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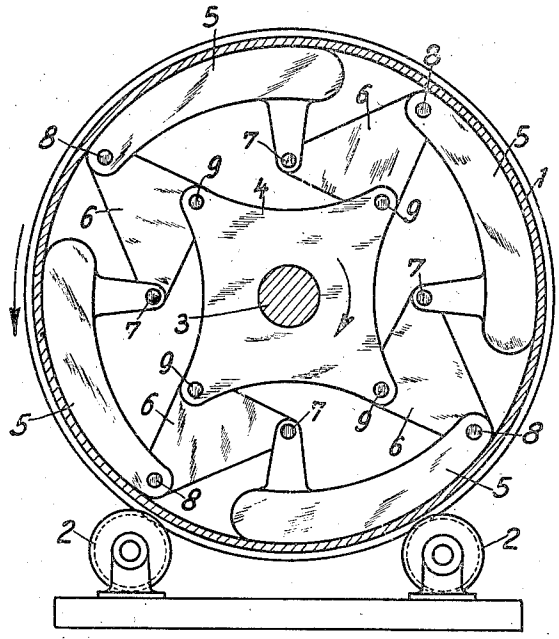

Inventor
Ulrich Kirchner and Gerald Stocker.
by McClure Bone attorney.

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UNITED STATES PATENT OFFICE

ULRICH KIRCHNER, OF BIBERACH-ON-THE-RISS, AND GERALD STRECKER, OF DARMSTADT, GERMANY

DRUM TYPE MILL FOR PAPER AND PULP MANUFACTURE

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The invention relates to a drum mill for paper and pasteboard manufacture with grinding units which are so connected with a rotating shaft positioned in the central axis of the drum that they are able to move in planes vertical thereto, and which, in the rotation of the shaft, grind on the inside surface of the drum under the action of centrifugal force.

In the known drum mills of this type, the grinding units are rotatable on journals which are set in a disc, or the like, attached to said shaft so that they can execute oscillation about their pins merely with respect to the shaft. If a grinding unit, attached in this manner, encounters in the stuff introduced a bundle of fibers then it can grind it up between its working surface and the inside surface of the drum only, if it is sufficiently thin to pass into the space between these surfaces. If the bundle is too thick for this, then it is either pushed ahead by the grinding unit and then not ground up, or else it is so strongly gripped in the space, tapering to the rear, between the front surface of the grinding unit and the inside surface of the drum that the fibers are torn up into small pieces. In so doing, the working surface of the grinding unit is so obliquely placed with respect to the inside surface of the drum that the gap between the two surfaces is considerably wider in the rear than in front. As long as the grinding unit remains in this position, it exerts no grinding action of any kind. Therefore, drum mills, the grinding members of which, as stated, are rotatably attached on pins, require a comparatively long time to grind the stuff uniformly and to the desired degree.

According to the present invention, the working efficiency of drum mills of the kind mentioned is essentially increased by the fact that the grinding members are connected with the driving shaft by parallel guiders. If a grinding member so installed encounters a bundle of fiber in the stuff introduced, then it yields, giving way to the latter under the influence of centrifugal force, parallel with itself in an inward direction so that the space between its working surface and the inside surface of the drum is widened for the entire extent of the working surface in uniform manner. Consequently, even a thick bundle is not pushed ahead by the grinding member but passes through the gap, and in so doing is caught by the working surface of the grinding member for its entire length and worked up.

According to the present invention, further in a suitable manner, the parallel guiding members are coupled together whereby the efficiency of such drum mills is still further enhanced, and a quiet impactless motion obtained as is to be shown in the foregoing with the aid of the drawing.

The said drawing shows the new drum in a constructional example in the direction of the axis wherein the parallel guiders of all grinding members are coupled to one another.

As shown in the drawing, a drum 1 is revolubly mounted on rollers 2 and driven in any suitable way, say counterclockwise. Along its axis extends a shaft 3 also driven in any suitable way, say clockwise. Upon the shaft 3 is fastened a spider 4 to which the grinders 5 are yieldingly connected and adapted to "float" between the shaft 3 and inner surface of drum 1. When the shaft 3 is rotated the grinders 5 are pressed by centrifugal force against the inner surface of the drum 1, on which they slide, and so grind the material in the drum and thoroughly mix it.

The grinders 5 are connected with the spider 4 and with each other by plates 6 and the pivotal connections 7, 8, 9. In each plate 6 the lengths 7—9 and 8—9 are equal and these lengths are the same in all the plates. Further the length 7—8 of each grinder is the same in all the grinders and all the lengths 9—9 of the spider 4 are equal. Finally the length 7—8 of each grinder is equal to the length 9—9. Each grinder considered alone therefore forms with the corresponding side of the spider 4 a parallelogram of links 9—9, 9—8, 8—7, 7—9, the lengths 9—8 and 9—7 being parallel links and the link 9—8 of one grinder parallelogram being connected with the link 7—9 of the next.

If such a "floating" grinder encounters a

resistance, for instance in the form of a dense knot in the material being milled, so that an inward pressure is exerted upon it, this pressure will be transmitted by the coupled parallel links to the remaining grinders and will tend to press these also inward. Hence the inward pressure upon the one grinder is resisted by the centrifugal force not only of that grinder but of all the other grinders, so that the pressure exerted upon the knot or other obstacle is the pressure due to the grinder encountering it multiplied by the number of grinders. It will be plain that the result of this is more rapid and powerful distintegration of the knots than in existing machines where only the centrifugal force upon a single grinder is operative at one time. Hence after a comparatively short time the material is evenly ground and thus a greater output obtained than from known drum type mills. A further result is that the grinding effect of the mill is automatically adapted to the increased resistance encountered by any one grinder and this affects the working of the mill in the sense of lessening shocks and making it run smoothly.

By varying the speed of rotation of the shaft 3 and drum 1, which latter, under some circumstances, may even stand still or can revolve in the same direction as the shaft 3, the grinding effect of the new drum mill may be governed within wide limits without the effect thereby experiencing a change. Also, there may be attached between the member 4 and the grinding member 5 springs which seek to remove it from the inside surface of the drum.

We claim:—

1. In a pulp mill, the combination with a hollow drum, a rotatable shaft within said drum, having its axis coaxial with the axis of said drum, a plurality of grinders within and arranged adjacent to the inner surface of said drum, means rotating with and pivotally connected to said shaft and to the adjacent ends of each of said grinders to parallely guide said grinders with respect to the inner surface of said drum, under the action of centrifugal force, in planes normal to the axis of said shaft, to thereby maintain said grinders in parallel spaced relation with the inner surface of said hollow drum.

2. In a pulp mill, the combination with a hollow rotatable drum, a rotatable shaft within said drum, having its axis coaxial with the axis of said drum, a plurality of grinders within and arranged adjacent to the inner surface of said drum, means rotating with and pivotally connected to said shaft and to the adjacent ends of each of said grinders to parallely guide said grinders with respect to the inner surface of said drum, under the action of centrifugal force, in planes normal to the axis of said shaft, to thereby maintain said grinders in parallel spaced relation with the inner surface of said hollow drum.

3. In a pulp mill, the combination with a hollow rotatable drum, a rotatable shaft within said drum, having its axis coaxial with the axis of said drum and rotating in an opposite direction from that of said drum, a plurality of grinders within and arranged adjacent to the inner surface of said drum, means rotating with and pivotally connected to said shaft and to the adjacent ends of each of said grinders to parallely guide said grinders with respect to the inner surface of said drum, under the action of centrifugal force, in planes normal to the axis of said shaft, to thereby maintain said grinders in parallel spaced relation with the inner surface of said hollow drum.

4. In a pulp mill, the combination with a hollow drum, a rotatable shaft within said drum, having its axis coaxial with the axis of said drum, a plurality of elongated floating grinders within and arranged adjacent to the inner surface of said drum, a guider for each grinder pivotally connected to and rotating with said shaft, and also pivotally connected to opposite ends of two adjacent grinders to pivotally couple said grinders and guiders to one another and to the rotatable shaft.

5. In a pulp mill, the combination with a hollow drum, a rotatable shaft within said drum, having its axis coaxial with the axis of said drum, a plurality of elongated floating grinders within and arranged adjacent to the inner surface of said drum, a guider substantially triangular in shape for each grinder, having one of its angular sections pivotally connected to and rotating with said shaft, and each of the other two triangular sections of said guider pivotally connected to an opposite end of adjacent grinders to pivotally couple said grinders and guiders to one another and its rotatable shaft.

6. In a pulp mill, the combination with a rotatable hollow drum, a rotatable shaft within said drum, having its axis coaxial with the axis of said drum, a plurality of elongated floating grinders within and arranged adjacent to the inner surface of said drum, a guider substantially triangular in shape for each grinder, having one of its angular sections pivotally connected to and rotating with said shaft, and each of the other two triangular sections of said grinder pivotally connected to an opposite end of adjacent grinders to pivotally couple said grinders and guiders to one another and its rotatable shaft.

7. In a pulp mill, the combination with a hollow drum, a rotatable shaft within said drum, having its axis coaxial with the axis of said drum, a plurality of floating grinders, and guiding elements alternately and circularly arranged within said drum, said grind-

ers disposed adjacent to the inner surface of said drum and their adjacent and opposed ends pivotally connected to one and the nearest interposed guiding element, and said guiding elements independently and pivotally connected to said rotatable shaft whereby said guiders and grinders are pivotally linked to each other and to the shaft.

8. In a pulp mill, the combination with a rotatable hollow drum, a rotatable shaft within said drum, having its axis coaxial with the axis of said drum, a plurality of floating grinders, and guiding elements alternately and circularly arranged within said drum, said grinders disposed adjacent to the inner surface of said drum and their adjacent and opposed ends pivotally connected to one and the nearest interposed guiding element, and said guiding elements independently and pivotally connected to said rotatable shaft whereby said guiders and grinders are pivotally linked to each other and to the shaft.

9. In a pulp mill, the combination with a rotatable hollow drum, a rotatable shaft within said drum, having its axis coaxial with the axis of said drum, a plurality of floating grinders, and guiding elements alternately and circularly arranged within said drum, said grinders disposed adjacent to the inner surface of said drum and their adjacent and opposed ends pivotally connected to one and the nearest interposed guiding element, and said guiding elements independently and pivotally connected to said rotatable shaft whereby said grinders and guiders are pivotally linked to each other and to the shaft and rotate with said shaft within a rotary drum.

In testimony whereof we have affixed our signatures.

ULRICH KIRCHNER.
GERALD STRECKER.