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**Datasheet for the decision
of 4 July 2017**

Case Number: T 1267/15 - 3.3.05

Application Number: 08747821.0

Publication Number: 2162388

IPC: C01B25/237, C01B25/16,
C08F14/18, C08F214/18,
C08F8/00, C08F114/18

Language of the proceedings: EN

Title of invention:

Process for removing fluorinated compounds from an aqueous phase originating from the preparation of fluoropolymers

Patent Proprietor:

3M Innovative Properties Company

Opponent:

Solvay Specialty Polymers Italy S.p.A.

Headword:

Removal of fluorinated compounds/3M

Relevant legal provisions:

EPC Art. 56

Keyword:

Inventive step - non-obvious solution

Decisions cited:

Catchword:



Beschwerdekammern
Boards of Appeal
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Case Number: T 1267/15 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 4 July 2017

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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 13 April 2015
revoking European patent No. 2162388 pursuant to
Article 101(3) (b) EPC.**

Composition of the Board:

Chairman E. Bendl
Members: J.-M. Schwaller
R. Winkelhofer

Summary of Facts and Submissions

- I. The present appeal lies from the decision of the opposition division to revoke European patent No. 2 162 388 on the grounds that the requests then on file lacked novelty or inventive step.
- II. With its grounds of appeal dated 14 August 2015, the proprietor ("the appellant") filed five sets of claims as main request and auxiliary requests 1 to 4.
- III. The opponent ("the respondent") held that these sets of claims lacked inventive step over D1: EP 1493716 A1 or D5: US 6706193 B1 (both documents representing in its view the closest prior art) in combination with any of documents D6: WO 91/07354 A1, D7: US 2005/0230318, D8: US 6059978 A, D9: US 2006/0196834 A1, D10: JP 2003/181 466 or D11: H.I. Heitner, "Flocculating Agents", Kirk-Othmer Encyclopedia of Chemical Technology, 623 to 647, published online 16 July 2004.
- IV. At the oral proceedings, which took place on 4 July 2017, inventive step was discussed. After having been informed that the then pending main request was held to lack inventive step, the appellant withdrew it and made auxiliary request 1 the new main request. Claim 1 thereof reads:

"1. A process for reducing the amount of fluorinated compounds in an aqueous phase, the process comprising a) adding to the aqueous phase one or more polycationic polymers or precursor polymers thereof to cause at least partial precipitation of fluorinated compounds, and

*b) adding to the aqueous phase one or more polyanionic polymers,
wherein b) is carried out after or simultaneously with
a) and wherein the aqueous phase is generated in the
production of fluoropolymers comprising repeating units
derived from vinylidene fluoride (VDF)."*

Claims 2 to 8 are dependent on claim 1 and are directed to preferred embodiments of the claimed process.

- V. At the end of the oral proceedings, the appellant requested that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of the claims of the new main request (filed as auxiliary request 1 with the grounds of appeal) or, alternatively, of one of the sets of claims according to auxiliary requests 2 to 4, also filed with the grounds of appeal dated 14 August 2015.

The respondent requested that the appeal be dismissed.

Reasons for the Decision

1. Admissibility of the main request

The present main request was submitted with the grounds of appeal. The respondent did not object to its admissibility, nor does the board see any reason to do so.

2. Article 123(2) and (3)

The respondent did not raise any objection with regard to Article 123 EPC.

The board is also satisfied that the requirements of Article 123(2) EPC are met, as claim 1 derives from claims 1, 3 and 8 as originally filed and claims 2 to 8 correspond to original claims 4 to 6 and 9 to 12 with an amendment to claim 5 which derives from the original description on page 17, line 4.

Furthermore, the only independent claim 1 contains all the features of claim 1 as granted and therefore complies with Article 123(3) EPC.

3. Main request - novelty

The subject-matter of claim 1 is novel, as none of the documents presented in the course of the appeal procedure discloses steps a) and b) in the claimed order in combination with the treatment of an aqueous phase comprising repeating units derived from vinylidene fluoride. The respondent did not call into question the novelty of the claimed subject-matter.

4. Main request - inventive step

Applying the problem-solution approach, the board came to the conclusion that the subject-matter of claim 1 of this request involves an inventive step for the following reasons:

4.1 As regards the closest prior art, the question is whether D1 or D5 is the best starting point to assess the inventive step of the claimed subject-matter.

4.1.1 D1 discloses (claim 2) a method for treating a waste water containing fluoride and/or phosphate ions, comprising adding (A) a film-forming agent comprising a water-soluble organic polyelectrolyte constituted by

units derived from at least one organic acid selected from the group consisting of mannuronic acid, glucuronic acid and cellulose glycolic acid, and an anionic polymeric flocculant to the waste water; and (B) a cationic polymeric flocculant alone, or a water-soluble aluminum salt and the cationic polymeric flocculant, are added sequentially or simultaneously to the waste water.

- 4.1.2 D5 discloses (claims 1, 6 and 7) a process for the recovery of fluorinated emulsifiers from an aqueous phase which also contains small amounts of fluoropolymer particles, the process comprising contacting the aqueous phase with an anionic exchanger resin in order to adsorb the emulsifier onto the exchanger resin, and optionally adding an effective amount of an organic flocculating agent, which may be cationic, to the aqueous phase in order to precipitate essentially all the fluoropolymer particles.
- 4.1.3 According to the case law of the boards of appeal, the closest prior art is normally a document disclosing subject-matter conceived for the same purpose or aiming at the same objective as the claimed invention and, in addition, having the most relevant technical features in common, i.e. requiring the minimum of structural modifications.
- 4.1.4 In the present case, the board judges that D5 is the closest document because it deals with the same kind of waste water as defined in claim 1, namely that produced by the treatment of an aqueous phase generated in the production of fluoropolymer.

D1 is more remote as it relates to the treatment of waste waters containing fluoride and/or phosphate ions,

generated in semiconductor production apparatuses, desulphurisers, or stainless steel or glass production processes. As the contested patent does not disclose the presence of fluoride ions in the waste water and since the respondent has not provided any evidence that fluoride ions were inevitably present in said waste waters, D1 does not represent the closest prior art.

4.2 As regards the problem underlying the contested patent, this is described in paragraphs [0008], [0010] and [0018] as consisting in the provision of a cost-effective and (more) efficient method for removing fluorinated compounds from waste water generated in the production of fluoropolymers.

4.3 As a solution to this problem, the contested patent proposes the process according to claim 1 at issue, which is in particular characterised in that one or more polyanionic polymers are added after or simultaneously to the addition of polycationic polymers or precursor polymers thereof to the waste water.

4.4 As to whether the problem identified in point 4.2 above has been solved by the proposed solution, Example 5 of the patent shows that the treatment of a waste water as defined in the claimed subject-matter by sequential addition of a polycationic polymer (ZETAC 8818) and a polyanionic polymer (Magnafloc 110 L or 90L) leads to a significant reduction of organic bonded fluorine (33% and 40% respectively). This is even more effective than treating the same waste water by adding the polycationic polymer alone (reduction of 25%). The board thus has no doubt that fluorinated compounds can be more effectively removed by the claimed process than by adding a polycationic polymer alone.

Regarding the respondent's argument that the patent does not provide any evidence that the problem is similarly solved with the second claimed alternative (simultaneous addition of a polyanionic and of a polycationic polymer), the board has no reason to doubt that the effect shown can also be achieved by simultaneously adding both polyionic polymers, because the polyanionic polymer serves to aid the polycationic polymer to further reduce the fluorinated compounds (paragraphs [0052] and [0053]), i.e. to increase precipitation of the fluorinated compounds (paragraph [0061]). The respondent has not provided any evidence that this was not the case. Therefore, this argument has to be rejected.

- 4.5 As regards the obviousness of the claimed subject-matter in view of the disclosure of the closest prior art D5, it has to be determined whether the proposed solution was obvious in view of the closest state of the art alone or, alternatively, in the light of the remaining state of the art, in particular of documents D6 to D11 that the respondent held to be particularly relevant.
- 4.5.1 D5 refers to the treatment of the waste water containing fluorinated compounds with an anion exchanger to adsorb the emulsifier. The resulting phase may optionally be treated with an organic flocculating agent, which may be cationic, to precipitate the fluoropolymer particles. Thus D5 teaches the use of the anionic exchange resin alone to adsorb the emulsifier and the precipitation is solely done by the (cationic) flocculating agent, whereas, in the patent in suit, precipitation of fluorinated compounds caused by the polycationic polymer is **further increased** by the

polyanionic polymer (see paragraph [0061] and example 5).

Thus, D5 does not give any hint towards precipitation achieved by introducing two differently charged polyionic polymers in a specific order, nor does it teach that precipitation of total organic bonded fluorine may be improved by doing so. Thus, any effects or improvements in this regard cannot be derived from D5 alone.

- 4.5.2 D6 (claim 1) discloses a method of treating contaminated water by adding sequentially, but not necessarily in this order, an anionic or cationic coagulant, at least one agent which reacts with dissolved metal ions to form insoluble salts and a coagulant of opposite charge to the first coagulant. Page 1 of D6 describes the contaminated water as being household or industrial sewage or leachate from a waste dump or land fill site.
- 4.5.3 D7 (paragraph [0011] discloses a method for clarifying industrial waste water, specifically industrial laundry waste water, to reduce the sludge content by 30 to 80%, using a two-part system consisting of a pDADMAC/ACH blended coagulant followed by a poly(acrylamide-co-acrylate) flocculant, i.e. a system composed of a "polycationic" and a "polyanionic" polymer in the sense of claim 1 of the main request under dispute.
- 4.5.4 D8 (column 2, lines 36 to 39) discloses the removal of dyes from waste water by first adding a cationic polymer and then an anionic polymer to form a flocculent precipitate.

- 4.5.5 D9 (paragraph [0008]) discloses the removal of submicron particulates from water containing a halogenating agent by adding a soluble cationic polymer, followed by adding a soluble anionic polymer or anionic salt. It gives no hint that the described process can be applied to waste water from vinylidene fluoride production.
- 4.5.6 D10 (abstract) discloses the treatment of waste water from the paper industry, using a mixture of a cationic water-soluble polymer and an amphoteric water-soluble anionic polymer containing cationic and anionic structural units.
- 4.5.7 For the board, as none of the above documents refers to waste water generated in the production of fluoropolymers, the skilled person faced with the problem underlying the invention would not have any incentive to use the solution proposed by these documents and thereby arrive at the subject-matter defined in claim 1 at issue.

The respondent's argument that the above waste waters might implicitly comprise fluoride or fluorinated derivative is not convincing, in particular in view of the fact that it has the burden of proving this assertion, but has not produced the necessary evidence.

- 4.5.8 The same conclusion arises from the disclosure of document D11, a chemical encyclopedia referring to flocculating agents, which in particular discloses (page 635, first lines of the heading "Flocculant performance and selection") that "*there is no comprehensive quantitative theory for predicting flocculation behavior that can be used for flocculant selection*". So, for that reason alone it appears

difficult to predict that a system combining a polycationic and a polyanionic polymer would solve the problem identified in point 4.2 above, namely providing an efficient method for removing fluorinated compounds from waste water generated in the production of fluoropolymers.

The respondent mentioned that D11 discloses combinations of cationic and anionic polymers for efficiently treating waste waters from "*mineral processing applications*" (last full paragraph on page 635). There is, however, no specific teaching in this paragraph that these waste waters include fluorinated compounds or that they may have been generated in the production of fluoropolymers.

- 4.6 It follows from the above considerations that having regard to the state of the art, the subject-matter of claim 1 of this request, and by the same token that of dependent claims 2 to 8, which include all the features of claim 1, is not obvious to a person skilled in the art, and so involves an inventive step within the meaning of Article 56 EPC.
5. Since the claims of the main request comply with the EPC, there is no need to consider the lower-ranking requests.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the department of first instance with the order to maintain the patent on the basis of the main request, filed as first auxiliary request with the statement of grounds of appeal, and to adapt the description, if necessary.

The Registrar:

The Chairman:



A. Vottner

E. Bendl

Decision electronically authenticated