AUSTRALIA

PATENTS ACT 1990

NOTICE OF ENTITLEMENT

I, **Hans-Peter Call**, the applicant/Nominated Person in respect of Application No. 75430/91 state the following:-

The Nominated Person is entitled to the grant of the patent because the Nominated Person is the inventor.

The Nominated Person is entitled to claim priority from the application listed in the declaration under Article 8 of the PCT because the Nominated Person made the application listed in the declaration under Article 8 of the PCT, and because that application was the first application made in a Convention country in respect of the invention.

DATED this FIFTEENTH day of OCTOBER 1992

.....

a member of the firm of DAVIES COLLISON CAVE for and on behalf of the applicant(s)

(DCC ref: 1530756)

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PROCESS FOR PROCESSING WASTE PAPER WITH ENZYMATIC REMOVAL OF PRINTING INK

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(71) Applicant(s)
HANS-PETER CALL

(72) Inventor(s)
HANS-PETER CALL

(74) Attorney or Agent
DAVIES COLLISON CAVE , 1 Little Collins Street, MELBOURNE VIC 3000

(56) Prior Art Documents
WO 8803190
AU 11244/76 D21C 5/02
AU 48558/72 D21C 5/02

(57) Claim

1. A process for scrap paper recycling with enzymatic printing ink removal, comprising

a) adjusting a redox potential in the range of 200 to 500 mV by carrying out a metered addition of oxidants and reductives to a reacting solution containing scrap paper;

b) starting a lignin-decomposing reaction by adding lignolytic enzymes; and

c) continuing the reaction in a commercial flotation unit for approximately 10 minutes to 40 °C, 0.8 to 2.5% consistency and a stirring speed of 1,200 to 1,600 rpm, during which period 60 to 80 l of air/h per 1.5 l reaction volume is added, and

d) continuing the reaction for 60 to 90 minutes, during which period the addition of air and the stirring speed are reduced.

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(71)(72) Anmelder und Erfinder: CALL, Hans-Peter [DE/DE]; Heinsbergerstr. 14a, D-5132 Übach-Palenberg (DE).

(74) Anwalt: FITZNER, Ulrich; Am Eichförstchen 2a, D-4030 Ratingen-Lintorf (DE).

(81) Bestimmungsstaaten: AT (europäisches Patent), AU, BE (europäisches Patent), BR, CA, CH (europäisches Patent), DE (europäisches Patent), DK (europäisches Patent), ES (europäisches Patent), FI, FR (europäisches Patent), GB (europäisches Patent), GR (europäisches Patent), HU, IT (europäisches Patent), JP, LU (europäisches Patent), NL (europäisches Patent), NO, SE (europäisches Patent), SU, US.

Veröffentlicht
Mit internationalem Recherchenbericht.

652358

(54) Title: PROCESS FOR PROCESSING WASTE PAPER WITH ENZYMATIC REMOVAL OF PRINTING INK

(54) Bezeichnung: VERFAHREN ZUR ALTPAPIERAUFBEREITUNG MIT ENZYMATISHER DRUCKFARBENENTFERNUNG

(57) Abstract

Process for processing waste paper with enzymatic removal of printing ink, in which a) the redox potential of a solution containing waste paper is adjusted to a value in the range of 200 to 500 mV by simultaneous dosing of oxidizing and reducing agents, b) a lignin-decomposing reaction is initiated by addition of lignolytic enzymes, c) the reaction is continued for approximately 10 minutes by adding 60 to 80 litres/hour of air per 1.5 litres of reaction volume at 40° C, 0.8 to 2.5 % substance density and a stirrer speed of 1200 to 1600 rpm in a standard commercial flotation installation, and d) the reaction continues for 60 to 90 minutes with a reduced supply of air and at reduced stirrer speed.

(57) Zusammenfassung

Die vorliegende Erfindung betrifft ein Verfahren zur Altpapieraufbereitung mit enzymatischer Druckfarbenentfernung, wobei a) unter gleichzeitiger Zudosierung von Oxidations- und Reduktionsmitteln zu einer Altpapier enthaltenden Lösung ein Redoxpotential im Bereich von 200 bis 500 mV eingestellt, b) durch Zugabe von lignolytischen Enzymen eine ligninabbauende Reaktion gestartet und c) die Reaktion unter Zugabe von 60 bis 80 l/Std. Luft pro 1,5l Reaktionsvolumen bei 40 °C, 0,8 bis 2,5 % Stoffdichte und einer Rührergeschwindigkeit von 1200 bis 1600 rpm in handelsüblicher Flotationsanlage für ca. 10 Min. fortgeführt wird und d) die Reaktion unter verminderter Zufuhr und reduzierter Rührergeschwindigkeit 60 bis 90 Minuten weiterläuft.

March 18, 1991

Dr. Hans-Peter Call
Heinsberger Strasse 14a
D-5132 Uebach-Palenberg

A Process for Scrap Paper Recycling with Enzymatical Printing Ink Removal

The present invention concerns a process for scrap paper recycling with enzymatical printing ink removal.

In practical application, scrap paper recycling including printing ink removal ("deinking") is a chain of several partial processes. The selection of the apparatuses to be used and the design of the entire system must always be geared to the end product, taking into account the economic aspect of cost minimisation and the technological aspect of optimising the quality of the half-finished products. The objective of scrap paper recycling in a deinking process is the best possible quantitative removal of printing ink particles while losing only a minimum of those substances which are valuable for the subsequent paper production. Directly coupled with this objective is the desire to free the heterogeneous basic scrap paper substance of all substances, be they solids, solutes or colloidal solutes so that the paper production is not influenced negatively and the quality of the paper is not affected. It depends on the quality required of the end product which scrap paper ingredients are valuable for scrap paper production. Filling substances, for example, are valuable components of newsprint paper within certain limits, but

they are undesirable for the production of tissue papers. Accordingly, a variety of processes have been examined and recommended in prior art (Lausch, H.; Ortner, H.: Über den Einfluß der Druckfarbenzusammensetzung auf den Deinkingprozeß (The Influence of Printing Ink Composition on the Deinking Process) Wochenbl. f. Papierf. 94 (1966), No. 5, pages 129 - 136; Berndt, W.: Druckfarben und Deinken (Printing Ink and Deinking) Wochenbl. f. Papierf. 104 (1976), No. 3, pages 95 - 98; Forester, W.K.: Deinking of UV-cured Links Tappi J. (1987), No. 5, 127 - 130; N.N.: Deinkbarkeit von Flexodruck Tageszeitungen (Deinkability of Flexoprint Newsprint Paper) IFRA Special Report 1.3, Darmstadt, October 1987; Putz, H.J.: Upcycling von Altpapier für den Einsatz in höherwertigen graphischen Papieren durch chemisch-mechanische Aufbereitung (Deinken und Bleichen) (Upcycling of Scrap Paper for Use in High-grade Graphical Papers by Chemo-Mechanical Treatment - Deinking and Bleaching) Thesis, Technical University of Darmstadt, 1987; Weidhass, A.G.: Erfahrungen mit einer Deinking-Anlage zur Erzeugung von Zeitungspapier (Experience with a Deinking Apparatus for the Production of Newsprint Paper) Wochenbl. f. Papierf. 104 (1976), No. 22, pages 857 - 865; Lippert, G.V.: Erfahrungen mit der Deinking-Anlage für Zeitungsdruckpapier der Leykam-Mürztaler AG im Werk Bruck (Experience with the Deinking Apparatus for Newsprint Paper of Leykam-Muerztaler AG at the Bruck Factory) Wochenbl. f. Papierf. 111 (1983), No. 15, 540-542). All these processes work with physico-chemical methods. A process functioning biologically or enzymatically is not known from the prior art.

A process widely used today is the technology of flotation. A rectangular flotation cell with mechanical distribution of the flotation air was developed by Voit at the beginning of the sixties. In this cell, the suspen-

sion flows to a running wheel positioned at the bottom of the cell and propelled from above, which said wheel is surrounded by a concentrically positioned casing with holes. The cell is operated on a self-sucking basis. The running wheel effects the fine dispersion of air in the suspension as well as thrusts of the printing ink particles and the ink, and the distribution of the substances on the bottom of the cell. The accepts are withdrawn via an overflow, the foam is removed by means of a paddle.

In order to improve the hydrodynamics of the cell, the flotation pipe cell was developed in 1978. Both the type of ventilation and the mechanical fine dispersion of the air were taken from the above-described flotation cell in this concept.

In 1982, the flotation pipe cell was reconstructed with the aim of energy reduction, improvement of the deinking effectiveness and increased safety. All that was kept was the shape of the pipe cell. The ventilation method was changed from mechanical ventilation to injector ventilation. The injector is operated on a self-sucking basis accordding to the Venturi principle and permits ventilation of up to 30 %. Removal of the foam is carried out automatically without the aid of a paddle.

In 1984, the compact flotation cell was introduced. Two factors are of decisive significance for flotation in this cell: 1) a suitable ventilation element in front of the cell, namely the step diffuser and 2) hydrodynamics of the cell which are favourable for the separation step. In four locations, the ventilated substance is guided tangentially to the round, upright cell. In contrast to all other flotation cells, the substance is fed in exclusively below the surface of the suspension. Provided the mixture of air and suspension is optimal,

the immediate double flow in the cell (air with printing ink particles upwards and accepts downwards) should prevent separation of the printing ink particles from the air bubbles.

A so-called "verticel" flotation cell consisting of two cylindrical vessels of different diameters which are positioned one over the other is also known. In this system, the substance is tangentially fed into the lower vessel by means of injectors. The substance-air-suspension stream rises and, over a separating wall, reaches the upper cylindrical vessel which has a larger diameter. While surmounting the separating wall the bubbles are captured by the foam suction means. The substance is led off tangentially downwards in the outer vessel and transported to a levelling bulb. The levelling bulb ensures a constant distance between the suspension level and the foam suction pipe so that control of the level is not required.

In addition to the flotation processes described above, there are other processes which will not be addressed in detail here. All these processes have in common that they work with chemicals which are harmful to the environment.

From U.S.-PS 4 687 745, 4 692 413 and 4 690 895 there is known that the enzymes produced by special mutants of the fungus Phanerochaete chrysosporium are suitable for bleaching materials containing cellulose which process, however, has nothing to do with a deinking process. Also, such a process takes time (approx. 12 hours). Moreover, the enzymes can only be obtained from a specially bred strain of Phanerochaete chrysosporium.

The present invention has the object of providing a

process for paper recycling by means of enzymatic deinking which does not have any of the disadvantages of the chemical and enzymatical processes described above.

According to the present invention there is provided a process for scrap paper recycling with enzymatic printing ink removal, comprising

a) adjusting a redox potential in the range of 200 to 500 mV by carrying out a metered addition of oxidants and reductives to a reacting solution containing scrap paper;

b) starting a lignin-decomposing reaction by adding lignolytic enzymes; and

c) continuing the reaction in a commercial flotation unit for approximately 10 minutes to 40 °C, 0.8 to 2.5% consistency and a stirring speed of 1,200 to 1,600 rpm, during which period 60 to 80 l of air/h per 1.5 l reaction volume is added, and

d) continuing the reaction for 60 to 90 minutes, during which period the addition of air and the stirring speed are reduced.

In a preferred embodiment step d) is carried out before step c).

In an alternative embodiment step d) is omitted altogether.

What is novel is the combination according to the invention of an enzyme system with the flotation processes known per se. This achieves that deinking is largely effected by lignolytical raw enzymes rather than by the conventional above-described flotation chemicals such as NaOH, H_2O_2 or oleic acid. The actual decolouring process in the process according to the invention is probably due to a loosening of the fibres caused - as already mentioned above - by the attack of the enzyme on the lignine. The effect is similar to the swelling effect of soda lye on the fibre in the conventional decolouring processes mentioned earlier. Therefore, the loosening by means of the enzymes results in a separation of the printing ink particles from the fibre. Owing to the loosened structure, the printing ink can be easily removed in the subsequent flotation process so that additional metered addition of a frothing reagent is only necessary in minimal concentrations.

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Cupric sulphate, Mn(II)sulphate, Mn(II)acetate, Fe(II)-sulphate, Ti(III)chloride, Ce(IV)ammonium nitrate and Ce(III)nitrate can additionally be used as redox mediators. Zinc, antimonial and lead salts are also suitable.

Phenolic compounds are added to the reaction as enyzme protection substances. Especially suitable for this purpose are veratryl alcohols.

In addition to the above-mentioned chemicals other substances can be added to the reacting solution. These are sodium hypochlorite, polysaccharides such as glucanes or xanthanes, detergents, surface-active agents, fatty acids such as oleic acids, haeme compounds such as haemoglobin, and bleaching reagents such as sodium perborate. Conventional bleaching agents such as sodium hypochlorite, oxygen, chlorine dioxide, Ozone, H_2O_2 and sodium dithionite can be used for after-bleaching of the decoloured paper.

Lignolytical enzymes such as phenol oxidases, laccases and lignine peroxidases are used as enzymes. These also include lignolytical enzymes obtained from the Phanerochaete chrysosporium fungus. However, it is not essential to employ the specific enzymes obtained in accordance with the U.S. patents mentioned above. According to the invention, it is not necessary to use enzymes in highly purified form or enzymes obtained by means of specially optimised mutants of micro-organisms. Rather, it is sufficient to use, for the process according to the invention, raw enzymes which are commercially available today. In addition to the lignolytical enzymes, pectinases and/or hemicellulases can also be used.

The great advantage of the process according to the invention is based on the fact that a pre-treatment before the actual flotation process by means of the flotation chemicals mentioned above - which could take up to 90 minutes according to the prior art -is not necessary any more. Since lyes and similar substances are added to the process only in minimal quantities, the process according to the invention is characterised by waste products which are not harmful to the environment. In addition, it is possible to remove the lignine from the scrap paper by inserting a step either before or after the actual flotation process and thus to improve its mechanical properties. For example, the ripping length of the treated stuff can be improved by more than 30 % at a lignine removal rate of 5 - 8 %.

Besides, it should be mentioned that the use of surface-active agents is no longer essential in the process according to the invention. Presumably the polysaccharides present in the raw enzymes partially assume the frothing effect of the surface-active agents. This is because these surface-active agents as amphoteric substances with their hydrophobic molecules deposit on the originally hydrophobic printing ink particles in conventional flotation processes. Owing to the reaction with the hardening substances in the water they can deposit on the air bubbles that are present. The soap components which are not precipiatated by the water-hardening ions become active as frothing and dispersing agents.

In the following, the invention is illustrated in greater detail with the aid of an example:

12 g abs.dry (atro) substance (waste paper, newsprint paper) is torn into pieces of approx. 2 cm x 2 cm. Then

300 ml of water having an approximate calcium hardness of 2.5 mmol are added, homogenised by hand at approx. 40 °C and then disintegrated in the disintegrator at 3,000 rpm for 5 minutes. Then disintegration is repeated for 2 minutes at a consistency of 3.5 % and 3,000 rpm. Next, water at a temperature of 40 °C is added until a volume of 1.5 l is reached, and then the substance is filled into a 1.5 l flotation cell.

0.1 - 1.5 % H_2O_2 based on abs.dry (atro) paper are added. 2×10^{-5} % to 2×10^{-3} % of VA based on abs.dry paper are also added. After addition of 500 to 5,000 IU of lignolytical enzymes (1 IU = turnover of 1 nmol VA/min to veratryl aldehyde) the deinking flotation process is started with a stirring speed of 1,200 rpm, simultaneously adding 60 l of air/h. At the same time, the addition of H_2O_2 and the sodium bisulphite solution is metered in such a way by means of a submerged redox electrode connected to a pump control that an average redox potential of approx. 400 mV remains constant. The process is continued for 10 to 15 minutes at 40 °C, and the contaminated substance is then skimmed off by means of a scraper.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A process for scrap paper recycling with enzymatic printing ink removal, comprising

a) adjusting a redox potential in the range of 200 to 500 mV by carrying out a metered addition of oxidants and reductives to a reacting solution containing scrap paper;

b) starting a lignin-decomposing reaction by adding lignolytic enzymes; and

c) continuing the reaction in a commercial flotation unit for approximately 10 minutes to 40 °C, 0.8 to 2.5% consistency and a stirring speed of 1,200 to 1,600 rpm, during which period 60 to 80 l of air/h per 1.5 l reaction volume is added, and

d) continuing the reaction for 60 to 90 minutes, during which period the addition of air and the stirring speed are reduced.

2. A process according to claim 1 wherein step d) is carried out before step c).

3. A process according to claim 1 wherein step d) is omitted.

4. A process according to any one of claims 1 to 3 wherein the redox potential is in the range of 250 to 450 mV.

5. A process according to any one of claims 1 to 4, wherein at least one member of the group consisting of H_2O_2, and ozone is used as the oxidant.

6. A process according to any one of claims 1 to 5, wherein at least one member of the group consisting of ascorbic acid, dithionite and sodium bisulphite is used as the reductive.

7. A process according to any one of claims 1 to 6, further comprising adding at least one member of the group consisting of cupric sulphate, Mn(II)sulphate, Mn(III)acetate, Fe(II)sulphate, Ti(III)chloride, Ce(III)nitrate and/or

Ce(IV)ammonium nitrate to the reacting solution.

8. A process according to claim 7, wherein zinc salts, antimonial salts and lead salts are added to the reacting solution.

9. A process according to any one of claims 1 to 8, wherein phenolic compounds are added to the reacting solution.

10. A process according to claim 9, wherein veratryl alcohol is used as the phenolic compound.

11. A process according to any one of claims 1 to 10, wherein at least one member of the group consisting of phenoloxidases, laccases and peroxidases are used as the lignolytic enzymes.

12. A process according to any one of claims 1 to 11, wherein pectinases and/or hemicellulases are used in addition to the lignolytic enzymes.

13. A process according to any one of claims 1 to 12, wherein only the prosthetic groups of the lignolytical enzymes are used.

14. A process according to any one of claims 1 to 13, wherein the pH value is between 2 and 5.

15. A process according to any one of claims 1 to 14, wherein the pH value is 3.

16. A process according to any one of claims 1 to 15, wherein sodium hypochlorite is added to the reacting solution.

17. A process according to any one of claims 1 to 16, wherein complexing agents are added to the reacting solution.

18. A process according to claim 17, wherein ethylene diamine tetraacetic acid (EDTA) or diethylene triamine pentaacetic acid (DTPA) is used as complexing agent.

19. A process according to any one of claims 1 to 18, wherein polysaccharides are added to the reacting solution.

20. A process according to claim 19, wherein glucanes or xanthane are used as polysaccharides.

21. A process according to any one of claims 1 to 20, wherein detergents are added to the reacting solution.

22. A process according to any one of claims 1 to 21, wherein surface-active agents are added to the reacting solution.

23. A process according to any one of claims 1 to 22, wherein fatty acids are added to the reacting solution.

24. A process according to claim 23, wherein oleic acid is used as fatty acid.

25. A process according to any one of claims 1 to 24, wherein haeme compounds are added to the reacting solution.

26. A process according to claim 25, wherein haemoglobin is used as haeme compound.

27. A process according to any one of claims 1 to 26, wherein perborate is added to the reacting solution.

28. A process according to claim 1 substantially as hereinbefore described with reference to the example.

DATED this 3rd day of March, 1994.

HANS-PETER CALL
By His Patent Attorneys
DAVIES COLLISON CAVE

AUSTRALIA PATENT OFFICE

March 13, 1991

Summary

The present invention concerns a process for scrap paper recycling with enzymatic printing ink removal wherein a) a redox potential in the range of 200 to 500 mV is adjusted while metered addition of oxidants and reductives to a solution containing scrap paper takes place simultaneously, b) a lignine-decomposing reaction is started by adding lignolytical enzymes, c) the reaction is continued in a commercial flotation unit for approximately 10 minutes at 40°C, 0.8 to 2.5 % consistency and a stirring speed of 1,200 to 1,600 rpm, during which period 60 to 80 l of air/h per 1.5 l reaction volume is added, and d) the reaction is continued for 60 to 90 minutes during which period the addition and the stirring speed are reduced.

INTERNATIONAL SEARCH REPORT

International Application No PCT/EP 91/00539

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl.[5] D 21 C 5/02

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
Int. Cl.[5]	D 21 C

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
Y	WO, A, 8803190 (CALL, H.P.) 5 May 1988, see page 3, lines 21 - 28, see page 4, lines 13 - 20; claims 1-20	1,5
A		4,6,7, 9-12,14-16
Y	ABSTRACT BULLETIN OF THE INSTITUTE OF PAPER CHEMISTRY, volume 59, No. 3, September 1988, APPLETON US page 373 Nomura, Y.; Shoji, S.: "Elimination of ink from reclaimed paper." see abstract & JP-63059494 (Oji Paper Mfg. Co.)	1,5
P,A	PAPIER DAS. volume 44, No. 10A, October 1990, DARMSTADT DE pages V33 - V41; Call, H.P. et al.: "Einsatz von lignolytischen Enzymen bei der Zellstoff- und Papierherstellung (Biopulping, Biobleaching)." see page Vn40 - V41	1,5,9-11, 14,15, 23-25

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
27 June 1991 (27.06.91)	10 July 1991 (10.07.91)
International Searching Authority	**Signature of Authorized Officer**
European Patent Office	

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

EP 9100539
SA 45711

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international 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. 27/06/91

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A-8803190	05-05-88	DE-A- 3636208	05-05-88
		AU-B- 605215	10-01-91
		AU-A- 8230387	25-05-88
		EP-A- 0327576	16-08-89
		JP-T- 2500990	05-04-90
&J---63059494		None	

INTERNATIONALER RECHERCHENBERICHT

PCT/EP 91/00539

Internationales Aktenzeichen

I. KLASSIFIKATION DES ANMELDUNGSGEGENSTANDS (bei mehreren Klassifikationssymbolen sind alle anzugeben)[6]

Nach der Internationalen Patentklassifikation (IPC) oder nach der nationalen Klassifikation und der IPC

Int.Kl. 5 D21C5/02

II. RECHERCHIERTE SACHGEBIETE

Recherchierter Mindestprüfstoff [7]

Klassifikationssytem	Klassifikationssymbole
Int.Kl. 5	D21C

Recherchierte nicht zum Mindestprüfstoff gehörende Veröffentlichungen, soweit diese unter die recherchierten Sachgebiete fallen [8]

III. EINSCHLAGIGE VEROFFENTLICHUNGEN [9]

Art.°	Kennzeichnung der Veröffentlichung [11], soweit erforderlich unter Angabe der maßgeblichen Teile [12]	Betr. Anspruch Nr.[13]
Y	WO,A,8803190 (CALL,H.P.) 05 Mai 1988 siehe Seite 3, Zeilen 21 - 28 siehe Seite 4, Zeilen 13 - 20; Ansprüche 1-20	1, 5
A		4, 6, 7, 9-12, 14-16

Y	ABSTRACT BULLETIN OF THE INSTITUTE OF PAPER CHEMISTRY. vol. 59, no. 3, September 1988, APPLETON US Seite 373 Nomura,Y.; Shoji,S.: "Elimination of ink from reclaimed paper." siehe Zusammenfassung &JP-63059494 (Oji Paper Mfg. Co.)	1, 5

	-/--	

° Besondere Kategorien von angegebenen Veröffentlichungen [10] :

"A" Veröffentlichung, die den allgemeinen Stand der Technik definiert, aber nicht als besonders bedeutsam anzusehen ist

"E" älteres Dokument, das jedoch erst am oder nach dem internationalen Anmeldedatum veröffentlicht worden ist

"L" Veröffentlichung, die geeignet ist, einen Prioritätsanspruch zweifelhaft erscheinen zu lassen, oder durch die das Veröffentlichungsdatum einer anderen im Recherchenbericht genannten Veröffentlichung belegt werden soll oder die aus einem anderen besonderen Grund angegeben ist (wie ausgeführt)

"O" Veröffentlichung, die sich auf eine mündliche Offenbarung, eine Benutzung, eine Ausstellung oder andere Maßnahmen bezieht

"P" Veröffentlichung, die vor dem internationalen Anmeldedatum, aber nach dem beanspruchten Prioritätsdatum veröffentlicht worden ist

"T" Spätere Veröffentlichung, die nach dem internationalen Anmeldedatum oder dem Prioritätsdatum veröffentlicht worden ist und mit der Anmeldung nicht kollidiert, sondern nur zum Verständnis des der Erfindung zugrundeliegenden Prinzips oder der ihr zugrundeliegenden Theorie angegeben ist

"X" Veröffentlichung von besonderer Bedeutung; die beanspruchte Erfindung kann nicht als neu oder auf erfinderischer Tätigkeit beruhend betrachtet werden

"Y" Veröffentlichung von besonderer Bedeutung; die beanspruchte Erfindung kann nicht als auf erfinderischer Tätigkeit beruhend betrachtet werden, wenn die Veröffentlichung mit einer oder mehreren anderen Veröffentlichungen dieser Kategorie in Verbindung gebracht wird und diese Verbindung für einen Fachmann naheliegend ist

"&" Veröffentlichung, die Mitglied derselben Patentfamilie ist

IV. BESCHEINIGUNG

Datum des Abschlusses der Internationalen Recherche	Absendedatum des Internationalen Recherchenberichts
27.JUNI 1991	10 JUL 1991
Internationale Recherchenbehörde	**Unterschrift des bevollmächtigten Bediensteten**
EUROPAISCHES PATENTAMT	BERNARDO NORIEGA F.

III. EINSCHLAGIGE VEROFFENTLICHUNGEN (Fortsetzung von Blatt 2)

Art °	Kennzeichnung der Veröffentlichung, soweit erforderlich unter Angabe der maßgeblichen Teile	Betr. Anspruch Nr.
P,A	PAPIER, DAS. vol. 44, no. 10A, Oktober 1990, DARMSTADT DE Seiten V33 - V41; Call,H.P. et al.: "Einsatz von lignolytischen Enzymen bei der Zellstoff- und Papierherstellung (Biopulping, Biobleaching)." siehe Seite Vn40 - V41 ---	1, 5, 9-11, 14, 15, 23-25

ANHANG ZUM INTERNATIONALEN RECHERCHENBERICHT ÜBER DIE INTERNATIONALE PATENTANMELDUNG NR.

EP 9100539

SA 45711

In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten internationalen Recherchenbericht angeführten Patentdokumente angegeben.
Die Angaben über die Familienmitglieder entsprechen dem Stand der Datei des Europäischen Patentamts am 27/06/91
Diese Angaben dienen nur zur Unterrichtung und erfolgen ohne Gewähr.

Im Recherchenbericht angeführtes Patentdokument	Datum der Veröffentlichung	Mitglied(er) der Patentfamilie		Datum der Veröffentlichung
WO-A-8803190	05-05-88	DE-A-	3636208	05-05-88
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