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D E C I S I O N
of 9 February 2001

Case Number: T 0053/97 - 3.3.6

Application Number: 91120643.1

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IPC: D21C 9/153

Language of the proceedings: EN

Title of invention:

Medium consistency pulp ozone bleaching

Patentee:

Kamyr, Inc.

Opponent:

KVAERNER PULPING TECHNOLOGIES AB

Headword:

Pulp ozone bleaching/KAMYR

Relevant legal provisions:

EPC Art. 69, 56

Keyword:

"Clarity - interpretation in the light of the description of an unclear claim in order to assess inventive step"
"Inventive step (no) - not solved partial technical problem to be disregarded - distinguishing feature not contributing to the solution of the technical problem to be disregarded"

Decisions cited:

T 0364/97, T 0916/94, T 0016/87, T 0020/81

Catchword:

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Boards of Appeal

Chambres de recours

Case Number: T 0053/97 - 3.3.6

D E C I S I O N
of the Technical Board of Appeal 3.3.6
of 9 February 2001

Appellant:
(Opponent)

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Representative:

Kylin, Peter and Furhem, Hans
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Respondent:
(Proprietor of the patent)

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Representative:

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Decision under appeal:

**Decision of the Opposition Division of the
European Patent Office posted 20 November 1996
rejecting the opposition filed against European
patent No. 0 511 433 pursuant to Article 102(2)
EPC.**

Composition of the Board:

Chairman: P. Krasa
Members: L. Li Voti
C. Rennie-Smith

Summary of Facts and Submissions

I. The present appeal is from the decision of the Opposition Division to reject the opposition and to maintain European patent No. 0 511 433 unamended.

Independent Claim 1 reads as follows:

"1. A method of ozone bleaching paper pulp having a consistency of about 6-15% throughout treatment, using a mixer (12), comprising the steps of:

- (a) feeding ozone in a carrier gas, under a pressure substantially greater than 1 bar, and paper pulp having a consistency of about 6-15% to the mixer;
- (b) effecting intimate and uniform mixing of the pulp and ozone in the mixer; and
- (c) passing the intimate uniform mixture of ozone and pulp in a first path (17) from the mixer, retaining it in the first path a first time period sufficient for at least 90% of the ozone to react with the pulp to effect bleaching thereof;
- (d) moving the pulp which has reacted with ozone in a second path (21), markedly different than the first path, so that separation of gas in the pulp and the pulp occurs, while the gas is maintained under pressure;
- (e) removing separated gas from step (d) in a third path (35), while retaining it under pressure; and
- (f) removing pulp with gas separated therefrom, from step (d), in a fourth path (33)."

II. The Appellant (Opponent), in its notice of opposition, sought revocation of the patent on the grounds of Article 100(a) EPC, in particular because of an alleged lack of an inventive step of the subject-matter of claim 1.

The opposition was based upon the following documents:

D1: EP-A-0 397 308

D2: MC Information Leaflet 1 by A. Ahlström Osakeyhtiö
Karhula Pump Factory, Karhula, Finland and Kamyр
AB, Karlstad, Sweden

D3: Kamyр MC-Pump, Info 1, November 1983

D4: US-A-4 834 837

III. In its decision, the Opposition Division found that the subject-matter of claim 1 as disclosed in the patent in suit fulfilled the patentability requirements of the EPC. In particular it held that

- D1 represented the closest prior art;
- the ozone bleaching process disclosed in D1 differed from that of the patent in suit insofar as it did not explicitly specify the proportion of ozone which reacted with the pulp and it did not disclose step (e), namely removing in a third path the gas separated during step (d), while retaining it under pressure;
- in this respect the wording "while retaining it under pressure" in claim 1 implied that no loss of

pressure occurred during the gas removal step (e)
(see points 3.1 and 3.2 of the reasons)

- even though MC degassing pumps, as disclosed in D2 and D3, could have been used by a skilled person as the high-consistency pumps mentioned in D1, the use of such pumps for removing the gas separated during step (d) would have brought about a drop in pressure inconsistent with the maintained pressure required by the patent in suit;
- the recirculation of the gas in the multistage delignification process of D4 involved the use of a circulation blower for compensating the pressure loss at the exit of reactor 31;
- therefore the prior art did not suggest step (e) of claim 1, removing separated gas from step (d) in a third path, while retaining it under pressure;
- the patent in suit thus provided a method which did not require the recompression of the separated gas for further use in other pulp processing steps, thus resulting in significant energy saving;
- therefore the claimed subject-matter involved an inventive step.

IV. The Appellant (Opponent) filed an appeal against this decision and requested that the decision be set aside and the patent be revoked.

- V. The Appellant's arguments as regards inventive step as submitted in writing and at the oral proceedings on 9 February 2001 can be summarized as follows:
- the process of D1 implicitly achieved an ozone reaction degree of at least 90%;
 - in D1 the gas separation occurred in a high-consistency fluidizing gas-separating centrifugal pump of Ahlstrom Corporation, which could be an MC-pump as described in D2 and D3;
 - the wording of claim 1 encompassed a method wherein process steps (d), (e) and (f) were carried out in a conventional MC pump of the type described in D2 and D3 and did not require a specific apparatus such as shown in Figures 1A and 1B of the patent in suit and the subject-matter of claim 6;
 - further, claim 1 of the patent in suit did not require that the pressure maintained in the third path in step (e) should be the same pressure as that present either in the second path, where a first separation of pulp and gas occurred, or in the mixer; on the contrary, it simply required that there be some pressure higher than atmospheric pressure but possibly lower than that required in the previous steps of the process;
 - thus the only apparent difference between the claimed process and that disclosed in D1 consisted in that D1 did not specify the pressure of the gas after separation in the centrifugal degasifying pump.

The Appellant admitted that the method of claim 1 of the patent in suit would bring about energy saving, since there was no need to recompress the separated gas from atmospheric pressure for further use; however, it argued that

- it was an obvious step to a skilled person, faced with the above mentioned problem of saving energy, to recirculate the gas separated in step (d) under a certain pressure if it was to be reused in another pressurized step;
- for example, D4 had already disclosed a delignification process wherein the bleaching gas was recirculated under pressure;
- therefore the subject-matter of claim 1 lacked an inventive step.

VI. The Respondent's (Proprietor's) counter-arguments can be summarised as follows:

- D1 did not teach the consumption of ozone at a level of 90% and the inventors of D1 were not aware of the rapid reaction inherent in ozone bleaching;
- D1 did not teach separation of the gas from step (d) by maintenance of a pressure in the third path substantially the same as that in the fluidizing mixer;
- further, the pressure of the gas at the entrance to the circulation blower in D4 was at atmospheric pressure (as can be deduced from the passage in

column 4, lines 58 to 63 of D4, according to which the pressure at the outlet of the drainage screw 7' is substantially 0 bar) and thus this prior art did not teach recirculation of the used gas by maintaining the same pressure;

- therefore the invention of the patent in suit provided a means for maintaining pressure, e.g. by the use of a control valve 34, thereby overcoming the need for energy intensive equipment to increase the pressure of the recirculating gas from atmospheric pressure to the pressure of the operating equipment;

and the claimed subject-matter therefore involved an inventive step over the cited prior art.

VII. The Respondent requested in writing that the appeal be dismissed.

VIII. Oral proceedings before the Board were held on 9 February 2001 which the Respondent, as indicated in its letter dated 8 January 2001, did not attend.

Reasons for the Decision

1. *Interpretation of claim 1.*

1.1 The subject-matter of claim 1 of the patent in suit concerns a method of ozone bleaching paper pulp of medium consistency of 6 to 15% involving steps (a) to (f) as defined (see I above).

1.2 The wording "substantially greater than 1 bar" in step (a) of claim 1 does not clearly define the required minimum pressure at which the gas mixture has to be introduced into the mixer according to the broadest scope of this claim.

It is established jurisprudence of the Boards of Appeal of the EPO that in order to assess the scope of an unclear claim for the judgement of novelty or inventive step, the wording of such a claim must be interpreted taking into account the respective parts of the description in accordance with Article 69(1) EPC (see e.g. T 0364/97, point 2.3 of the reasons and T 0916/94, point 5 of the reasons, both unpublished in the OJ EPO; see also T 0016/87, OJ EPO 1992, 212, point 6 of the reasons).

Therefore, the above mentioned wording has to be interpreted in the light of the description.

The patent in suit teaches in this respect that

- according to the state of the art, in the pressure range of 7 to 8 or 9 bar or less the presence of the carrier gas limited the total amount of ozone which could be effectively added in a single bleaching stage (column 1, lines 39 to 42 and column 6, lines 15 to 19);
- it was difficult to perform gas separation with an MC pump under such pressure conditions (column 1, lines 42 to 48);
- according to the invention, the used gas pressure was of 10 to 13 bar (column 2, lines 12 to 23).

Further, lines 28 to 30 of the same column specify that ozone in a carrier gas is fed "under a pressure substantially greater than 1 bar (preferably at about 10 to 13 bar)", the same pressure range of 10 to 13 bar being repeated on column 3, lines 6 to 7; column 6, lines 20 to 22 and column 8, lines 46.

Therefore, in Board's judgement the patent in suit teaches the use of a pressure greater than 7 to 9 bar and the wording "substantially greater than 1 bar" must be interpreted in the present case as relating to a pressure of about 10 to 13 bars, which is that consistently used throughout the patent in suit and allows the application of higher amounts of ozone as compared with the state of the art.

- 1.3 With regard to the wording "while retaining it under pressure" at the end of step (e), the meaning of which was discussed at first instance, the Board cannot agree with the opposition division that this wording implies the maintenance of the same pressure as in the gas separation vessel (second path) or even in the mixer, i.e. that no loss of pressure arises in the third path.

The Board agrees that the wording "retaining **the** pressure" (emphasis added by the Board), would mean "not losing pressure", an interpretation consistent with the meaning of the word "retain" as defined on page 889 of "The Concise Oxford Dictionary" 7th edition, 1990, Oxford at Clarendon Press, cited at the first instance.

The present wording however reads "retaining **it under** pressure" (emphasis added by the Board), thus meaning

that the separated gas is maintained at an unspecified pressure above atmospheric pressure. This pressure can be lower than that applied in the preceding process steps (a) through (d) and, in an apparatus as shown in figures 1A and 1B of the patent in suit, will be lower because of the hydrostatic pressure loss as convincingly explained by the Appellant during the oral proceedings.

1.4 The following discussion of the inventiveness of the claimed subject-matter is based on the above given interpretation of the terminology used in claim 1.

2. *Closest prior art*

2.1 D1 discloses a method of ozone bleaching of paper pulp of medium consistency of 5 to 25%, e.g. 10% consistency (page 2, lines 49 and 50 and page 3, lines 2 and 3), wherein

- ozone is fed in a carrier gas, under a pressure substantially greater than 1 bar, e.g. 10 bar to a fluidizing mixer (page 2, line 50 to page 3, line 8 and table 1);
- the gas is intimately and uniformly mixed for a short time with the pulp in the mixer thereby forming a stable foam (page 3, line 1 and lines 21 to 27; page 3, lines 40 to 42);
- the intimate uniform mixture of ozone and pulp is passed into a reaction vessel (first path) from the mixer, retaining it in the reaction vessel under light agitation in order to prevent gas separation for a period of time sufficient for the

ozone to react with the pulp to effect bleaching thereof (page 3, lines 25 to 30, 33 to 37, 42 and 46; page 4, lines 4 and 5; Figure 3);

- the pulp which has reacted with ozone is moved into an Ahlstrom Corporation fluidizing gas-separating centrifugal pump, so that gas separation occurs in a second path markedly different than the first path (page 3, lines 42 to 43; Figure 3);
- the separated gas is removed to a third path (page 3, line 44; Figure 3) and
- the degassed pulp is further moved to a fourth path (page 3, line 44; Figure 3).

Furthermore, since a fluidizing, gas-separating centrifugal pump, which is the type of pump disclosed in D2 and D3, brings about the gas separation by means of pressure, this feature is also implicitly disclosed in D1.

- 2.2 The process of D1 thus differs from that of claim 1 only insofar as it does not explicitly specify the proportion of ozone which has reacted with the pulp and insofar as, in step (e), the gas separated during step (d) is maintained under pressure.

The Board thus accepts D1 as representing the most suitable starting point for evaluating inventive step as suggested by the parties.

3. *The Technical Problem*

3.1 According to the patent in suit, the known commercially available MC-mixers were able intimately to mix ozone and pulp of medium consistency; however, even with this equipment it was difficult to bring enough ozone into intimate contact with the pulp, so that bleaching occurred only in localized areas with consequent degradation of the pulp; moreover, even when introducing the mixture of ozone and carrier gas into the mixer under a pressure of 7 to 8 bars, it was found that the amount of ozone which could be added in a single step was limited and it was thereafter difficult to separate the gas from the pulp in a known degassing pump of the MC-type (column 2, lines 14 to 26 and 36 to 48).

The problem allegedly solved by the claimed invention was thus that of providing a method, which

- permitted an easier separation of gas from the pulp and did not therefor require substantial energy consuming degassing appliances;
- permitted the use of more ozone in the gas mixture introduced into the mixer;
- and achieved energy saving by recirculating the separated gas (column 1, line 57 to column 2, line 5; column 2, lines 12 to 17; column 5, line 56 to column 6, line 11 and lines 41 to 45).

3.2 As explicitly mentioned in column 6, lines 1 to 11, of the patent in suit, the removal of gas from the pulp prior to passage through a degassing pump and the use of an increased amount of ozone in the gas mixture entering the mixer (a consequence of the better gas

separation) can only be achieved if there are sufficient time and means for separation of gas and pulp, which are achieved by providing

- a conduit such as 21 in Figure 1A, opening up into the gas chamber 26 at the top of the vessel 22;
- a relatively large pulp residence time within the vessel 22;
- and a relatively large cross-sectional area for the vessel 22.

However, claim 1 does not contain these necessary features.

Therefore the process of claim 1, not being limited to the use of an apparatus having these features, does not guarantee that the problems of achieving an easier separation of gas from the pulp and the use of more ozone in the gas mixture introduced into the mixer can be effectively solved.

These partial technical problems must thus be disregarded in the assessment of inventive step as not being credibly solved (see T 0020/81, OJ EPO 1982, 217, point 3 of the reasons).

Indeed, the maintenance at a certain pressure of the gas separated in step (d) allows the reuse of this gas in other steps of the pulp processing without the need to recompress it thus leading to energy savings as admitted by the Appellant in the oral proceedings.

3.3 Thus, the objective technical problem underlying the

claimed invention, as against the method disclosed in D1, amounted to the provision of a process requiring less energy with respect to the recirculation or reuse of gas.

- 3.4 The Board has no reason to doubt that a method as specified in claim 1 solved this problem.

4. *Evaluation of inventive step*

- 4.1 As already mentioned, the only difference existing between the process of D1 and the claimed subject-matter consists in the fact that the method of D1 does not specify the degree of ozone consumption and whether or not the gas separated by means of the fluidizing degassing pump is thereafter retained under pressure.

- 4.2 The patent in suit requires the introduction of the gas at a pressure of between about 10 to 13 bar into a mixer, which can be a conventional MC-mixer, and thereafter the retention of the intimate mixture of gas and pulp in a so-called first path, wherein the mixture is maintained for a time sufficient for at least 90% of the ozone to react (e.g. 10 to 30 seconds) (see column 2, lines 28 to 38 and column 4, lines 43 to 59).

Thus, according to the patent in suit, a sufficient ozone reaction with the pulp occurs because of the combination of used gas pressure in the mixer and sufficient residence time in the reaction path.

However, the method of the closest prior art, that of D1, had already specifically addressed the rapid reaction of ozone (page 2, line 10). According to this

method, after having achieved an intimate mixture of the ozone-containing gas and pulp in a fluidizing mixer under a pressure of, e.g., 10 bar with consequent production of a stable foam (see page 2, line 49 to page 3, line 26), the pulp is transferred to a separate reaction vessel wherein agitation means are provided in order to permit maintenance of an intimate contact of gas and pulp (see page 3, lines 32 to 37).

Therefore, in the Board's judgement, D1 did not disclose any precise residence time in the reaction vessel; however, it was an obvious desideratum for the skilled person to achieve a conversion of reactants as high as possible and a skilled person, following the teaching of D1, would have taken any possible steps, e.g. by preventing the foam produced in the mixer from collapsing, to ensure a longer intimate contact of gas and pulp, so that almost all the ozone would react with the pulp. Therefore, without defining in concrete terms in Claim 1 how to achieve this desideratum in a non-obvious manner, the feature "... a first time period sufficient for at least 90% of ozone to react..." cannot contribute to an inventive step.

Therefore, this feature has to be disregarded in the assessment of the inventiveness of the claimed subject-matter.

Under these circumstances it is not necessary to consider whether or not that feature makes any contribution to the solution of the technical problem stated at point 3.3. above.

- 4.3 D1 teaches also that the oxygen gas recovered from the degassing step may be reused in other stages of the

pulp production process (see page 4, lines 5 to 7).

The Respondent argued in this respect that according to the invention the gas stream, once separated from the pulp, remains at the pressure of the mixer and that a control valve is used to maintain this pressure, such means for maintaining pressure being neither disclosed nor suggested in D1.

However, this is contrary to the wording of claim 1, which does not require the presence of any control valve for maintaining the pressure of the gas at the pressure of the mixer.

4.4 Thus, the only question to be answered in assessing the inventiveness of the claimed subject-matter is whether a skilled person, faced with the problem of saving energy in the recirculation of the separated gas, would have maintained it at a particular pressure greater than atmospheric in order to solve that problem.

Even though D1 is silent about this specific problem, it does teach the use of a fluidizing centrifugal degassing pump for separating the gas from the pulp.

This pump functions as shown in D2 and D3; in particular, D3 specifies (see page 2) that such pumps have an external vacuum/control system enabling a very steady discharge in terms of flow and pressure from the pump independent of the amount of air drawn in. Thus, it was known that the use of such pumps allows a steady separation of the gas, which is maintained at a controlled pressure.

Therefore, in Board's judgement, it was a

straightforward step for a skilled man, faced with the problem of saving energy in the recirculation of the separated gas, to maintain the gas at a pressure greater than atmospheric at the exit of the pump and to forward it, still under pressure, to other equipment downstream in the process, this step being simply a matter of plant layout or design which would not present any difficulty to a skilled person.

- 4.5 Consequently, the process of claim 1 does not contain any feature, which in view of D1 would not have been obvious to the skilled person and, the subject-matter of claim 1 cannot involve an inventive step.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:

G. Rauh

P. Krasa