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D E C I S I O N
of 11 February 1999

Case Number: T 0891/95 - 3.3.5

Application Number: 88100433.7

Publication Number: 0314855

IPC: C01F 7/06

Language of the proceedings: EN

Title of invention:
Polymers containing hydroxamic acid groups for reduction of suspended solids in bayer process streams

Patentee:
American Cyanamid Company

Opponent:
SNF Floerger

Headword:
Bayer alumina/American Cyanamid

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step - yes, unexpected improvement of the process efficiency"

Decisions cited:
-

Catchword:
-

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Case Number: T 0891/95 - 3.3.5

D E C I S I O N
of the Technical Board of Appeal 3.3.5
of 11 February 1999

Appellant: (Opponent)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 28 August 1995 rejecting the opposition filed against European patent No. 0 314 855 pursuant to Article 102(2) EPC.**

Composition of the Board:

Chairman: R. K. Spangenberg
Members: G. J. Wassenaar
J. H. van Moer

Summary of Facts and Submissions

I. The appeal is from the decision of the Opposition Division to reject the opposition and to maintain European patent No. 0 314 855 with claims 1 to 19 as granted. Claim 1 of the patent in suit reads as follows:

"A process for removing suspended solids from the Bayer alumina circuit, the improvement which comprises contacting and efficiently mixing a process stream with a water-soluble polymer containing pendant hydroxamic acid or salt groups thereof in an amount effective to settle the suspended solids therein."

II. According to the contested decision, the only opposition ground put forward by the appellant (opponent), lack of inventive step, was not founded. In the decision the following prior art documents were cited:

D1: Winnacker-Küchler, Chemische Technolgie, Band 4, 4. Auflage (1986), pages 244 to 252;

D2: US-A-4 480 067;

D3: US-A-3 390 959;

D4: Journal of the South African Institute of Mining and Metallurgy, 1975, pages 117 to 119;

D5: "Reagent Min.",Mineral flotations with hydroxamate collectors, Fuerstenau and Pradip, 1984, pages 161 to 168.

Document D5 was disregarded under Article 114(2) EPC for having been filed late and having had no influence on the tenor of the decision.

III. With the statement of the grounds of appeal the appellant made reference to three more documents:

D6: US-A-3 345 344;

D7: International Journal of Mineral Processing, 3 (1976), pages 27 to 34;

D8: Technical Completion Report, Information Report 13, Functional Polymers for Removal of Heavy-Metal Pollutants from Water, Project A-031-WVA (1980).

It was concluded that the disclosures of D1 to D8, alone or in combination, would have led the notional person skilled in the art to the process of claim 1 of the patent in suit without any inventive step being necessary.

The arguments put forward in the grounds of appeal and the following written procedure may be summarized as follows:

The technical problem underlying the invention was to reduce suspended solids in the Bayer process stream. In solving this problem the skilled person could not fail to consider D2, disclosing the use of hydroxamated polymers in clay suspensions, and D4, disclosing hydroxamic acid as a selective flocculant of cassiterite. The skilled person was therefore aware that polymers containing hydroxamic acid groups would be suitable for flocculating fines from aqueous solutions. On the basis of its chemical structure, the skilled person was also aware that such polymers would be stable and effective under caustic conditions. There was no reason not to use such polymers for removing suspended solids from a Bayer process stream, so that it was obvious to solve the problem in the claimed manner.

IV. The respondent maintained that the subject-matter of the granted claims involved an inventive step over the available prior art. With reference to Article 114(2) EPC it was requested to disregard documents D5 to D8, because they had not been submitted in due time and were not relevant.

V. The appellant requested that the decision under appeal be set aside and the patent be revoked.

The respondent requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.

2. *Late-filed documents*

2.1 In the contested decision D5 was disregarded under Article 114(2) EPC for having been filed late and being not so relevant that it could have influenced the decision. In the grounds of appeal this finding was disregarded and reference was again made to D5. Moreover, three new documents D6, D7 and D8 were introduced. No reasons have been provided why documents D5 to D8 could not have been presented within the 9-month opposition period. Since the set of claims remained unchanged during the opposition and appeal procedure, these documents should be regarded as evidence which was not submitted in due time. Late evidence may be disregarded (Article 114(2) EPC). According to standard jurisprudence of the Boards of Appeal, late-filed documents should be disregarded if they appear to be not so relevant that they could reverse a decision based on the documents submitted in due time (Case Law of the Boards of Appeal 1996, page 222, paragraph 6.1).

2.2 D5, D6 and D8 are not related to the problem of removing suspended solids from a Bayer liquor. In fact they are not even related to the art of flocculation in general. D7 relates to the same subject-matter as treated in D4. It appears to be no more relevant than D4. The Board therefore holds that documents D5 to D8 cannot reverse a decision reached on the basis of documents D1 to D4 and disregards D5 to D8 under Article 114(2) EPC.

3. *Inventive step*

3.1 Since the only opposition ground was lack of inventive step, this issue is the only one to be decided here. The closest prior art is represented by D3, which has been discussed in the patent in suit. It relates to the use of acrylic acid or acrylate polymers for removing red mud from Bayer aluminate liquor (column 2, line 44 to column 3, line 42). According to the patent in suit, the technical problem underlying the invention was to remove suspended solids from Bayer process streams more effectively (page 3, lines 1 to 2). The patent in suit proposes to solve this problem by using a water-soluble polymer containing pendant hydroxamic acid or salt groups according to the process of claim 1. In the decision under appeal it is held that the patent in suit contains a large number of comparative examples from which it is evident that hydroxamated acrylate polymers are more effective in removing suspended solids from a Bayer liquor than the acrylate polymers used according to D3. The Board concurs with that finding, which was not contested on appeal, and is therefore satisfied that the said problem has actually been solved.

3.2 It remains to be decided whether the claimed solution of this technical problem was obvious or not to a person skilled in the art. Although D3 teaches that the polyacrylate may contain hydrophilic or solubilizing groups, it contains no pointer towards hydroxamic acid groups.

3.3 D1 is a part of a general textbook of chemical technology and discloses background information about the Bayer process. It mentions the use of flocculants for the separation of red mud. Only potato starch and synthetic flocculants are specifically disclosed (page 249, paragraph 2.4.1.4). It does not, however, provide any information as to how the process of D3 can be improved.

3.4 D2 discloses the use of a water-soluble polymer bearing hydroxamic groups for impeding the sedimentation of clays in water. Said use of the polymer is thus quite opposite to its present use, whereby particles are removed from a suspension. It is true that D2 also discloses that it is known from an earlier US patent application that hydroxamic polymers decrease the viscosity of a drilling mud and that one might expect that the presence of such polymers in clay containing water would have led to a marked sedimentation of the clay (column 2, line 60 to column 3, line 3). From this passage the appellant derived that hydroxamic polymers could also be used as a flocculant, and that it was obvious to use hydroxamic polymers as the synthetic flocculants referred to in D1. The Board cannot accept this conclusion. Said passage should be read in context. It is followed by the statement: "What is observed when hydroxamic polymers are introduced in the water is on the contrary a very marked hindrance of the deposit. The prevailing factor in this case is the non-conglomeration of particles, and therefore the decrease of the sedimentation speed thereof by virtue of the

Stokes law." Thus even if the skilled person ever had the idea that hydroxamic polymers might act as a flocculant, after the publication of D2 it was clear that this was not in fact the case, at least not for clay suspensions. From D2 it can certainly not be derived that hydroxamic polymers are suitable flocculants for removing red mud from a Bayer liquor, let alone that they are better in this respect than the flocculants used in D3.

3.5 D4 relates to the art of recovery cassiterite (SnO_2) from aqueous suspensions comprising cassiterite. According to D4 cassiterite is separated from other suspended particles, in particular from quartz particles, by selective flocculation from an aqueous suspension comprising particles with a size < 5 µm. It discloses the use of hydroxamated polyacrylamide for that purpose. According to D4 hydroxamated polyacrylamide is specifically adsorbed by the cassiterite particles, which causes agglomeration followed by flocculation of cassiterite.

It follows from the above that the art of recovery of cassiterite is essentially different and rather remote from the art of purifying a Bayer liquor. Not only are the products completely different, ie solid cassiterite in the case of D4 and a caustic solution of sodium aluminate in the present case, but also the treatment conditions are completely different, ie a neutral till slightly acid aqueous suspension at room temperature in D4 (pH 3.5 to 7.0 and T 18-20°C, Table I) and a suspension of particles in a hot, highly basic and highly concentrated salt solution in the Bayer liquor (patent in suit, page 3, lines 36 to 39; T 85-107°C (185-225°F) and 80-400g/l total alkali content). Therefore, the Board cannot agree with the appellant that D4 addresses the same problem (removing fines <5 µm) as the patent in suit. On the contrary, it

follows from the above that the problem to which D4 is related is not simply to remove fines below 5 µm, but to remove fine particles of a selected kind from a specific suspension. Thus, D4, disclosing that by adding hydroxamated polymers to a neutral or slightly acid aqueous suspension only a specific type of particles is flocculated, does not provide a hint for using such a polymer for an improved removal of red mud from a strongly basic Bayer liquor.

In the absence of any pointer in D4 relating to the technical problem of the purification of a Bayer liquor, the Board is unable to accept that a skilled person would have taken D4 into consideration. It is therefore immaterial whether this skilled person could have inferred from D4 that the hydroxamic acid polymer used therein would also be a suitable flocculant under hot caustic conditions. In the Board's judgement, any possible relevance of the teaching of D4 for the solution of the present technical problem, as inferred by the appellant, became only apparent after the present invention was made. Thus the appellant's line of argument is the result of an inadmissible ex post facto analysis.

For these reasons the Board holds that the subject-matter of claim 1 involves an inventive step within the meaning of Article 56 EPC. The same applies to claims 2 to 19 being dependent upon claim 1.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

S. Hue

The Chairman:

R. Spangenberg