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United States Patent [19]

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Olsen et al.

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[54] **METHOD OF IMPROVING PULP FREENESS USING CELLULASE AND PECTINASE ENZYMES**

5,503,709	4/1996	Burton	162/6
5,507,914	4/1996	Sarkar et al.	162/100
5,582,681	12/1996	Back et al.	162/5

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FOREIGN PATENT DOCUMENTS

758488	5/1967	Canada	.
0 351655	6/1989	European Pat. Off.	.
84-15886	10/1984	France	.
84-00448	7/1985	France	.
8613208	3/1988	France	.
63-59494	3/1988	Japan	.
2-080683	3/1990	Japan	.
1406962	9/1975	United Kingdom	.
2231595	11/1990	United Kingdom	.
WO9218688	10/1992	WIPO	D21C 9/10

[73] Assignee: **International Paper Company**, Purchase, N.Y.

[*] Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

OTHER PUBLICATIONS

Sakar et al., "Applying Enzymes . . . Recycled Fibers", Tappi Journal, vol. 78, No. 2, pp. 89-95, Feb. 1995.

Stork et al., "Upgrading . . . Enzymatic Treatment", Recycling Symposium, 1994, pp. 107-117, 1994.

"Enzymes'0 Future Look Bright . . .", Roger Grant, Pulp's International, Aug. 1994.

"Enzymes Help to Increase Pulp's Paper Production", Roger Grant, Pulp's Paper International, Aug. 1995, pp. 26-27.

"Biotechnology's Potential is Growing", Pulp's Paper International, May 1990, pp. 118-119.

"The Use of Enzymes in Paper and Board Making", Pommier, Paper Technology, Oct. 1991, pp. 50-53.

"Biotechnology in the Pulp and Paper Industry: A Review", Tappi Journal, May 1990, pp. 201-205.

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[51] **Int. Cl.**⁷ **D21C 5/02**

[52] **U.S. Cl.** **162/5; 162/72; 435/277; 435/278**

[58] **Field of Search** 162/4, 5, 72 B, 162/158, 189; 435/277, 278

[56] References Cited

U.S. PATENT DOCUMENTS

4,891,096	1/1990	Akkawi	162/1
4,923,565	5/1990	Fuentes et al.	162/72
5,068,009	11/1991	Jokinen et al.	162/9
5,103,883	4/1992	Vikari et al.	144/342
5,110,412	5/1992	Fuentes et al.	162/5
5,116,474	5/1992	Fuentes et al.	162/71
5,116,746	5/1992	Bernier et al.	435/172.3
5,169,497	12/1992	Sarkar et al.	162/158
5,179,021	1/1993	du Manoir et al.	435/278
5,308,449	5/1994	Fuentes et al.	162/72
5,364,501	11/1994	Baret et al.	162/5
5,407,827	4/1995	Casimir-Schenkel et al.	435/278
5,423,946	6/1995	Sarkar et al.	162/158
5,487,812	1/1996	Thornton et al.	162/72
5,501,770	3/1996	Sarkar et al.	162/100

(List continued on next page.)

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[57] ABSTRACT

A method for enhancing the freeness of pulp made from secondary fiber is provided by adding an enzymatic mixture comprised of cellulase and pectinase enzymes to the pulp and treating under conditions to cause a reaction to produce an enzymatically treated pulp. The freeness of the enzymatically treated pulp is increased from the initial freeness of the secondary fiber pulp without a loss in brightness.

15 Claims, 14 Drawing Sheets

