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**Datasheet for the decision
of 5 July 2024**

Case Number: T 0850/22 - 3.3.09

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Title of invention:
POLYMER ELECTROLYTE FILM

Patent Proprietor:
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Daikin Industries, Ltd.

Opponent:
Wess, Wolfgang

Headword:
POLYMER ELECTROLYTE FILM/ASAHI

Relevant legal provisions:
EPC Art. 56, 111(1), 123(2)
RPBA 2020 Art. 11, 12(4)

Keyword:

Amendment to case - request - admitted

Amendments - added subject-matter (no)

Inventive step - (yes)

Remittal - (no)



Beschwerdekammern

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Case Number: T 0850/22 - 3.3.09

D E C I S I O N
of Technical Board of Appeal 3.3.09
of 5 July 2024

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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 31 January 2022
rejecting the opposition filed against European
patent No. 3065209 pursuant to Article 101(2)
EPC.**

Composition of the Board:

Chairman F. Rinaldi
Members: C. Meiners
 A. Jimenez

Summary of Facts and Submissions

I. This decision concerns the appeal filed by the opponent (appellant) against the opposition division's decision to reject the opposition filed against the patent in suit (hereinafter "the patent").

II. In its decision, the opposition division decided, *inter alia*, that the subject-matter of granted claims 1 to 4 did not extend beyond the content of the application as filed. Furthermore, the opposition division admitted, *inter alia*, document D15 into the proceedings. It also found that the subject-matter of claim 1 as granted involved an inventive step in view of, among other things, that document as the closest prior art.

III. In its notice of opposition, the opponent had requested revocation of the patent on the basis of, *inter alia*, Article 100(a) EPC for lack of inventive step and Article 100(c) EPC for added matter.

IV. The following documents, filed in the opposition proceedings, are relevant to this decision:

D13 US 3,953,566 A

D14 Extract from the "Expanded PTFE Applications Handbook", Elsevier, 2017

D15 US 6,156,451 A

V. *Wording of the relevant claims*

Claim 1 of the main request reads:

"A membrane, which is a polymer electrolyte membrane

comprising

(i) a porous film having pores having an average pore size of $> 0.20 \mu\text{m}$ and being obtained by copolymerizing TFE, tetrafluoroethylene, and an ethylenic comonomer to provide PTFE, polytetrafluoroethylene, and then stretching the PTFE, and

(ii) a polymer electrolyte contained in the pores, characterized in that the PTFE, based on all monomer units, contains 0.011-0.100 mol-% of units derived from the ethylenic comonomer,

wherein the ethylenic comonomer is at least one selected from the group consisting of perfluoro(methyl vinyl ether), perfluoro(propyl vinyl ether), (perfluorobutyl)ethylene, (perfluorohexyl)ethylene, and (perfluorooctyl)ethylene."

This request was filed as auxiliary request 2 by letter dated 14 June 2024.

VI. The appellant's arguments relevant to the present decision can be summarised as follows:

(a) The auxiliary requests 1 to 9 filed by letter of 14 June 2024 should not be admitted into the appeal proceedings. If any were admitted into the appeal proceedings, the case should be remitted to the opposition division.

(b) The main request lacked *inventive step* in view of document D15 as the closest prior art in combination with the teaching of document D13. No effect had been demonstrated that could be causally associated with the specific comonomer content called for in claim 1. Claim 1 merely required comonomer levels that resulted in PTFE copolymers that could be stretched into porous films as

specified in claim 1. Starting from D15 and the selection of the specific comonomers called for in claim 1 as the starting point for the problem-solution approach, a skilled person would inevitably arrive at the subject-matter of claim 1. A one-way-street situation thus applied that rendered the claimed subject-matter obvious to the skilled person.

VII. The patent proprietor's (respondent's) arguments relevant to the present decision can be summarised as follows:

As regards the requirement of inventive step, the subject-matter of claim 1 was not obvious in view of D15 as the closest prior art and document D13 as a secondary information source. The results featured in the patent allowed the conclusion that the claimed comonomer content led to effects of increasing the strength of the polymer electrolyte membranes and reducing the dimensional change while maintaining a low membrane resistance. The disclosure of D15 taken in combination with that of document D13 did not lead to a one-way-street situation that might render the subject-matter of claim 1 obvious. Therefore the claimed subject-matter of the main request involved an inventive step.

VIII. *Final requests*

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

The respondent requested that the decision under appeal be set aside and that the patent be maintained on the

basis of the main request, filed as auxiliary request 2 by letter dated 14 June 2024.

Reasons for the Decision

1. Admittance of the main request and conditional request for remittal of the case to the opposition division

1.1 The appellant requested that, *inter alia*, the main request not be admitted into the appeal proceedings. The request did not correspond to any auxiliary request filed in the first-instance proceedings, and comprised a list of specific comonomers rather than the list of more generic comonomers such as for instance in auxiliary request 5 filed in opposition proceedings. The subject-matter claimed in auxiliary request 2 had thus not been the subject of the opposition proceedings. Consequently, the main request constituted an amendment that should not be admitted into the appeal proceedings (see Article 12(4) and (6) RPBA).

1.2 The respondent countered that it had not been necessary to discuss auxiliary requests in the decision under appeal because the opposition had been rejected. The main request had been filed together with the reply to the statement of grounds of appeal (as auxiliary request 3 then on file). It had been submitted in direct response to the statement of grounds of appeal and to the amended case that had been presented by the appellant. The specific list of comonomers in claim 1 merely limited the claimed subject-matter from the generic to the specific that had already been discussed in the first-instance proceedings.

- 1.3 The board notes that the appellant had not reacted to the filing of, *inter alia*, the main request until the date of the oral proceedings before the board.
- 1.4 The main request was filed for the first time with the respondent's reply to the statement of grounds of appeal (as auxiliary request 3 then on file, then renumbered as auxiliary request 2 by letter of 14 June 2024). It is not contested that this request does not correspond to any request on file in opposition, specifically not to what was then auxiliary request 5, which contained a list including generic comonomers and not the specific corresponding comonomers as now claimed. The main request therefore constitutes an amendment to the respondent's case and its admittance is to be decided under Articles 12(4) and (6) RPBA.
- 1.5 The board notes that limiting the comonomer in claim 1 to specific comonomers is suitable for overcoming objections of inventive step over the granted claims that had been raised by the opponent. The main request was filed by the respondent at the outset of the appeal proceedings as a response to the appellant's line of argument in the statement of grounds of appeal. It raises no new issues and is not detrimental to procedural economy. Likewise, in the reply to the statement of grounds of appeal, the respondent had indicated the basis in the application as filed for the amendments made to the main request. The amendments in claim 1 are based on page 10, line 7 of the application as filed in respect of the upper end point for the comonomer level and the list of comonomers is disclosed on page 9, lines 18 to 21 as preferred embodiments in the application as filed. In the view of the board, the requirements set out in Article 12(4) RPBA were thus

complied with. In view of this, the board saw no reason not to admit the request.

1.6 Likewise, the appellant's request to *remit the case* to the opposition division in the event of one of the former auxiliary requests being admitted into the appeal proceedings had been submitted only at the oral proceedings. The board sees no special reasons to remit the case to the opposition division. As stated above, the main request is based on auxiliary request 5 on file in opposition, with a list of specific comonomers rather than the list including the corresponding more generic comonomers. The opposition division's decision is based on a much broader definition of the comonomer in claim 1 as granted. Moreover, *inter alia*, all the grounds for opposition had already been dealt with in the opposition division's decision. Similarly, the board discussed all the requests in its communication under Article 15(1) RPBA. Hence the board decided not to remit the case to the opposition division for further prosecution (Article 11 RPBA and Article 111(1) EPC).

2. *Amendments - main request*

In the course of the oral proceedings before the board, an objection of the appellant under Article 123(2) EPC in respect of claim 1 of a superseded, higher-ranking request was discussed. The feature objected to was "a porous film having pores having an average pore size of $> 0.20 \mu\text{m}$ ". By contrast, in claim 1 as originally filed it is stipulated: "the porous film having an average pore size of greater than $0.20 \mu\text{m}$ ". The board concluded that the claim complied with the requirement of Article 123(2) EPC.

With respect to the amendments to claim 1 of the main request, the board makes the following observations.

A skilled person would infer from the patent and the application as filed that an average of the pore size of all the pores is determined and that the pores are formed by stretching the films. Claim 1 requires that the polymer be formed and that then the porous film be formed from that polymer by stretching. Consequently, postulating the potential presence of further subsets of pores whose average pore size is not encompassed by the average pore size called for in claim 1 does not seem to be conclusive in the case at hand. In view of this, the board concluded that the said amendment is directly and unambiguously derivable from the application documents as filed. The admittance of the objection was thus left undecided.

No further objection under Article 123(2) EPC was raised by the appellant against the main request. Hence the board sees no added matter arising from the feature combination of claim 1. Thus the board sees no lack of compliance with the requirement of Article 123(2) EPC.

3. *Inventive step - main request*

3.1 The patent

The patent is directed towards polymer electrolyte membranes. Such membranes can be used in membrane electrode assemblies of fuel cells (see paragraphs [0001] to [0003] of the patent). The patent aims at providing a polymer electrolyte membrane having excellent strength, a small dimensional change and a

low membrane resistance (see paragraphs [0013] and [0044] of the patent).

3.2 Problem posed in the patent

3.2.1 This problem is said to be solved by the subject-matter of claim 1, characterised by a porous film obtained by copolymerising tetrafluoroethylene and an ethylenic comonomer as specified in claim 1 to provide PTFE and then stretching the PTFE.

3.2.2 The board considers that it has not been demonstrated that it would not be possible to stretch PTFE copolymers comprising the specific comonomers called for in claim 1 in amounts of up to 0.100 mol% into porous films across the full scope claimed.

3.2.3 This was conceded by the appellant at the oral proceedings before the board. The appellant argued at the oral proceedings that the properties of PTFE copolymers comprising perfluoro(methyl vinyl ether)/PMVE could not be extrapolated to PTFE copolymers comprising other comonomers in polymerised form other than that they could be stretched.

3.2.4 The appellant also argued in this context that the comonomer PMVE was the smallest in the list claimed, and comonomers having larger side chains thus did not necessarily exhibit the same behaviour as PMVE. All but one example in the patent involved PMVE as a comonomer in the PTFE.

3.2.5 As to the effect observed across the whole scope of claim 1, the board concluded that it is credible that the favourable balance or compromise of certain properties is indeed obtained across the full scope

claimed. These properties are "dimensional change" after immersion in hot water, matrix tensile strength in terms of the product of vertical and lateral tensile strength, and membrane resistance. The examples of the patent feature PMVE and (perfluorobutyl)ethylene/PFBE as comonomers. All examples within the scope of claim 1, comprising between 0.011 mol% and 0.091 mol% comonomers - and thus close to the upper end point of the range for comonomer content - exhibit that favourable balance.

3.2.6 The board sides with the respondent that the comonomers specified in claim 1 of the main request have comparably low molecular weights, thereby considerably limiting the amorphous fraction to be expected in the copolymers. It is therefore credible that the effect can be obtained with all the comonomers of claim 1.

3.2.7 The appellant also criticised that the examples of the patent deviated from each other in more than one parameter at the same time. No conclusion could thus be drawn from the examples. For instance, the matrix tensile strength was determined by the process parameters applied. To the board, however, it is not apparent that e.g. the differences in terms of stretching conditions, line speeds and heat setting temperatures between the examples would render the improved balance of said properties vis-à-vis the comparative examples not credible. In this regard, the examples support said effect, obtained for all examples irrespective of the specific conditions and process parameters applied vs. the comparative examples.

3.2.8 At the oral proceedings, the appellant argued that it was part of common general knowledge that preparing expanded PTFE (stretched PTFE) required a polymer

having a standard specific gravity (SSG) below 2.143. Likewise, the respondent stated that suitable conditions for stretching PTFE had to be applied to implement stretching. For the board, this confirms that it is not required to include a restriction to a specific SSG in claim 1 to ensure that the problem is solved.

3.2.9 As stated above, the board therefore concluded that the feature combination of claim 1 credibly solves said problem of improved balance of properties, also referred to in paragraph [0044] of the patent, over the full scope claimed.

3.3 Closest prior art and distinguishing technical feature

It is common ground between the parties that document D15 can be taken as the closest prior art. The board sees no reason to deviate from this assessment. Document D15 discloses polymer electrolyte membranes comprising a microporous support film having pores having a pore size of typically at least about 0.2 μm . The porous support material is impregnated with a fluorinated sulfonic acid polymer or precursor thereof. D15 also aims at improving the tensile strength of polymer membranes having high electrical conductivity (column 1, line 31 ff). D15 also sets out in column 1, lines 48 to 52: "*Composite ion exchange membranes have been developed which incorporate porous supports of a highly fluorinated nonionic polymer such as expanded polytetrafluoroethylene (EPTFE) to increase tensile strength and improve dimensional stability.*" D15 explicitly refers, *inter alia*, to PTFE copolymers as suitable polymers for the microporous support film impregnated with the polymer electrolyte. Useful comonomers for tetrafluoroethylene are

perfluoroalkenes, such as hexafluoropropylene (n = 1 in the first formula of column 5), and perfluoro(alkyl vinyl ethers) such as PMVE (m = 0 and n = 1 in the second formula in column 5), see column 5, lines 33 to 66. By contrast, the list in column 6, line 12 ff of D15, to which the appellant pointed in the oral proceedings, relates to possible fluorinated monomers used for preparing the highly fluorinated nonionic polymers in general rather than to PTFE (copolymers). The latter list mentions, *inter alia*, PMVE and PFBE.

The *distinguishing feature* is thus at least the *comonomer content* of 0.011 to 0.100 mol% in the PTFE copolymers.

- 3.4 Technical effect and objective technical problem
 - 3.4.1 The appellant stated that no technical effect could credibly be associated with that range for the comonomer content. Rather, it coincided with the range of comonomer level that "worked", i.e. that resulted in polymers that could be stretched into porous films. The claimed invention was very close to D15 and differed only in the level of comonomer, which was arbitrary.
 - 3.4.2 The appellant argued that no improvement in technical properties specifically over the closest prior art had been demonstrated across the full scope claimed for the selected comonomers called for in claim 1 associated with the specific comonomer level of 0.011 to 0.100 mol%. Such an improvement would have to be shown over e.g. a PTFE copolymer having for instance 0.13 mol% of hexafluoropropylene. This copolymer was disclosed in D13, and D15 explicitly referred to it.

3.4.3 It is true that no comparative tests are on file with respect to the closest prior art. Nevertheless, in view of what is stated in section 3.2 above, the resulting objective technical problem is not merely to provide alternative polymer electrolyte membranes but alternatives *having a favourable balance of the aforementioned properties* (rather than to provide any alternative). This effect is not disclosed in the prior art.

3.5 Obviousness

3.5.1 D15 mentions aiming at improving tensile strength of polymer membranes having high electrical conductivity, and associates expanded PTFE with improved dimensional stability of composite ion-exchange membranes having a porous support.

3.5.2 D15 does not teach or suggest that such a favourable balance or compromise of the aforementioned properties can be obtained in the chosen range for the specific comonomers. Likewise, the teaching of D15 also includes PTFE polymers that do not credibly show this balance (at least PTFE homopolymers). As shown in the following, the missing link to render the claimed subject-matter obvious is not present in D13 either.

3.5.3 The board takes the view that a monomer list provided in column 5 of D15 in the explicit context of PTFE copolymers is not an implementation of an electrolyte membrane comprising the stretched PTFE film (see paragraph [78] of the statement of grounds of appeal). A skilled person wishing to implement the teaching of D15 and pondering the use of any of the comonomers proposed in column 5, line 36 ff in the two chemical formulae, such as PMVE or a perfluoroalkylene, would

thus turn to the examples of D15, referring to microporous PTFE films prepared as disclosed, *inter alia*, in document D13. Alternatively, reference is also made to D13 in column 5, lines 54 and 63 of D15 in the context of the preparation of the microporous supports (stretched PTFE films).

- 3.5.4 D13 aims at providing highly porous membranes made from tetrafluoroethylene polymers. These membranes exhibit high strength. D13 further discloses in this context PTFE copolymers that contain less than 0.2% hexafluoropropylene as a comonomer in column 2, lines 45 to 49. Assuming that this indication relates to wt%, this transforms into about 0.13 mol% hexafluoropropylene. In this context, D13 mentions that such copolymers "*can be made to work in this invention by going to very high rates of expansion at high temperatures just below the melting point*". The corresponding teaching of D13 is thus complementary to that of D15, also seeking to provide, *inter alia*, porous membrane materials having high strength.
- 3.5.5 Similarly, tetrafluoroethylene copolymers comprising less than 0.2% comonomers are also disclosed in column 21, lines 49 to 60 in D13. This passage teaches, *inter alia*: "Such monomers are ethylene, chlorotrifluoroethylene, or fluorinated propylenes, such as hexafluoropropylene." The comonomer content in D13 seems to relate to wt% since the amorphous content in the polymer is influenced by the comonomers' mass content (see column 3, lines 53 to 55; column 21, lines 54 to 60).
- 3.5.6 Whether or not the specific embodiments in D13 using "Teflon® 6A" as a material for the preparation of the porous support film comprised 0.2 wt%

hexafluoropropylene (HFP) at the filing date of D13 does not need to be answered (see point 3.5.4 above). For the sake of completeness only, it is however observed that D14 states that: "*In the very early days of ePTFE development the importance of maximizing the crystallinity of the resin was discovered. The premium PTFE resin at the time was Teflon® 6A, which contained 0.2% HFP and TFE*". In this context it is noted that D14 mentions D13 (filed in 1973) as an early patent in the field of ePTFE (expanded/stretched PTFE). At least in the early days of ePTFE, Teflon® 6A contained 0.2% hexafluoropropylene, and the general teaching of D13 also discloses PTFE which comprises about 0.2% HFP (see above).

- 3.5.7 As the examples of D13 represent the *preferred* mode of carrying out the invention, the respondent's statement that there was no incentive to combine the examples of D13 with D15 does not seem to be convincing. As is apparent from the filing date of D13 (1973), however, D13 stems from the very early days of ePTFE technology, as mentioned in D14. There thus seems to be no reason to doubt that Teflon® 6A, available in 1973 and used in more than 50% of all examples in D13, would be understood by the skilled person to contain 0.2% hexafluoropropylene at that time.
- 3.5.8 A skilled person deciding to use PTFE copolymers in D15 would thus, in the light of document D13 as a complementary teaching, have been prompted to employ a copolymer of PTFE having the characteristics of Teflon® 6A.
- 3.5.9 The appellant stated that the skilled person, following the recommendation in D13 to use less than 0.2 wt% of comonomers and applying this to comonomers claimed in

claim 1 such as PMVE, would inevitably have arrived at the subject-matter of claim 1. They would have been set on this track in D13.

- 3.5.10 However, the board sees no one-way-street situation arising in the present case that would inevitably lead to the invention claimed in the main request. A skilled person wishing to implement copolymers of PTFE, comprising e.g. PMVE in polymerised form, would in the light of the teaching of D13 have turned to the preferred embodiments taught therein. In this regard, D13 states that copolymers of tetrafluoroethylene do not work as well as homopolymers. D13 teaches that certain PTFE copolymers can be made to work by going to *very high rates of expansion at high temperatures* just below the melt point. This does not render obvious improved tensile strength of PTFE copolymers vs. homopolymers or the aforementioned favourable balance of properties.

Likewise, column 21, lines 54 to 60 in D13 states that it is highly preferred to use poly(tetrafluoroethylene), i.e. the *homopolymer, for the reason that it presents the optimum crystalline/amorphous structure.*

If the skilled person had tried to implement copolymers of PTFE, they would have turned to the material used in various examples of D13. This is a copolymer comprising about 0.13 mol% of HFP as a comonomer in polymerised form, which falls outside the scope of claim 1.

- 3.5.11 The skilled person would not have had a reasonable expectation of success that the aforementioned balance of properties would have been obtained by the claimed subject-matter either. Unlike what was argued by the

appellant, D13 does not associate the presence of comonomers in the PTFE with the strength of the film, let alone with dimensional stability. The improved properties of the claimed membranes at least over corresponding membranes prepared from PTFE homopolymers are not derivable from D13 and the appellant's corresponding arguments. Whether said properties are "unique" to the scope of claim 1 or could possibly also be encountered outside, e.g. at any other comonomer content range encompassed by D15, is irrelevant in this context. As stated above, D15 clearly comprises areas in which the aforementioned effects are not obtained (i.e. at least not for homopolymers of PTFE).

3.5.12 Hence the subject-matter of claim 1 is not obvious to a skilled person in view of D15 as the closest prior art. It thus meets the requirement of Article 56 EPC. The dependent claims have the feature combination of claim 1, thus held equally to meet the requirement of Article 56 EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the opposition division with the order to maintain the patent with the following claims:

Claims 1-12 of auxiliary request 2 filed by letter of 14 June 2024

and a description and drawings to be adapted thereto.

The Registrar:

The Chairman:



K. Götz-Wein

F. Rinaldi

Decision electronically authenticated