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**Datasheet for the decision
of 14 April 2023**

Case Number: T 0319/21 - 3.3.05

Application Number: 16204180.0

Publication Number: 3170789

IPC: C01B21/093, C07C303/40,
C07C311/48, C01B21/092,
H01M10/10, H01M10/052,
H01M10/0568

Language of the proceedings: EN

Title of invention:

PRODUCTION PROCESS FOR FLUROSULFONYLIMIDE AMMONIUM SALT

Patent Proprietor:

NIPPON SODA CO., LTD.

Opponent:

SOLVAY (SOCIETE ANONYME)

Headword:

FLUROSULFONYLIMIDE AMMONIUM SALT/Nippon Soda

Relevant legal provisions:

EPC Art. 87(1), 83, 123(2), 54, 56, 100(c)

Keyword:

Priority - partial priority (yes)
Sufficiency of disclosure - (yes)
Grounds for opposition - fresh ground for opposition (yes)
Amendments - added subject-matter (no)
Novelty - (yes)
Inventive step - (yes)

Decisions cited:

G 0001/15, G 0010/91, T 1311/15

Catchword:



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Case Number: T 0319/21 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 14 April 2023

Appellant: SOLVAY (SOCIETE ANONYME)
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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 8 February 2021
rejecting the opposition filed against European
patent No. 3170789 pursuant to Article 101(2)
EPC.**

Composition of the Board:

Chairman E. Bendl
Members: J. Roider
S. Fernández de Córdoba

Summary of Facts and Submissions

I. The appeal lies from the decision of the opposition division to reject the opposition.

II. The following documents, which were already cited in the opposition proceedings, are relevant here:

P1 JP 2011-046738 (priority document)

PA EP 12752317.3

D1 WO 2010/010613 A1

D1bis Machine translation of D1

D2 WO 2009/123328 A1

D3 US 4,374,818 A

D4 EP 2 662 332 A1

III. The following document first cited by the appellant (opponent) in the appeal proceedings is referred to as:

E1 Experimental evidence (and corrected version)

The patent proprietor acknowledged the filing of E1.

IV. In the communication under Article 15(1) RPBA, the board expressed the preliminary opinion that the appeal should be dismissed.

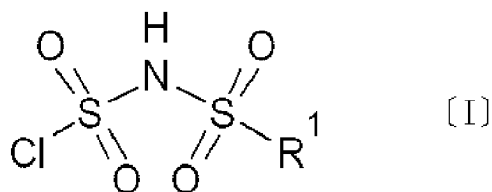
V. By letter dated 29 March 2023, the appellant then withdrew the request for oral proceedings and requested a decision based on the written submissions.

VI. Since the board had no reason to deviate from the preliminary opinion, it was not deemed expedient to

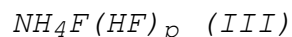
hold oral proceedings and thus the oral proceedings were cancelled.

VII. Claim 1 of the main request (as granted) reads as follows:

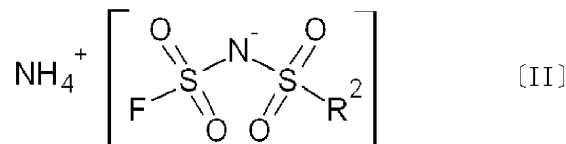
A process for producing a fluorosulfonylimide salt represented by formula [IV], the method comprising reacting a compound represented by formula [I] with a fluorinating agent represented by formula [III] to obtain a fluorosulfonylimide ammonium salt of formula [II], and reacting the obtained fluorosulfonylimide ammonium salt represented by formula [II] with an alkali metal hydroxide under reduced pressure to obtain the fluorosulfonylimide salt represented by formula [IV],



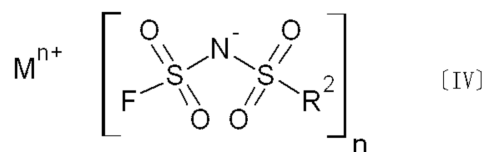
wherein R^1 represents a fluoroalkyl group having 1 to 6 carbon atoms, a fluorine atom, or a chlorine atom,



wherein p represents 0 to 10,



wherein R^2 represents a fluoroalkyl group having 1 to 6 carbon atoms, or a fluorine atom,



wherein M^{n+} represents an alkali metal cation, n corresponds with a valency of the alkali metal cation and is 1, and R^2 is as defined above in formula [II].

VIII. The key arguments of the appellant (opponent) can be summarised as follows below.

Priority right, Article 87(1) EPC

The priority document P1 disclosed for the parameter p in the chemical formula $\text{NH}_4\text{F}(\text{HF})_p$ only the integers 0, 1, 2, 3 and 4, whereas the patent application extended these natural numbers to real numbers comprised in the range of 0 to 10. This extended the scope of the application of the patent in suit with respect to the priority document.

Moreover, the term "alkali metal hydroxide" did not appear in P1, which did contain in paragraph [0028] a list of examples of alkali metal compounds including hydroxides, carbonates, chlorides, bromides, etc. The hydroxides contained in the list were disclosed using their chemical formula i.e. "LiOH, NaOH, KOH, RbOH and CsOH".

LiOH.H₂O was an example of an alkali metal hydroxide, which was included within the scope of "alkali metal hydroxide", but which was not contained in the list of components disclosed with their chemical formulas. For this reason the feature alkali metal hydroxide was not disclosed in the priority document.

Finally, for the synthesis under reduced pressure, the priority document did not disclose alkali metal

hydroxides other than those disclosed in paragraph [0028] of P1. Since, however, the generic feature alkali metal hydroxide also included LiOH.H₂O, the use of this hydroxide under reduced pressure was not disclosed.

Admission of grounds under Article 100(c) EPC

The appellant asserts that the application as originally filed contained no basis for the subject-matter of claim 1 of the patent in suit (Article 100(c) EPC / Article 123(2) EPC) basically for the same reasons as those which made the priority claim invalid.

The appellant further argues that the divisional application DA differed from the parent application PA and therefore Article 100(c) EPC / Article 76(1) EPC was violated basically for the same reasons as those which made the priority claim invalid and the opposition division erred in not admitting this fresh ground into the proceedings.

Sufficiency of disclosure, Article 100(b) EPC

In general terms, the appellant argues that the process of claim 1 lacked reproducibility because its desired technical effect, i.e. obtaining a fluorosulfonylimide salt at high purity and sufficient yield, was not achieved, thus resulting in a lack of sufficient disclosure. Details of the arguments are set out in the reasons below.

Novelty, Article 100(a) EPC

The appellant argues that since the priority claim was invalid, document D4, example 4 was relevant and

anticipated the novelty of the subject-matter of claim 1.

Inventive step, Article 100(a) EPC

D1/D1bis, embodiment 5 was considered to be the closest prior art. The technical problem solved by the patent in suit was merely to provide an alternative because a higher purity at an acceptable yield could not be achieved, as demonstrated in document E1.

In view of D2 (or D3), the skilled person knew that potassium fluoride could be replaced by alkali metal hydroxides which led the skilled person directly to the claimed subject-matter.

- IX. The key arguments of the patent proprietor (respondent) can be summarised as follows:

Priority right, Article 87(1) EPC

The priority right was valid for the integers 0, 1, 2, 3 and 4 of the parameter p in the chemical formula $\text{NH}_4\text{F}(\text{HF})_p$. P1 contained in paragraph [0028] a disclosure for the feature "*alkali metal hydroxide*" as well as the combination with the use of reduced pressure during the reaction.

Admission of grounds under Article 100(c) EPC

The respondent did not give consent to the admission of the fresh ground for opposition under Article 100(c) EPC / Article 123(2) EPC.

Moreover, the opposition division did not err by not admitting the new ground for opposition based on Article 100(c) EPC / Article 76(1) EPC.

Sufficiency of disclosure, Article 100(b) EPC

The appellant did not discharge the burden of proof that was upon him. Therefore, the objection was not sufficiently substantiated.

Novelty, Article 100(a) EPC

As the priority of the patent in suit was valid, D4 did not form state of the art according to Article 54(2) EPC and was also not novelty-destroying for the claim under Article 54(3) EPC.

Inventive step, Article 100(a) EPC

Starting from D1/D1bis, embodiment 5 as the closest prior art, the technical problem was to provide an improved process for producing bis(fluorosulfonyl)imide salts via a shorter and therefore more efficient reaction.

The technical incompatibility of D2 and D3 with D1/D1bis was enough to ensure that the skilled person would not arrive at the claimed subject-matter.

X. Requests as to substance:

(a) The appellant requests that the decision under appeal be set aside and the patent be revoked.

(b) The respondent requests that the appeal be dismissed, or in the alternative that the patent be maintained on the basis of auxiliary requests 1 or 2, filed on 5 June 2019, auxiliary requests 3, 4 and 5, filed with the reply to the appeal or

auxiliary request 6, filed on 30 November 2020.

Reasons for the Decision

1. Priority right, Article 87(1) EPC

The patent in suit was filed as a divisional application (DA) from the earlier application PA (parent application) which claims priority from P1, the priority document.

1.1 In view of G 1/15 (order), the patent enjoys (partial) priority for processes as claimed using the values of p identical to the integers 0, 1, 2, 3 and 4.

Processes as claimed using pure substances of NH_4F , $\text{NH}_4\text{F}(\text{HF})$, $\text{NH}_4\text{F}(\text{HF})_2$, $\text{NH}_4\text{F}(\text{HF})_3$, $\text{NH}_4\text{F}(\text{HF})_4$ thus enjoy the right of partial priority.

1.2 P1 referred to "alkali metal hydroxide". Paragraph [0028] of P1 reads (emphasis added) as follows: **"Examples of the alkali metal compound used in the cation exchange reaction include hydroxides such as LiOH , NaOH , KOH , RbOH and CsOH , carbonates such as ..., hydrogen carbonates such as ..., chlorides such as ..., bromides such as ..., fluorides such as ..., alkoxide compounds such as ..., hydrides such as ..., and alkyllithium compounds such as ... Of these compounds, a hydroxide is preferable. By using a hydroxide, ammonia is produced as a by-product in the cation exchange reaction, and therefore by removing this ammonia under reduced pressure, the equilibrium can be adjusted to a state that promotes the cation exchange reaction..."**

Paragraph [0028] thus discloses hydroxides as an example of alkali metal compounds. Some specific examples of alkali metal hydroxides are also disclosed. These specific examples do not restrict the generic disclosure that the alkali metal compounds can be (alkali metal) hydroxides to the specific examples of the alkali metal hydroxides.

1.3 Paragraph [0028] also teaches the use of reduced pressure, particularly in combination with the use of hydroxides.

Moreover, alkali metal hydroxides have the valency of 1 since the (outermost) s-orbital contains only one electron. The selection of the valency is thus implicitly contained in the restriction to alkali metal hydroxide.

No multiple selection is apparent.

The subject-matter of claim 1 thus enjoys the right to the claimed priority inasmuch as it relates to the embodiments disclosed in the priority document.

2. Grounds for opposition, Article 100(c) EPC

2.1 Fresh ground under Article 100(c) EPC / Article 123(2) EPC

The objection under Article 100(c) EPC / Article 123(2) EPC was not raised during the opposition proceedings. Since the proprietor does not give consent to the introduction of this fresh ground, it is not admitted into the appeal proceedings (G 10/91 Headnote, point 3.).

2.2 Ground under Article 100(c) EPC / Article 76(1) EPC

The objection under Article 100(c) EPC / Article 76(1) EPC was already filed in opposition proceedings as a then fresh ground for opposition (see letter dated 2 November 2020, page 4). It is essentially based on the same arguments as were put forth against the validity of the priority claim.

The opposition division did not admit this fresh ground into the proceedings because it did not consider the ground to be *prima facie* relevant for the same reasons related to the validity of the priority claim and because of its conclusion that the priority claim was valid. Therefore the opposition division exercised their discretion according to the correct principles and in a reasonable way.

There is thus no reason to overturn the decision of the opposition division not to admit the then fresh ground for opposition into the proceedings.

3. Sufficiency of disclosure, Article 100(b) EPC

The subject-matter of claim 1 does not specify any desired technical effect.

It is well-established case law that an objection of insufficient disclosure cannot legitimately be based on an argument that the patent did not enable a skilled person to achieve a technical effect which is not defined in the claim (see T 1311/15, Reasons 5.2.).

3.1 The appellant argues specifically that the patent in suit lacked information and a limitation regarding the organic solvent.

The patent in suit discloses the claimed process in examples 3 to 5. All three examples disclose a suitable type of solvent. The skilled person would therefore obtain enough guidance for selection of the solvent.

- 3.2 The appellant argues further that the patent in suit did not provide guidance for a solvent-free process, which was covered by the subject-matter of claim 1. Despite bearing the burden of proving the alleged facts, the appellant did not provide any evidence that a solvent-free process would not work even if one of the reactants were liquid and therefore this speculation cannot be taken into account.
- 3.3 The appellant argues that some solvents could be used because a product free of metal impurities could not be achieved.
However, a product free of metal impurities is not claimed in the subject-matter of claim 1 and therefore this argument must fail.
- 3.4 The appellant argues that ammonium bis(fluorosulfonyl)imide could not be dissolved in any solvent.
However, the subject-matter of claim 1 does not require that the ammonium bis(fluorosulfonyl)imide be dissolved in a solvent prior to the cation exchange reaction. The appellant did not provide evidence that the cation exchange reaction was not possible for this compound, and therefore this argument cannot be taken into account.
- 3.5 The appellant argues that replicating the reproduction of example 4 did not achieve the yield disclosed in example 4. When some parameters such as the molar amount of the reactants were changed, the yield dropped

further as demonstrated in document E1.

This argument fails simply because the subject-matter of claim 1 does not claim a minimum yield. Moreover, document E1 shows that a skilled person had no apparent trouble in selecting an alternative solvent.

- 3.6 Document E1 also discloses that the mixture was refluxed under reduced pressure. A skilled person thus had no apparent difficulty in understanding and implementing this feature.

The patent is therefore sufficiently disclosed.

4. Novelty, Article 100(a) EPC with Article 54(1) and (2) EPC

The appellant bases their objection on D4, example 4 which discloses the production of ammonium di(fluorosulfonyl)imide with the fluorinating agent $\text{NH}_4\text{F}(\text{HF})_p$, where $p=0$. Since $p=0$ is contained in the priority document, the effective date is the priority date of the patent in suit.

Since both documents claim the same priority date and at least the patent in suit's priority is valid, D4 cannot be a prior art document within the meaning of either Article 54(2) EPC or Article 54(3) EPC.

The subject-matter of claim 1 is thus novel.

5. Inventive step, Article 56 EPC

The patent is directed to a process for producing a fluorosulfonylimide salt.

The parties consider D1/D1bis, embodiment 5 to constitute the closest prior art.

This is directed to the production of bis(fluorosulfonyl)imide and is thus suitable as a starting point for an inventive step objection.

According to the respondent, the patent in suit aims to provide an improved process for producing bis(fluorosulfonyl)imide salts via a shorter and therefore more efficient reaction.

The appellant disagrees and argues that it is ambiguous what is to be understood by "*under reduced pressure*". This feature should thus not be considered as a difference and therefore the only difference is to use KOH instead of KF. Since E1 demonstrated that it was not possible to achieve a higher purity at an acceptable yield, the problem considered to be solved by the patent in suit should be merely to provide an alternative.

The appellant argues that in view of D2 (or D3), the skilled person knows that potassium fluoride could be replaced by alkali hydroxides.

The feature "*under reduced pressure*" is broad. However, it does not encompass ambient pressure as argued by the appellant. It cannot therefore be ignored.

Even if, to the benefit of the appellant, it were accepted that the objective technical problem was the provision of an alternative and the skilled person would consider replacing potassium fluoride with an alkali metal hydroxide, the subject-matter of claim 1 could not be achieved.

Paragraph [0057] of D1/D1bis discloses *neutralising* the bis(chlorosulfonyl)imide acid by merely adding an approximately equimolar amount of ammonium fluoride and mixing at room temperature. Under the given reaction conditions, it is not apparent that this would result in the comprehensive formation of ammonium bis (fluorosulfonyl)imide. Firstly, the added ammonium fluoride cannot be considered to provide enough fluorine to the reaction system for complete fluorination. Moreover, it is not clear whether merely mixing at room temperature yields the same product as reaction under reduced pressure (i.e. refluxing according to the patent in suit).

Finally, if the potassium fluoride were replaced by an alkali metal hydroxide, as suggested by the appellant, the fluorine which completes the fluorination in D1/D1bis, embodiment 5, would not be added (see paragraph 9 of D1/D1bis).

6. In view of the objective in D1/D1bis of producing bis(fluorosulfonyl)imide, it is immediately apparent that a skilled person would not, when starting therefrom, consider a measure which had the consequence of the reaction system not receiving enough fluorine to complete the fluorination.

The presence of an inventive step must therefore be acknowledged.

Order

For these reasons it is decided that:

The appeal is dismissed

The Registrar:

The Chairman:



C. Vodz

E. Bendl

Decision electronically authenticated