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**D E C I S I O N**  
of 14 December 1999

**Case Number:** T 0426/97 - 3.3.5

**Application Number:** 91911284.7

**Publication Number:** 0536194

**IPC:** C02F 1/54

**Language of the proceedings:** EN

**Title of invention:**  
Purification of aqueous liquor

**Patentee:**  
Ciba Specialty Chemicals Water Treatments Limited

**Opponent:**  
S.N.F.

**Headword:**  
Water-purification/CIBA

**Relevant legal provisions:**  
EPC Art. 56, 114(2)

**Keyword:**  
"Inventive step - yes (auxiliary request)"  
"Late-filed document - accepted"

**Decisions cited:**  
T 0745/92, T 0552/89, T 1002/92, T 0459/94, T 0039/93,  
T 0113/96

**Catchword:**  
-



Case Number: T 0426/97 - 3.3.5

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.5  
of 14 December 1999

**Appellant:**  
(Opponent)

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**Decision under appeal:**

Interlocutory decision of the Opposition Division  
of the European Patent Office posted 21 February  
1997 concerning maintenance of European patent  
No. 0 536 194 in amended form.

**Composition of the Board:**

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

## Summary of Facts and Submissions

I. The appeal is from the decision of the Opposition Division to maintain European patent No. 0 536 194 in amended form.

II. In the decision, inter alia, the following prior art documents were considered:

D1: US-A-4 578 255

D3: Derwent Abstract of JP-A-60202787

D6: Textbook "Coagulation and Flocculation" by Bratby (1980), pages 5, 6, 11-13, 144, 146, 151 and 157

D6p: Same textbook, section 3.2.4.3, pages 84 and 85

D7p: Manual of British Practice in Water Pollution Control Unit Processes, Sewage Sludge II, 1981, pages 28-31

D8: US-A-3 288 770

D8p: Kirk Othmer Encyclopaedia of Chemical Technology 4th Ed. 1994, page 66.

(Documents D6p, D7p and D8p were cited by the respondent (patentee)).

The Opposition Division held that the subject-matter of the amended claims was new and involved an inventive step in view of the available prior art documents. In the grounds of the decision it was indicated that D1, disclosing a process for the purification of Bayer process liquors which comprised introducing into the liquor a water-soluble, vinylic cationic polymeric

quaternary ammonium salt, represented the closest prior art. The only specifically disclosed form in which these polymers were added was as an aqueous solution thereof. In conformity with the description of the patent in suit, the problem underlying the invention was considered to be improving the separation of solids from the suspension and at the same time avoiding the need for normal solids make-up apparatus and handling equipment such as pumps and in-line dilution equipment. The Opposition Division held that the claimed solution, according to which such polymers were added in the form of solid particles of which at least 90% by weight have a size above 30  $\mu\text{m}$ , was not obvious in view of the cited prior art.

III. In the statement of the grounds of appeal, the appellant (opponent) maintained that the subject matter of the amended claims lacked an inventive step over the prior art. Apart from the citations already on file before the Opposition Division, further reference was made to a new citation:

D9: English translation of JP-A-57-15807.

IV. With the response to the grounds of the appeal the respondent submitted five sets of claims as main request and auxiliary requests 1 to 4.

The independent claims 1 and 2 of the main request read as follows:

Claim 1:

"A process of separating coagulatable solid material from an aqueous suspension of the coagulatable solid material, the process comprising adding to the suspension a water soluble, ionic, polymeric coagulant and thereby coagulating the suspension and subjecting

the said coagulated suspension to a separation process and thereby separating said coagulatable solid material from said suspension, characterised in that the coagulant is added to the suspension in the form of solid particles that have a size of at least 90% by weight of above 30 $\mu$ m and these particles are mixed into the suspension and are thereby dissolved in the suspension, and the suspension is selected from iron ore washery tailings, china clay effluent, waste water from the feldspar or alumina industries, cellulosic suspensions, sewage suspensions, other organic suspensions, suspensions for the production of potable water and textile industry effluent and the coagulant polymer is selected from (a) cationic polymer that have intrinsic viscosity of from about 0.2 to 3 dl/g and that are formed from ethylenically unsaturated monomers of which at least 80% by weight are cationic, and (b) anionic polymers that have intrinsic viscosity of from 0.2 to 2 dl/g and that are formed from ethylenically unsaturated monomers of which at least 80% by weight are anionic."

Claim 2:

"A process of separating coagulatable solid material from an aqueous suspension of the coagulatable solid material, the process comprising adding to the suspension a water soluble, ionic, polymeric coagulant that has intrinsic viscosity of 0.2 to 3 dl/g and thereby coagulating the suspension and subjecting the said coagulated suspension to a separation process and thereby separating said coagulatable solid material from said suspension, characterised in that the coagulant is a polymer of at least 80% by weight dialkylaminoalkyl methacrylate acid addition or quaternary ammonium salt and is added to the suspension

in the form of solid particles that have a size of at least 90% by weight of above 30 $\mu$ m and these particles are mixed into the suspension and are thereby dissolved in the suspension.

Claims 1 and 2 according to the first auxiliary request differ from those according to the main request by the addition of the words:

"and counterionic organic polymeric flocculant solution is added to the coagulated suspension to promote flocculation of the coagulated suspension before or during the said separation process" at the end of the respective claims.

Claims 1 and 2 of the second auxiliary request differ from the respective claims according to the main request in that the words:

"and the said mixing comprises flowing the suspension along duct means for a period of not more than about 5 minutes from a position at which the particulate coagulant is added to the suspension to a position at which the said separation process is initiated, and the coagulant particles substantially fully dissolve before the suspension reaches the said position at which the said separation process is initiated" are added at the end of these claims.

V. Oral proceedings took place on 14 December 1999.

The arguments put forward during the written and oral proceedings can be summarized as follows:

From the side of the appellant:

D8 disclosed solid water soluble polymers in the form of beads having the properties required by claim 1 of the main request and their use as flocculating agent. It was obvious to add these polymer beads to the suspension to be treated without first dissolving the beads in view of D3, which disclosed that water soluble polymeric coagulants were more effective in water purification treatment if added as a powder, and D9, which disclosed that water soluble polymers used as coagulants in water purification treatment and having a particle size distribution of at least 90% by weight between 10 and 40 mesh readily dissolved in water without the formation of lumps. With respect to the auxiliary requests it was argued that the additional features were the result of routine experimentation.

On the part of the respondent:

D9 should not be admitted as it was not filed in due time. In this respect reference was made to T 459/94, T 39/93 and T 1002/92.

It was admitted that the polymers used in the claimed processes were available in particulate form and used in the art as coagulants for the removal of solid particles from aqueous suspensions. These polymers, however, were always dissolved in water before they were added to the suspension. The respondent surprisingly found that in the vast majority of cases the removal of solid particles from suspensions was improved if these polymers were added as solid particles having a size such that at least 90% by weight was above 30  $\mu\text{m}$ . It had the additional advantage that no make-up apparatus for the preparation of a solution of the polymer was needed. The prior art did not suggest that the addition of water soluble polymers

in the form of particles was a feasible option. On the contrary, it was known that polymers used as coagulants did not easily dissolve in water and tended to form lumps when added to water. In this respect reference was made to D6p, D7p and D8p. There was certainly no indication that the performance of polymeric coagulants could be improved by adding them in particulate form.

D8 was published in 1966. If it was obvious to add the polymers disclosed therein in particulate form, it would not have taken until 1991, the year of filing of the patent in suit, to make the invention. The skilled person would not consider D3 because it related to oil in water emulsions and not to the removal of solid particles from a suspension. The teachings of documents from different technical fields such as D8 and D3 should not be combined. In this respect reference was made to T 745/92 and T 552/89. Moreover D3 was very vague and contradictory in its teaching. At the beginning it said that the anionic polymer was in its powder state and at the end it mentioned that the cationic polymer was added in powdery state. Furthermore it did not disclose the molecular weight or intrinsic viscosity of the polymers. Thus even if D3 was considered, inventive skill would be needed to arrive at a process according to claims 1 or 2 of the main request.

The independent claims of the auxiliary requests contained further distinguishing features for which there was no hint in the prior art. With respect to the first auxiliary request, it was argued that the references in D6 on pages 6, 151 and 157 to combinations of a primary coagulant and a flocculant related to combinations of a metal ion coagulant and a



polymeric flocculant. The present combination of a polymeric coagulant in particulate form and a counterionic organic polymeric flocculant was not disclosed or suggested.

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

The respondent requested that the appeal be dismissed and that the patent be maintained with claims 1 to 14 of the main request and the description as maintained by the first instance, or alternatively with claims 1 to 13 filed as auxiliary requests 1 or 2, or with claims 1 to 12 filed as auxiliary request 3, or with claims 1 to 11 filed as auxiliary request 4, all filed on 13 January 1998 with the letter dated 12 January 1998, after adaptation of the description to the claims of the auxiliary requests.

### **Reasons for the Decision**

1. The appeal is admissible.
2. *New evidence submitted during appeal proceedings*

D9 has been submitted with the grounds of appeal. It was brought forward by the appellant in order to demonstrate that it was known in the art that by using water soluble polymers of relatively large particle size the formation of lumps could be avoided. The filing of this document reinforces the existing line of attack which had not succeeded before the first instance. The filing of new documents with the grounds of the appeal in order to reinforce the line of attack

unsuccessfully made before the first instance has to be considered as the normal behaviour of a losing party (see also T 113/96 dated 19 December 1997, point 11 of the reasons).

The Board, therefore, cannot accept the respondent's position that, since D9 was not considered by the Opposition Division, it was filed too late and should not be introduced into the proceedings because it is irrelevant. The Board holds furthermore that the position taken in the decisions T 1002/92 (OJ EPO 1995, 605) and T 459/94 (dated 13 May 1997) mentioned by the respondent, that documents filed after expiry of the nine month opposition period should only be admitted if prima facie highly relevant in the sense that it can reasonably be expected to prejudice maintenance of the European patent, inadequately restricts the Board's discretion under Article 114(2)EPC to consider late-filed evidence. If during the proceedings a late filed document turns out to be irrelevant its consideration does not harm the patentee. If otherwise the late-filed document turns out to be pertinent, its consideration is justified. In addition, the Board's duty to protect the public against unjustified patent rights within the legal framework of the EPC must be properly taken into account when exercising the discretion to disregard facts and evidence which are not submitted in due time (see also T 855/96 of 10 November 1999, point 2.3 of the reasons). In the Board's judgement new evidence should therefore only be disregarded in exceptional situations, which are not apparent in this case. The other decision cited by the respondent in this respect T 39/93 (OJ EPO 1997, 134) relates to the admissibility of evidence filed after the issue of a communication under Rule 71a EPC and not, as in the present case, already with the grounds of appeal. On the basis of these considerations, the Board has decided to admit D9 into the proceedings.

3. The present claims according to the main request and auxiliary requests 1 and 2 differ from the claims before the Opposition Division only in that in claims 1 and 2 "solution" is replaced with "suspension". This is a correction of an obvious error, which is allowable under Rule 88 EPC. Regarding the other amendments made after grant of the patent, the Board concurs with the undisputed findings in the decision under appeal that they fulfil the requirements of Article 123 EPC. Novelty has never been at issue. The only remaining objection is lack of inventive step. Thus the sole issue to be decided in these appeal proceedings is that of inventive step.

4. *Main request*

4.1 The Board regards D8 as the closest state of the art. During oral proceedings the parties agreed that D8 was suitable as a starting point for discussing inventive step. D8 discloses the preparation of water soluble quaternary ammonium polymers and their use as flocculating agents. Specifically disclosed is polydiallyldimethylammonium chloride (hereinafter referred to as polydadmac) having an intrinsic viscosity of 1.35 and its use in the clarification of a montmorillonite clay suspension and sewage water in place of alum (column 11, lines 3 to 30 and Example I). D8 also discloses polydadmac having an intrinsic viscosity of 1.52 in the form of pearls or beads (Example XXV). Although the polymer in D8 is referred to as a "flocculant" it also fulfils the requirements of a "coagulant"; ie it is highly ionic and has the right intrinsic viscosity (below 2 dl/g; patent in suit, page 2, lines 15 to 18) and it is used in place of a metal coagulant (D6, page 6, 2nd paragraph). D8 does not disclose the way the polymer is added to the

dispersion. The Board accepts, that at least at the publication date of D8 (1966) it was common practice to dissolve the polymer in water before adding it to the suspension.

- 4.2 According to the patent in suit it was an object of the invention to provide improved processes for the separation of suspended material from aqueous suspensions by using polymer in the form of a powder but which avoid the need for normal make-up apparatus and concentrate handling equipment (page 3, lines 38 to 47). It was however admitted in the patent in suit and confirmed during oral proceedings that an improvement in performance was not obtained in every case (page 4, lines 7 to 12). Indeed, Example 5 shows that, only at one dosage, introduction of the coagulant as a solid gives an improvement over the introduction as a liquid. Moreover, examples in which solid dosage has been compared with liquid dosage have only been provided for polydadmacs and a specific sodium polyacrylate, whereas claim 1 comprises all kinds of water soluble ionic polymers. Under these circumstances the Board cannot accept the respondent's allegation that a performance improvement is obtained in the vast majority of the embodiments covered by claims 1 and 2. Since only those technical problems can be taken into consideration for inventive step which are plausibly solved over the whole range of the broadest claim, the Board considers that starting from D8, the problem underlying the invention was to provide a simplified process of separating solid material from an aqueous suspension. This statement of the problem is in agreement with the above mentioned statements in the patent in suit. The patent in suit, in the embodiment of claim 1 of the main request, proposes to solve this problem by adding the coagulant to selected suspensions in the form of solid particles having a particle size distribution so that at least 90% by weight of them have a size above

30 µm. It is plausible and uncontested by the appellant, that less apparatus is needed if solid particles are directly added without first being dissolved. The Board is, therefore, satisfied that the process of claim 1 actually solves the said problem.

4.3 It remains to be decided whether the claimed solution of this problem was obvious to a person skilled in the art in view of the available prior art documents.

D8 is silent about the way the polymer is added to the suspension.

D3, published in 1985, relates to a method for treating waste water containing oil to separate the oil phase from the water phase by means of a cationic polymer coagulant or a combination of a cationic and an anionic polymer coagulant. It discloses that the effect of the addition of the cationic polymer is increased when it is added in powdery state. Cited examples of suitable polymers are amongst others polydadmacs. The Board sees no contradiction in the statements of D3 "comprises adding a cationic polymer coagulant (II), or a combination of (II) and an anionic polymer coagulant (III) in its powder state" and "Effect of the addn. of (II) is increased when it is added in powdery state". In the Board's view D3 unambiguously discloses that polymer (II) can be used alone or in combination with polymer(III) in the form of a powder.

In the Board's view, a person skilled in the art would have immediately recognised that addition of polydadmac, available as particulate matter in the form of beads, directly in solid form would simplify the separation process. He was possibly reluctant to use it directly in particulate form because it was known in the art that adding polymeric coagulant to aqueous systems could give rise to the formation of gelled

solids or lumps as testified in handbooks about water purification; see eg D6p, chapter 3.2.4.3 and D7p, chapter 1.4.4, both published before D3. D8p, relating to high molecular weight polymeric flocculants, is of no relevance here because it does not relate to polymeric coagulants within the meaning of the patent in suit and was published in 1994, ie four years after the priority date of the patent in suit. After the publication of D3 it was apparent to the skilled person that, at least for the polymers mentioned therein, the problem of lump forming by adding particulate, water soluble, polymers to aqueous suspensions did not exist to such an extent that it would deteriorate their function as coagulant. There can be no doubt that the cationic polymers mentioned in D3 were used as a coagulant and not as a flocculant, since no metallic ion coagulant was used and no flocculation takes place in an emulsion. The skilled person also knows that the function of the coagulant is the same in suspensions of an insoluble liquid in water (emulsions and latices) and in suspensions of an insoluble solid in water. In both cases the coagulant reduces the electrical forces which stabilise the small droplets or particles so that agglomeration can take place; see D6, pages 5 and 6, page 144, last paragraph, page 146, last paragraph, page 151, second full paragraph. Thus, knowing that polymers such as polydadmac can be successfully added as coagulant to emulsions in the form of solid particles, the skilled person would realise that the same should be possible for their use as coagulant in aqueous suspensions of solid particles such as those mentioned in D8 and that, in this way, make-up apparatus for preparing a solution of the polymers could be saved.

4.4 The Board finds the respondent's argument that the invention was not obvious, because it was made 25 years after the publication of D8, not convincing since the use of polydadmac in powder form was made available to the public for the first time by D3 in 1985. There are only 5 years between the priority date of the patent in suit and D3. Such a time period is not unusual for a non-inventive further step in the normal development of the art.

4.5 Furthermore, the Board cannot agree with the respondent's argument that D8 and D3 related to different technical fields so that the skilled person, trying to improve a process described in D8, would not take notice of D3, although it agrees with the position taken in decisions T 745/92 (dated 8 June 1994, point 1.4 of the reasons) and T 552/89 (dated 27 August 1991, point 2.2 of the reasons) that the disclosures of two prior documents may only be combined if it would have been obvious for a skilled person, when seeking to solve the problem underlying the claimed invention, to combine them. In the present case, however, water treatment as disclosed in D8 essentially consists of only two steps, ie adding a coagulant to the suspension and separating the coagulated particles from the suspensions. Simplification of the process could thus only be expected in either the addition or the separation step of the process. Thus starting from D8, the skilled person seeking to solve the above mentioned problem would therefore consider any document in the field of water purification relating to the addition of coagulants. In the Board's view the skilled person would therefore have combined the teachings of D8 and D3.

4.6 D3 does not disclose the particle size of the polymers. Their state is referred to as "powdery". If a polymer powder can be suitably added to an aqueous dispersion,

the skilled person will expect that this must certainly be the case for the same polymer in the form of beads. The handling properties of aggregates or beads of soluble material are generally much better than these of a fine powder. The absence of a particle size in D3 will thus not prevent the skilled person from applying the teaching thereof to a process according to D8 using eg the water soluble polymer beads disclosed in Example XXV as coagulants. The respondent's argument that the expression "beads" does not automatically imply that at least 90% by weight of the polymer particles have a size above 30  $\mu\text{m}$ , is not convincing. According to D6p synthetic polyelectrolytes are supplied as free flowing beads or granular powders, fine and dusty powders or liquid (chapter 3.2.4.3 first paragraph). From this it follows that beads are not fine and dusty powders. Moreover, in the patent in suit it is stated that beads of polymers such as polydadmac typically having a size in the range of 200 to 1000  $\mu\text{m}$  were commercially available (page 7, lines 36 to 40 in combination with page 8, lines 28 to 31). An additional argument for using relatively coarse particles is the teaching in D9, relating to powder-like coagulants, that with water soluble polymers having a particle size distribution such that at least 90% has a particle size from 10 to 40 mesh (0.42 to 2.00 mm) "lump" formation is avoided (page 4, first paragraph and page 9, second paragraph). Likewise, the fact that D3 does not disclose the molecular weight or intrinsic viscosity of the polymers is, in the Board's judgement, not relevant for the issue of inventive step, since it does not prevent the skilled person from applying its general teaching to the process of D8, ie to use the polydadmac beads with the required intrinsic viscosity disclosed therein directly in particulate form.



4.7 For these reasons the Board holds that, after the publication of D3, it was obvious for the skilled person trying to solve the above-mentioned problem to add the polydadmac beads disclosed in D8 in particulate form to the aqueous suspensions of solid particles mentioned in D8, ie china clay effluent and waste water from the feldspar or alumina industries, which normally contain suspended clay particles, and sewage suspensions. Claim 1 of the main request, therefore, lacks an inventive step within the meaning of Article 56 EPC, so that the main request cannot be allowed.

5. *First auxiliary request*

Claim 1 of the first auxiliary request differs from claim 1 of the main request in the additional requirement that a counterionic organic polymeric flocculant solution is added to the coagulated suspension.

Thus, in respect of D8, the technical problem may now be seen as the provision of a simpler and more effective separation process. This problem can, in the absence of any evidence to the contrary, be regarded as being solved by the characterising features of claim 1.

It is, however, well known in the art that the clarification of suspensions can be improved if, after addition of an ionic coagulant, a counterionic flocculant is added; see eg D6, page 6, first three paragraphs, page 12, first paragraph and page 157, last paragraph. Since further according to D3 an anionic polymer may be combined with the cationic coagulant, it was obvious to the skilled person to improve the clarification by adding an anionic polymeric flocculant to a dispersion previously treated in an obvious way with cationic polydadmac beads. Moreover, anionic

polymeric flocculants do not easily dissolve in water and are generally used as a pre-mixed solution (see D6p and D7p). Thus it was also obvious to add the polymeric flocculant in the form of solution thereof. Thus the subject matter of claim 1 of auxiliary request 1 is not more than an aggregation of the obvious process of claim 1 of the main request with a routine additional process step, which does not involve an inventive step. Therefore, the first auxiliary request cannot be allowed.

6. *Second auxiliary request*

6.1 Claims 1 and 2 of the second auxiliary request differ from claims 1 and 2 of the main request by the additional requirement that the polymeric coagulant particles are added to the suspension flowing along duct means under such conditions that the flow time from the position where the coagulant particles are added to the position at which the separation process is initiated is not more than 5 minutes and that the coagulant particles are fully dissolved before the suspension reaches the position at which the separation is initiated. In this way no stirring means are necessary to dissolve the coagulant particles so that a further simplification is obtained. Therefore, the Board considers that, in respect of D8, the technical problem is the same as stated for the main request. It is thus to be examined whether the solution of this problem as now claimed in the second auxiliary request was obvious to a skilled person.

6.2 Neither D8 nor D3 discloses the addition of the coagulant in a duct to a separation unit. Although it is known in the art to introduce the coagulant in the slurry stream to the settler (D1, column 7, lines 53 to 60) there is no indication for the flow and dosing conditions required by claims 1 and 2 of the second

auxiliary request in D1 or any other cited document. It is not even evident that it is favourable to dissolve all the coagulant particles before the slurry reaches the settler. With respect to the second auxiliary request the appellant merely argued that the additional requirements were a matter of routine. In the absence of further evidence, the Board is not convinced that the claimed flow and dosing conditions are the result of routine experimentation by the skilled person. Under these circumstances the Board holds that the subject matter of claims 1 and 2 of the second auxiliary request is not obvious, but involves an inventive step. Claims 3 to 13 are dependent upon either claim 1 or claim 2. The inventive step of the processes according claims 3 to 13 follows from this dependency.

**Order**

**For these reasons it is decided that:**

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent with claims 1 to 13 submitted as second auxiliary request with letter of 12 January 1998 and a description to be adapted.

The Registrar:



S. Hue

The Chairman:



R. Spangenberg



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