



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 447 470 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
18.08.2004 Bulletin 2004/34

(51) Int Cl.7: **D21B 1/34**

(21) Application number: **04100510.9**

(22) Date of filing: **11.02.2004**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PT RO SE SI SK TR**
Designated Extension States:
AL LT LV MK

(72) Inventors:
• **Micheletti, Giorgio**
37010 Sant' Ambrogio di Valpolicella (IT)
• **Micheletti, Andrea**
37010 Sant' Ambrogio di Valpolicella (IT)

(30) Priority: **11.02.2003 IT TO20030098**

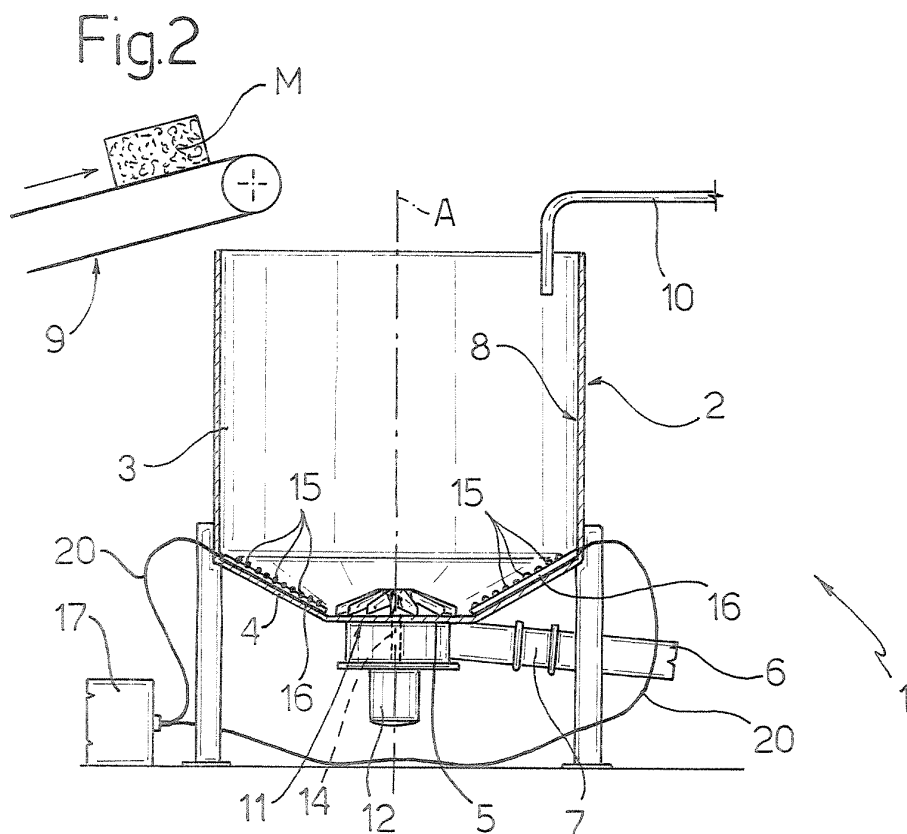
(74) Representative: **Jorio, Paolo, Dr. Ing. et al**
Studio Torta S.r.l.,
Via Viotti, 9
10121 Torino (IT)

(71) Applicant: **Idroservice S.r.l.**
37017 Lazise (IT)

(54) **Pulper for producing cellulose pulp from waste paper material**

(57) A pulper (1) for producing cellulose pulp from waste paper material, and having a tank (2) defining a chamber (8) and adapted to be loaded with predetermined quantities of waste paper material and water; a rotor (11) located at the bottom of the tank (2), having a

number of blades (13), and rotating in a predetermined direction; and a number of nozzles (15) connected to a high-pressure water source (17) and for emitting respective high-pressure water jets inside the tank (2) in a direction having a tangential component opposite the rotation direction of the rotor.



Description

[0001] The present invention relates to a pulper for producing cellulose pulp from waste paper material, and in particular from non-homogenous paper-based waste materials obtained by recycling paper.

[0002] As is known, the ever increasing use of paper, both as a finished product for professional or domestic use and as packing material, has created a need to develop differential refuse collection and recycling techniques, i.e. for partly recovering the cellulose necessary for producing paper.

[0003] Cellulose is recovered from recycled paper material in so-called pulpers, which substantially comprise a substantially cylindrical tank with a substantially conical bottom, and a vertical-axis rotor located at the bottom of the tank and having a number of radial blades.

[0004] The pulper process is normally discontinuous. The paper material, normally in the form of bales, is loaded into the tank by a conveying device; a predetermined amount of water is fed into the tank; and the rotor is activated to disperse the paper material, which tends to settle by gravity on the bottom, until a cellulose pulp of predetermined concentration is obtained.

[0005] Once the dispersion step is completed, the pulp is unloaded from the tank and pumped to successive processing stations, after which, another processing cycle can be started.

[0006] The main drawback of known pulpers of the type briefly described above is the excessively long processing cycle time involved, which, depending on the type of paper material being processed, may even be as long as two hours.

[0007] It is an object of the present invention to provide a pulper designed to greatly reduce processing cycle time.

[0008] According to the present invention, there is provided a pulper for producing cellulose pulp from waste paper material, and comprising a tank defining a chamber adapted to be loaded with waste paper material and water; and a rotor located at the bottom of the tank and having a number of blades; the pulper being characterized by comprising a number of nozzles connected to a high-pressure water source and for emitting respective high-pressure water jets inside said tank.

[0009] A preferred, non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic plan view of a pulper in accordance with the invention;

Figure 2 shows a sectioned elevation of the Figure 1 pulper;

Figure 3 shows a partial section along line III-III in Figure 1.

[0010] Number 1 in the accompanying drawings indicates as a whole a pulper for producing cellulose pulp

from waste paper material M.

[0011] Pulper 1 comprises a tank 2 defined by a cylindrical lateral wall 3 having a vertical axis A, and by a substantially truncated-cone-shaped bottom wall 4 tapering downwards to define, at the centre, a dump opening 5 communicating with a dump conduit 6 (shown partly) via an on-off valve 7. Tank 2 defines an open-top chamber 8 into which are fed, in predetermined proportions, material M in the form of bales, e.g. by means of a conveyor 9 shown partly and schematically, and water by means of a feed pipe 10. The water from pipe 10 is at a temperature, for example, of 30°C.

[0012] Pulper 1 also comprises a rotor 11, of axis A, located at the bottom of tank 2, just over dump opening 5, and fixed to a shaft 14, of axis A, fitted to rotate freely with respect to bottom wall 4 and connected to an electric motor 12 for rotating rotor 11. Rotor 11 comprises a number of substantially radial blades 13 for dispersing the paper material.

[0013] According to the present invention, pulper 1 comprises a number of nozzles 15 which are connected to a high-pressure water source 17, are located close to the walls of tank 2, and emit high-pressure water jets inside tank 2.

[0014] More specifically, source 17 is conveniently defined by a known hydrodynamic unit for supplying water at a pressure of 200 to 2000 bars, and preferably of about 1000 bars, at a temperature of 60 to 80°C, and at a flow rate of 50 to 300 l/min, and preferably of about 150 l/min.

[0015] In a preferred embodiment of the invention, nozzles 15 are arranged along a number of tubular headers 16 radiating about rotor 11 along respective generating lines of bottom wall 4, and in turn connected to source 17 by respective hoses 20, so that each header 16 supports and feeds one set of nozzles 15.

[0016] According to a further preferred characteristic of the invention, nozzles 15 are tilted upwards in the opposite direction to the rotation direction of rotor 11, so that the jets have a tangential component opposite the rotation direction ω of blades 13, and strike the work material at an angle of incidence.

[0017] Pulper 1 operates as follows.

[0018] The paper material M and water are loaded and piped respectively into tank 2 by conveyor 9 and pipe 10; rotor 11 is then activated and, at the same time, headers 16 are supplied with high-pressure water to produce a number of high-pressure, hot-water jets through nozzles 15. The dual action of rotor 11 and the water jets produced by nozzles 15 provides for much faster dispersion of material M. Tests in fact have shown that, even with the same end result, processing time can be reduced to less than half that of a conventional pulper. In particular, excellent results have been obtained with processing times of about 40 minutes.

[0019] In the preferred embodiment described, dispersion is made even more effective by the direction of the jets, which has a tangential component opposite the

rotation direction of blades 13, and by the temperature of the high-pressure water, which is much higher than that of the water originally inside tank 2.

[0020] Once dispersion is completed, the pulp is dumped from the tank and pumped to successive processing stations, after which, another processing cycle can be started.

[0021] Clearly, changes may be made to the pulper as described herein without, however, departing from the scope defined by the accompanying Claims.

[0022] In particular, the nozzles may differ in number and arrangement. For example, instead of or in addition to the nozzles on bottom wall 4, nozzles may be provided along cylindrical lateral wall 3 of tank 2 and supplied by headers of the type described located, for example, along generating lines of wall 3.

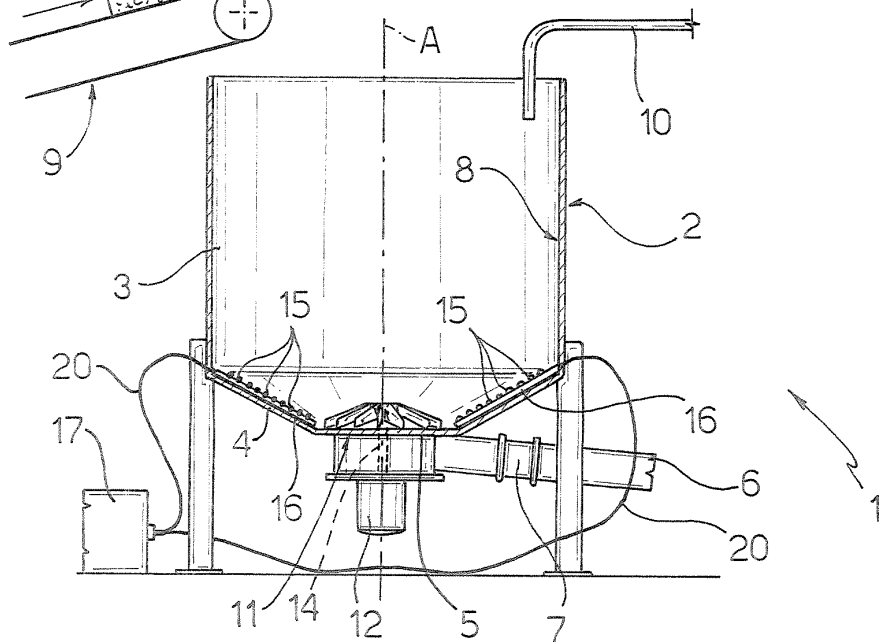
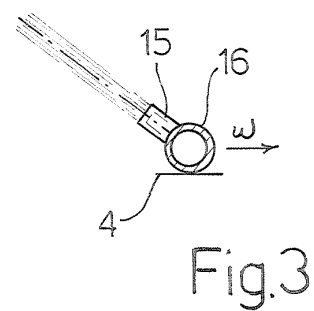
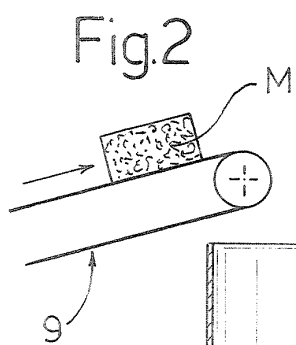
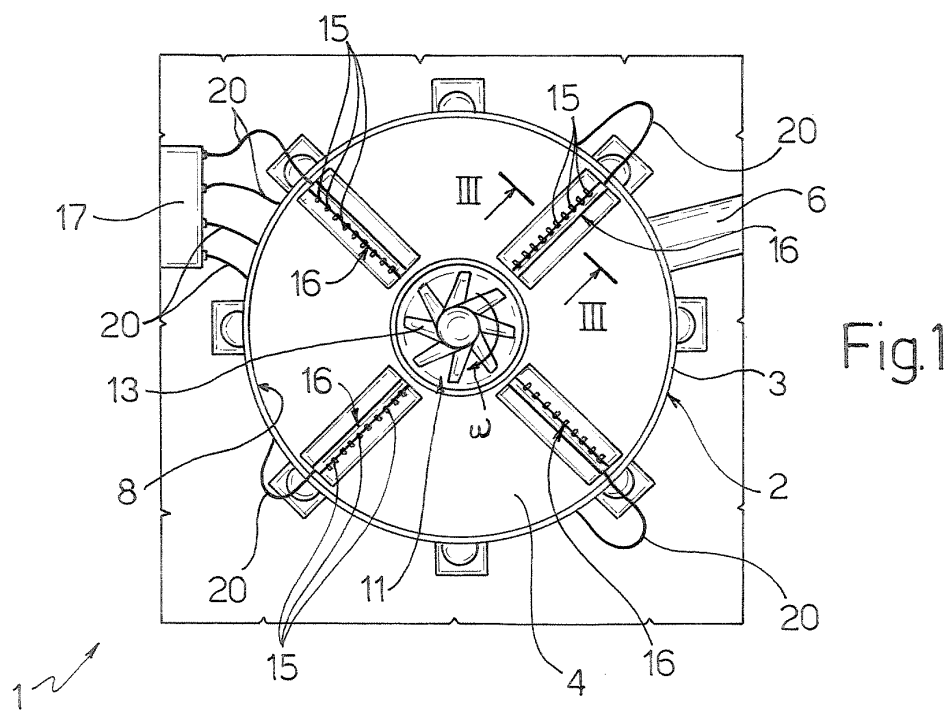
[0023] The pulper may also operate continuously as opposed to in discrete cycles.

that said headers (16) are located on a lateral wall (3) of said tank (2).

8. A pulper as claimed in any one of the foregoing Claims, **characterized in that** the water is supplied to said nozzles (15) at 200 to 2000 bar pressure.
9. A pulper as claimed in Claim 8, **characterized in that** the water is supplied to said nozzles (15) at roughly 1000 bar pressure.
10. A pulper as claimed in any one of the foregoing Claims, **characterized in that** the water is supplied to said nozzles (15) at a temperature of 60 to 80°C.

Claims

1. A pulper (1) for producing cellulose pulp from waste paper material, and comprising a tank (2) defining a chamber (8) adapted to be loaded with waste paper material and water; and a rotor (11) located at the bottom of the tank (2) and having a number of blades (13); the pulper being **characterized by** comprising a number of nozzles (15) connected to a high-pressure water source (17) and for emitting respective high-pressure water jets inside said tank (2).
2. A pulper as claimed in Claim 1, **characterized in that** said rotor (11) rotates in a predetermined direction; and **in that** said nozzles (15) are oriented in a direction having a tangential component opposite the rotation direction of the rotor (11).
3. A pulper as claimed in Claim 1 or 2, **characterized in that** said nozzles (15) are located close to a wall (4) of said tank (2).
4. A pulper as claimed in Claim 3, **characterized by** comprising a number of sets of nozzles (15), each set of nozzles (15) being carried by, and connected to, a common header (16) connected to said high-pressure water source (17).
5. A pulper as claimed in Claim 4, **characterized in that** said headers (16) are located on a bottom wall (4) of said tank (2).
6. A pulper as claimed in Claim 5, **characterized in that** said headers (16) are straight pipes radiating about said rotor (11).
7. A pulper as claimed in Claim 4, **characterized in**





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 10 0510

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 4 538 765 A (HEINBOCKEL WOLFGANG ET AL) 3 September 1985 (1985-09-03) * column 3, line 16 - line 67 * * figures 1,2 * ---	1,3,4,7	D21B1/34
X	US 4 863 107 A (HARZL ERICH ET AL) 5 September 1989 (1989-09-05) * column 4, line 32 - line 47 * * figure 1 * ---	1,3-5	
X	US 2 667 106 A (ROOT EDWARD M ET AL) 26 January 1954 (1954-01-26) * column 3, line 18 - column 4, line 13 * * figure 1 * -----	1,3,4	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			D21B
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 3 May 2004	Examiner Maisonnier, C
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 10 0510

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

03-05-2004

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4538765 A	03-09-1985	CH 654360 A5	14-02-1986
		AT 381331 B	25-09-1986
		AT 536381 A	15-02-1986
		CA 1198302 A1	24-12-1985
		IT 1153027 B	14-01-1987
US 4863107 A	05-09-1989	AT 387042 B	25-11-1988
		AT 99686 A	15-04-1988
		DE 3707813 A1	22-10-1987
		DK 198687 A	17-10-1987
		FI 871569 A	17-10-1987
		GB 2189162 A ,B	21-10-1987
		NO 871497 A	19-10-1987
		SE 503341 C2	28-05-1996
		SE 8701583 A	17-10-1987
US 2667106 A	26-01-1954	NONE	