

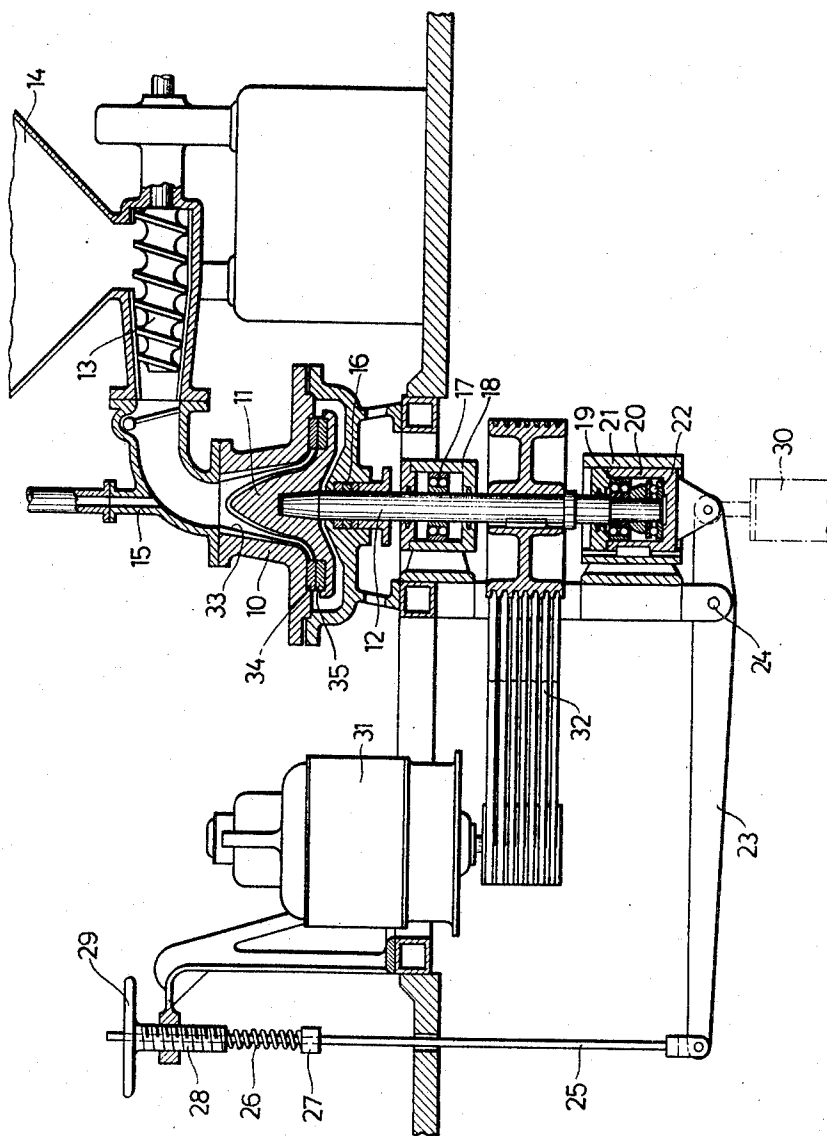
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J. O. LARSSON

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MULTIPLE STAGE MILL, WITH STEEPLY CONICAL SHAPE
PREGRINDING ZONE AND FLAT DISK
TERMINAL FINE GRINDING ZONE

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INVENTOR
JOHAN OLOF LARSSON

By *Toulmin & Toulmin*
ATTORNEYS

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MULTIPLE STAGE MILL, WITH STEEPLY CONICAL SHAPE PREGRINDING ZONE AND FLAT DISK TERMINAL FINE GRINDING ZONE

Johan Olov Larsson, Gavle, Sweden

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1 Claim. (Cl. 241—162)

The present invention relates to grinding machines for wood chips or the like of the kind comprising relatively rotatable grinding members which are displaceable with respect to each other in the direction of the axis of rotation, said grinding members defining between themselves a pre-grinding zone and a fine-grinding zone. The invention relates particularly to such grinding machines of the kind set forth in which the cooperating grinding surfaces in the pre-grinding zone are substantially conical and converge in the direction towards the fine-grinding zone.

It is an object of the invention to provide such improvements in grinding machines of the kind indicated above that a change of the grinding fineness, i. e. of the grinding conditions in the fine-grinding zone, can be obtained through axial displacement of the grinding members with respect to each other without appreciably changing at the same time the grinding conditions in the pre-grinding zone.

According to the invention a grinding machine having the desired properties has been provided by shaping the grinding members in such a manner as to cause the cooperating, preferably substantially conical grinding surfaces in the pre-grinding zone to form a comparatively small acute angle with the axis of rotation, while shaping the cooperating grinding surfaces in the fine-grinding zone to extend transversely and preferably under a straight angle to said axis.

On axial displacement of the grinding members with respect to each other in a grinding machine designed in this manner the change in the distance between the transversely extending fine-grinding surfaces will be equal to or substantially equal to the displacement, whereas the change in distance between the grinding surfaces in the pre-grinding zone will be only a fraction hereof on account of the comparatively small slope of said surfaces with respect to the direction of displacement.

The invention will now be described more in detail having reference to the accompanying drawing, which shows as an example a grinding machine having a vertical shaft.

On the drawing the reference numeral 10 designates the hermetically closed housing of the grinding machine and 11 the rotatable grinding member provided therein, the rotatable grinding member being secured at the upper end of a vertical shaft 12 which passes up through the bottom of the grinding housing. The material to be ground is pressed into the grinding housing 10 at the top thereof by means of a machine-driven horizontal feeding screw 13 from a hopper 14. By means of a tube connection 15 the interior of the grinding housing 10 can be put in communication with a steam pressure source, not shown. The reference numeral 16 designates a sealing box for the shaft 12.

Outside of the grinding housing 10 the vertical shaft 12 is rotatably journaled in an upper radial ball bearing 17, which is slidable in a stationary guide sleeve 18 in the direction of the shaft, and also in a lower radial ball bear-

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ing 19, fitted in a bearing housing 20, which is slidable in the direction of the shaft in a stationary guide sleeve 21. The lower end of the shaft 12 is supported by means of an axial ball bearing 22 mounted in the bearing housing 20 on the shorter arm of a two-armed lever 23, which is swingable about a fixed horizontal bearing pin 24. Engaging the end of the long arm of the lever 23 is a vertical rod 25, which is pressed in the direction downwards by a spring 26. The tension in the spring 26, which at its lower end bears against a fixed collar 27 on the rod 25 and at its upper end engages the underside of a threaded adjusting sleeve 28, can be changed by turning the sleeve by means of the hand wheel 29.

In place of the spring-operated pressing device described above a hydraulic pressing device 30 can be used.

The grinding member shaft 12 is driven from an electric motor 31 by means of a rope drive 32.

As clearly shown in the drawing, the central portion of the upper part of the grinding housing 10 is shaped as a cone having a comparatively small top angle, i. e. the generatrix of the conical surface forms a small angle with the vertical axis of rotation. A suitable value for the angle is about 30°.

The corresponding parts of the rotatable grinding member or body 11 are also substantially conically shaped, but the grinding surface of the said member forms a larger angle with the axis of rotation, so that there is formed between the conical grinding housing wall and the conical part of the rotatable grinding member a pre-grinding zone 33 which converges under an angle of about 3° from the feeding end for the material to be ground. The fine-grinding zone positioned after the pre-grinding zone 33 is formed between two annular grinding members 34 and 35, which are detachably secured to the grinding housing 10 respectively to a downwardly and outwardly extending position of the rotatable grinding body 11, said annular grinding members having plane grinding surfaces which form a straight angle with the axis of rotation. The degree of fineness of the ready-ground material discharged from the grinding machine obviously is determined by the distance between the transversely extending grinding surfaces of the grinding members 34 and 35 whereas a change of this distance through axial displacement of the grinding body 11 with respect to the grinding housing 10 results in only a slight change in the distance between the sloping grinding surfaces in the pre-grinding zone, as desired.

The grinding surfaces in the pre-grinding zone 33 may be provided in a manner known per se with spiral-shaped ridges or raised portions shaped in other manner, and the transversely extending grinding surfaces of the grinding members 34 and 35 defining the fine-grinding zone may be made rough in similar or other manner to improve the grinding effect.

For the continuous discharge of the ready-ground pulp or other substance from the grinding housing 10 a discharge valve of any suitable kind may be used. The discharge valve is not shown in the drawings.

The invention is not limited to the embodiment described in detail above and shown on the drawing, but modifications of various kinds may be made without departing from the inventive idea within the scope of the appended claim.

I claim:

A grinding machine for wood chips or the like comprising stationary and rotatable grinding members which are axially displaceable and which between them define a pre-grinding zone tapering in cross-section and increasing in diameter in the direction of feed, and a fine-grind-

ing zone positioned after said pre-grinding zone and extending transversely to the axis of rotation, said grinding members being so shaped that the grinding surfaces in the pre-grinding zone merge smoothly with the grinding surfaces in the fine-grinding zone, the grinding surfaces of each of said members being conical with the grinding surface of the stationary member forming an angle of about 30° with the axis of rotation and the grinding surface of the rotatable member forming a slightly larger angle with the axis of rotation whereby said grinding surfaces converge at an angle of about 3°, and spiral-shaped ridges on each of said grinding members in the pre-grinding zone having decreasing height in the direction of feed.

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