially towards the rotor. Thereby, a portion of the smaller particles carried by the air is caused to return, with the radially and outwardly moving branch of the current *x*, into the zone of the beaters 3, whereas another portion of the smaller particles and of said air current is caused to leave the crusher through the openings 8.

Thus, the restriction of the length of the openings 8 and the formation of a non-apertured zone 9' on the outlet member afford means for regulating the rejection of particles into the crushing zone and the recycling and evacuating of the air with the smaller particles within the crusher and out of the same.

In addition, due to the fact that the outlet member 9 can be rotated at any suitable relative speed with respect to the rotor 1 a very efficient crushing of the material can be effected and friction and shocks between the material to be evacuated and the outlet member can be practically eliminated when the outlet member is rotated at a speed lower than that of the rotor and corresponding to the speed of rotation of the material in proximity to the outlet.

Modifications may of course be made in the structure as described and illustrated without departing from the scope of the appended claims. Thus, instead of being of cylindrical shape, the outlet member may have a frusto-conical or any other suitable shape. It will also be understood that the invention is generally applicable to any crusher with rotary beaters.

I claim:

1. In a crusher, the combination of a stator, a rotor rotatably mounted in said stator, beaters on said rotor, an inlet in a side wall of said stator, an outlet in another side wall of said stator, the lateral ends of said beaters on the outlet side of

said stator being spaced from the internal wall of said stator by a horizontal clearance forming a path for downward air and material recirculation, and a hollow outlet member communicating with said outlet, said outlet member being in the shape of a hollow cylinder situated coaxially with said rotor, nearer the rotor axis than said beaters, and being provided with longitudinal openings extending between two diametrical planes passing respectively through the outer and the inner ends of said beaters leaving an unapertured zone in said hollow cylinder the width of which is at least equal to that of said horizontal clearance.

2. In a crusher as claimed in claim 1, the stator being provided at its inner periphery with two rings of chambers, one on the inlet side and the other on the outlet side of the stator, said chambers opening inwardly, the beaters on the rotor facing the openings of said chambers, the chambers on the outlet side of the stator facing, with their end portion which is remote from the rotor, the horizontal clearance and being laterally confined by a portion of the outlet side wall inclined at substantially 45° with respect to the radial plane of said side wall.

3. In a crusher as claimed in claim 1, the openings in said outlet member being in the form of slits of small cross-sectional area in comparison to the unapertured spaces left between said slits, said outlet member being rotatable in said stator.

4. In a crusher as claimed in claim 1, the openings in said outlet member being in the form of slits of small cross-sectional area in comparison to the unapertured spaces left between said slits, said outlet member being rotatable in said stator, separately from said rotor at a lower speed than the latter.

5. In a crusher as claimed in claim 1, the openings in said outlet member being in the form of slits of small cross-sectional area in comparison to the unapertured spaces left between said slits, said outlet member being rigidly mounted on said rotor.

6. In a crusher as claimed in claim 1, the longitudinal openings in said outlet member being in the form of slits the longer sides of which are inclined with respect to the direction of rotation of the rotor, the outer edge of said slits projecting forwardly in said direction of rotation, relatively to their inner edge, said outlet member being rigidly mounted on said stator.

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