April 18, 1961 E. J. A. LEJEUNE 2,980,350

FIBRE DISINTEGRATING APPARATUS

Filed May 26, 1958

Fig. 1

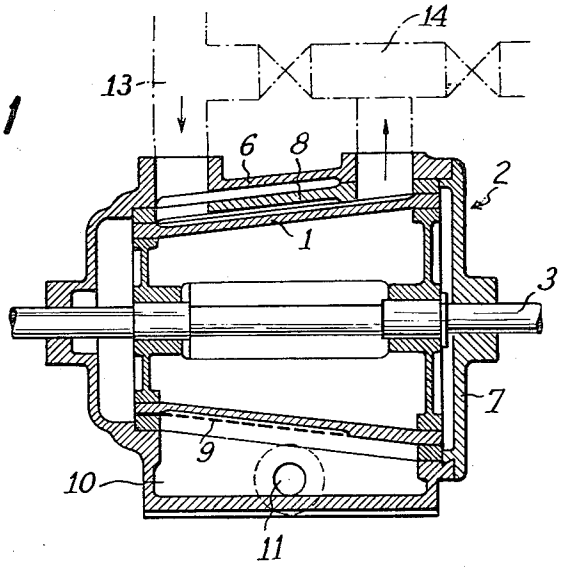


Fig. 2

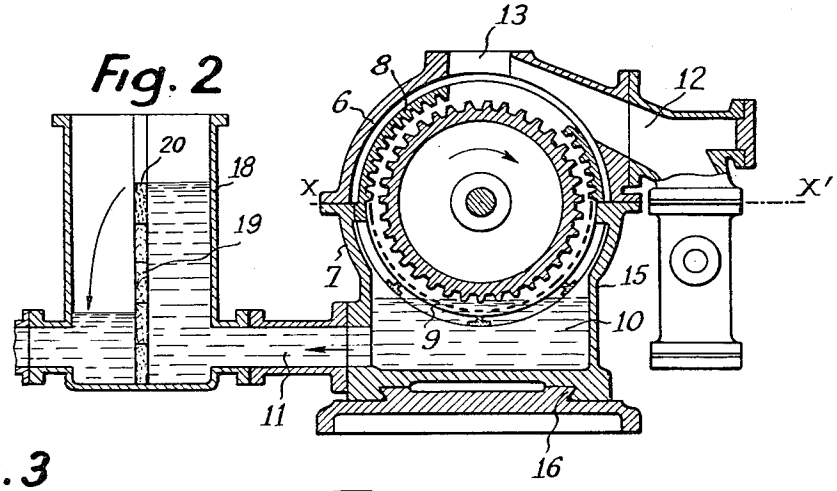
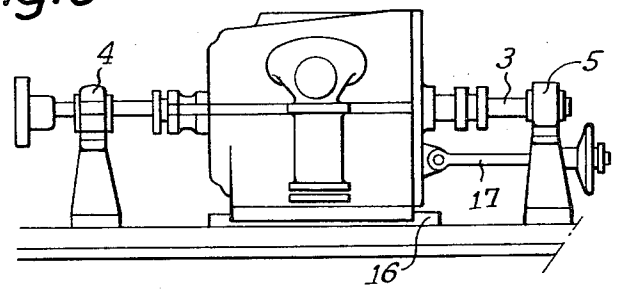


Fig. 3



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FIBRE DISINTEGRATING APPARATUS

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1 Claim. (Cl. 241—73)

This invention relates to grinding and/or disintegrating apparatus of the type used particularly in connection with cellulosic materials such as paper pulp, and similar fibrous materials. Grinding apparatus of this type generally comprises coaxial stator and rotor members respectively provided with similar grinding elements, such as projecting teeth or ribs which project inwardly into the gap between the stator and rotor to disintegrate and grind the fibrous materials introduced into said gap. Frequently a slightly frustoconical shape is imparted to both stator and rotor members for gradually varying the gap between the operating elements by imparting a limited relative axial reciprocation between the stator and rotor members. It is an object of this invention to provide improved grinding apparatus of this kind. Another object is to provide such apparatus including means for gradually separating the ground pulp or disintegrated material progressively as it is formed, from the incompletely ground stock.

In attaining these objects, it is contemplated according to a feature of the invention that part of the stator, specifically the lower part thereof, be provided in the form of a perforate wall through which the disintegrated fibre material is adapted to drop into a collector chamber. In a preferred construction, the perforate wall is provided in the form of arcuate perforate sheet elements positioned beneath the rotor periphery and extending arcuately over the lower half of the stator periphery.

With this arrangement the disintegrated material is allowed to drop by gravity into a sorting chamber provided in the base of the apparatus, and the ground pulp collected in this chamber is desirably maintained under a predetedmined pressure. Thus the ground pulp in the chamber is caused to remain in contact with the underside of the perforate wall thereby to exert upon the material being processed an upward back-pressure through the perforations, opposing the passage of incompletely ground material therethrough.

According to a further feature of the invention, means are preferably provided for establishing at the outlet of the apparatus a hydraulic back-pressure for thus maintaining the ground material in contact with the perforations. Such hydraulic back-pressure may for example be provided by providing a riser pipe or tank connected with the collecting chamber and wherein the ground pulp is allowed to rise to a predetermined height for establishing the desired back pressure. Adjustable overflow means may be provided in said riser pipe or tank for maintaining the controllable head of pulp in it.

The inlet pressure of raw stock supplied to the apparatus is made higher than the outlet back-pressure thus created. The pressure differential between inlet and outlet pressures is adjusted in accordance with the desired degree of a fineness in the final pulp product, and in accordance with the operating characteristics of the apparatus including velocity of rotor rotation, cross sectional area of the perforations and the like. Thus, it has been found that the back pressure provided at the outlet should be increased when the rotation velocity is decreased and vice versa.

It has further been found that the frusto-conical shape imparted to the stator and rotor makes it easier to separate materials that are relatively difficult to grind, from the ground material, in the apparatus of the invention. This is because as a result of the tapering gap the raw stock fed into the operating gap or chamber at the smaller-diameter end of the apparatus is gradually separated into the bottom collector chamber, while the material that has not yet been disintegrated and cannot pass through the perforations is forced to revolve round and round in the operating chamber and is thereby gradually forced over a helical path towards the larger-diameter end of the apparatus. In this connection, it is contemplated according to the invention that a further chamber be provided at the large-diameter end of the apparatus in which the coarser portions of the material will tend to collect as a result of the action just described, whence such coarse portions may be withdrawn for recycling or for rejection as the case may be. For this purpose, the above mentioned screening wall is left imperforate at the large-diameter area of the apparatus thereby to define a reject chamber and a discharge conduit is connected with said chamber for disposing of the coarse material fractions collecting therein and/or recycling such fractions back to the inlet of the apparatus.

An exemplary embodiment of the invention will now be described for purposes of illustration but not of limitation with reference to the accompanying drawings, wherein:

Fig. 1 is an axial sectional view of the stator and rotor of the grinder apparatus;

Fig. 2 is a transverse sectional view showing the same apparatus together with hydraulic back pressure means therefor; and

Fig. 3 is a smaller-scale view in side elevation of the apparatus showing the axial reciprocating means used therewith.

Referring to the drawings, the apparatus shown includes a rotor member 1 and a stator member 2 coaxially arranged and having a frusto-conical shape. The rotor 1 is secured on a shaft 3 journalled at its ends in bearings 4 and 5, see Fig. 3. The stator 2 is comprised of an upper shell member 6 and a lower shell member 7 which are assembled together on a horizontal plane X—X' by means of suitable flanges as shown. Secured in the upper stator shell 6 is a grinding element or set of elements 8 in the form of axially extending ribs and grooves, or serrations. The grinding means 8 are omitted in an area adjacent the inlet feed aperture 13 provided at the top of the apparatus, as shown. The lower stator shell 7, instead of receiving similar serrated elements as is generally the case in conventional grinders supports an arcuate perforate sheet metal wall 9. Serrations similar to the serrations 8 are provided all around the rotor circumference by forming spaced apart, axially extending grooves in the rotor surface, as shown in Fig. 2.

Defined by the frame 15 of the apparatus beneath the perforate wall 9 is a collecting chamber 10. An outlet is formed in a side of this chamber which connects by way of a conduit 11 with the base of a riser pipe or tank 18 provided with a separating wall 19 and adjustable overflow means 20 at the top of the wall for maintaining a predetermined head of liquid pulp in the tank and thus establishing the desired back pressure within chamber 10 as previously described.

As shown in Fig. 1, the perforate wall 9 includes a solid i.e. imperforate end portion adjacent the large diameter end of the stator and rotor thus defining a chamber in which the coarser portions of the material tend to collect for the reasons previously stated. An outlet at the

top of this reject chamber is connected with a conduit 14 connected at one end by way of a shut-off valve with the supply inlet 13 for recycling the rejects back into the grinder, and connected at its other end by way of another shut-off valve to any suitable means of disposal for finally rejected material.

Means are provided for axially reciprocating the stator 6—7 axially of the rotor and for this purpose the frame 15 is bodily reciprocable on slideways 16 relatively to a fixed base. The desired axial reciprocation may be imparted to the frame by way of a linkage 17, see Fig. 3, driven through suitable conventional means from the same power source as that serving to rotate the rotor.

What I claim is:

Apparatus for disintegrating and refining cellulosic material comprising a frustoconical stator arranged with its axis extending substantially horizontally, a frustoconical rotor rotatably mounted in said stator coaxially with the latter and having disintegrating grooves in the surface of the rotor, said stator having an inlet opening for the material to be treated in its upper portion adjacent the relatively small diameter end of the stator, said upper portion of the stator having disintegrating grooves in at least an axial portion thereof extending from said small diameter end a distance corresponding to the length of said grooves of the rotor, the lower portion of said stator being in the form of a smooth wall having perforations in an axial portion thereof extending from said small diameter end to form a sieve for the disintegrated material, a substantial axial length of said stator adjacent the relatively large diameter end thereof being smooth and imperforate at least in said lower portion thereof, and said stator further having an outlet orifice for incompletely disintegrated material opening from said upper portion adjacent said large diameter end.

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