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[54] **MECHANICAL REFINING OF FIBER MATERIAL INCLUDING STEAM RECYCLE**

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[51] **Int. Cl.²** **B02C 7/00;** B27L 11/08

[58] **Field of Search** 162/28, 47, 23, 19; 241/28

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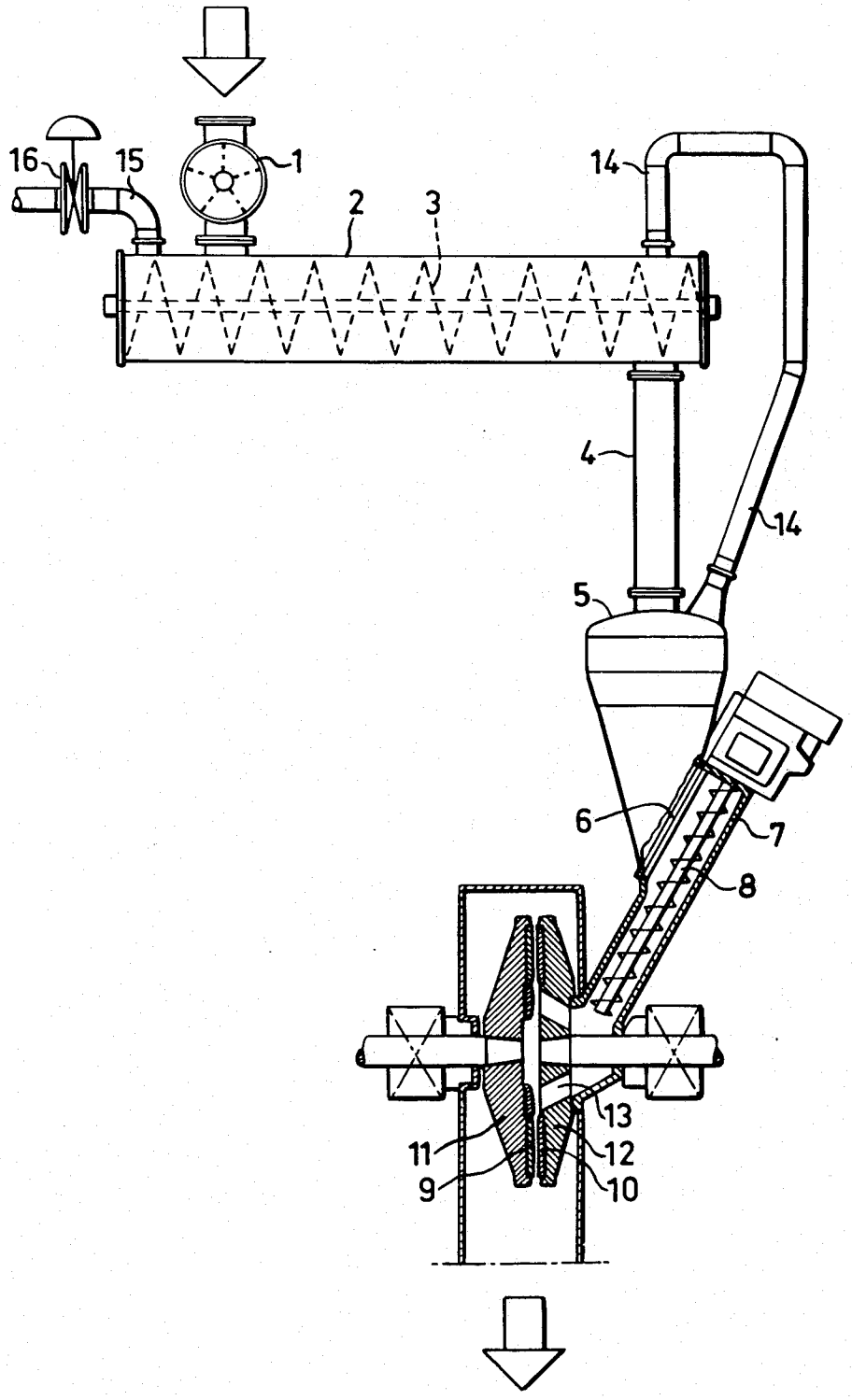
[57] **ABSTRACT**

Refiner pulp is prepared by the steps of pretreating fibrous material with steam in a preheater followed by the step of refining the steam-treated material in a disc refiner whereby steam is developed, and at least a part of the developed steam is conducted back to the preheater for maintaining desired pressure and temperature conditions in the preheater.

6 Claims, 1 Drawing Figure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MECHANICAL REFINING OF FIBER MATERIAL INCLUDING STEAM RECYCLE

This invention relates to a method of producing mechanical refiner pulp of various types of fibre material.

It is previously known to expose fibre material for a relatively short time to heating with steam to above 110°C and to a pressure increased corresponding to the temperature. The pressure is thereafter allowed to expand to a value somewhat above atmospheric pressure before the preheated fibre material is introduced between the refining surfaces of a disc refiner. The steam developed during the refining can by special means entirely or partially be led away from the central space between the grinding discs. Steam possibly following along from the preheating zone may, of course, also be evacuated in the same way. This implies, contrary to conventional systems, a greater freedom of refining with smaller gaps between the grinding discs and, consequently, with higher energy supply, without giving rise to serious process disturbances. The entire defibering and refining process to the finished product can in this way be carried out in a single step. At the production of certain pulp grades the refining may also be carried out in several, preferably two steps, but the portion of the total energy amount consumed in the first step immediately after preheating would still be so great that the steam developed during the process would cause serious disturbances, if the steam would be forced to pass out in its entirety through the gap between the beating discs, as is the case with conventional systems. According to the method described above, the preheater vessel is not in direct connection with the refiner, and the preheating of the fibre material usually takes place within the temperature range 110°–170°C, the pressure during the preheating being higher than the pressure which prevails immediately after the preheater vessel and in the central space between the grinding discs, and the steam developed during the refining being entirely or partially led away by special means from said space. It was found suitable to carry out the refining at a steam pressure of 0.2–0.6 kg/cm², corresponding to a temperature of about 105°–115°C, within which range the refining energy consumption seems to be at a minimum. It was found in a great number of mill experiments on an industrial scale that very good pulp grades can be produced also when the preheating of the fibre material takes place in the lower part of the aforesaid temperature range, or at about 110°–115°C. Although the resulting mechanical pulps do not reach the same high quality levels as at preheating at higher temperatures, preferably 130°C or above, their properties yet are so good that the pulps are fully acceptable for the production of a plurality of paper grades. This development has become possible by the application of increasingly finer patterns of the grinding surfaces on the segments mounted on the refiner discs, thereby rendering it possible to carry out a greater part of the defibering work with the segments and correspondingly reduce the energy consumption in the preheating phase.

One main object of the present invention is to establish a simplified system for producing mechanical pulps of high quality while maintaining the advantages involved with the refining of preheated fibre material, in such a manner, that a large part of the steam developed during the refining can be evacuated rearwards through

the system from the space between the grinding discs, but at the same time this steam is utilized for preheating the fibre material in order to save energy. According to the invention, the fibre material is exposed to heating with steam to 110°–115°C and to a pressure increased corresponding to the temperature. The temperature and pressure are maintained equal during the refining. The steam developed during the refining is led away from the space between the grinding discs through the feed screw of the refiner or through another suitable device to the preheater vessel, which is in direct connection with the refiner. It is hereby possible, if desired, to consume in a single step the entire energy amount required for the process without giving rise to process disturbances. Contrary to conventional systems, the steam developed by the refiner is utilized in this way for heating the fibre material. No steam generated in a different way need be supplied to the system, so that substantial energy can be saved compared with conventional systems. The refiner produces more steam than can be utilized for heating the fibre material, and the excess is removed from the preheater vessel through a pressure control valve. The energy savings thereby possible correspond to about 150–300 kWh/t of produced mechanical pulp, or 10–20 % of the total refining energy. The refining may, if desired, be carried out with the housing enclosing the beating discs being pressureless and open.

The invention is described in greater detail in the following, with reference to the FIGURE showing an apparatus for carrying out the process according to the invention.

The embodiment according to the FIGURE comprises a rotary vane feeder **1** for feeding the fibre material into a preheater vessel **2.** The fibre material has a high concentration and is metered to a correct amount by means of a metering device (not shown) arranged before the rotary vane feeder **1.** The fibre material is advanced through the preheater vessel **2** by means of a screw **3** with such a speed that the staying time is as long as desired, i.e. ½ – 3 minutes, preferably ½ – 1 ½ minutes. The screw **3** is for this purpose provided with variable operation. The heated fibre material after its passage through the preheater vessel **2** is allowed to fall freely through a chute **4** adjusted to local conditions, usually in the form of a pipe, which is drawn through a separation funnel **5** mounted on the opening **6** to the feed device **7** of the refiner which at the embodiment shown is an inclined double-screw. The feed device may also be of another kind, such as one or two separate horizontal feed screws. The chute **4** opens suitably spaced from the opening **6** to the feed screws, so that the chips unobstructedly can fall into the feed screws **8,** which feed the fibre material between the grinding discs **11, 12** of the refiner through the feed opening **13** in the grinding disc **12.** Said discs **11, 12** are provided with refining surfaces **9, 10.** The feed screws **8** are operated at such a high number of revolutions that they are only partially filled. It is hereby possible for the greater part of the steam formed during the refining process to escape rearwards through the system, from the refining zone and the central space between the grinding discs out through the feed openings **13** and through the only partially filled feed screws **8** out into the steam separation funnel **5.** The chute **4** for the chip transport being drawn down to a point close to the opening **6** of the feed screws **8,** the greater part of the steam coming from the refiner can be transported

through a separate duct **14** to the preheater vessel **2** and be utilized for heating the fibre material to 105°–115°C. Thereby, only a part of the steam will be transported through the chute **4**, and the fibre material, therefore, falls down through the chute without being disturbed by large steam amounts flowing in the opposite direction. The steam discharged from the refiner is the only heat source for heating the fibre material, and no further steam need be added. The steam flows through the preheater vessel **2** in a direction opposite to and thereby heating the fibre material, and the excess steam is evacuated through the duct **15** and control valve **16** located at the end of the preheater vessel where the fibre material is charged. By means of the control valve **16**, the pressure and temperature are adjusted to the desired level in the entire system, as described above.

The invention, of course, is not restricted to the embodiment shown, but can be varied within the scope of the claims. The refiner, for example, may be of the single-disc type and the fibre material can then be charged in a corresponding manner through the stationary disc.

I claim:

1. In a method of treating fiber material involving the steps of first preheating the material with steam under elevated temperature and superatmospheric pressure

in a preheater space and then feeding the material as a stream into a disc refiner for refining the material during its outward passage from between the grinding discs of the disc refiner during which passage steam at superatmospheric pressure is developed, the improvement consisting of conducting part of said developed pressurized steam back into the preheater space in order to maintain the temperature and pressure in said preheater space.

2. The method according to claim **1**, wherein the superatmospheric pressure within the preheater space is controlled by evacuating any excess steam from said space.

3. The method according to claim **1**, wherein preheated material is fed from said preheater space to the disc refiner by causing the material to fall freely through a feeding chute.

4. The method according to claim **1**, wherein the fibre material is heated by the steam to 105°–115°C, the steam pressure being 0.2–0.6 kg/cm².

5. The method according to claim **1**, wherein the refining is carried out in a single step.

6. The method according to claim **1**, wherein the refining is carried out in two steps.

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