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UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

Appeal No. 2006-0791
Reexamination No. 90/006,312
Patent No. 6,254,978

Ex parte GORE ENTERPRISE HOLDINGS, INC.,
Appellant.

HEARD 4 April 2006

DECISION - Bd. R. 50(a)(1)

Before TORCZON, LANE, and NAGUMO, Administrative Patent Judges.

TORCZON, Administrative Patent Judge.

INTRODUCTION

The patent owner appeals from final rejection of pending claims 1, 4-7, 11-42, 45-47, and 51-60 as unpatentable under 35 U.S.C. 103. The remaining claims of the underlying patent (of a total of sixty) have been canceled. The patent owner requested and received an oral argument for the appeal. The decision of the examiner to reject the claims is AFFIRMED-IN-PART.

FINDINGS OF FACT

The following enumerated findings are supported by at least a preponderance of the evidence. Ethicon, Inc. v. Quigg, 849 F.2d 1422, 1427, 7 USPQ2d 1152, 1156 (Fed. Cir. 1988) (explaining the general evidentiary standard for proceedings before the Office).

The claimed invention

[1] The patent under reexamination is:

Bamdad Bahar, A.R. Hobson & J.A. Kolde, "Ultra-thin integral composite membrane", U.S. 6,254,978 B1 (granted 3 July 2001) [978 patent].

[2] The appellant [Gore] in part cites (App. Br. at 3-4) the following text from the disclosure (4:10-34 & 47-61[1]) to describe the invention:

> An ultra-thin composite membrane is provided and includes a base material of microporous membrane with a thickness less than 1 mil (0.025 mm) having a microstructure of micropores and perfluoro ion exchange resin that substantially impregnates the microporous membrane so as to occlude the micropores. The ultra-thin composite membrane may be employed in many different types of applications including for example, chemical separation, electrolysis in fuel cells and batteries, pervaporation, gas separation, dialysis separation, industrial electrochemistry such as chlor-alkali, and other electrochemical devices, catalysis as a super acid catalyst and use as a medium of in enzyme immobilization.
>
> The ultra-thin composite membrane is mechanically strong and is substantially and uniformly pore occlusive so that it is particularly useful as an ion exchange material. Ultra-thin is hereby defined as 1 mil (0.025 mm) or less. Uniform is hereby defined as continuous impregnation with the ion exchange material so that no pin holes or other discontinuities exist within the composite structure. In addition, pore occlusive is hereby defined as pores being substantially impregnated (i.e., at least 90%) with the perfluoro ion exchange material rendering the final material air impermeable with a Gurley number of infinity.
>
> * * * * *
>
> * * * A most preferred material is expanded porous polytetrafluoroethylene (PTFE) made in accordance with the teachings of U.S. Pat. No. 3,593,566 herein incorporated by reference. This material is commercially available in a variety of forms from W. L. Gore & Associates, In., of Elkton, MD, under the trademark GORE-TEX.RTM. The expanded PTFE membrane can be made in a number of thicknesses ranging from 0.00025 inches to 0.125 inches (6µm to 3 mm) with the preferred thickness for the present invention being at most 1 mil (0.025 mm) and most preferably between 0.50 mils (0.013 mm) and 0.75 mils (0.019 mm). The expanded PTFE membrane can be made with porosities ranging from 20% to 98%, with the preferred porosity for the present invention being 70-95%. * * *

[1] References are to the disclosure as reproduced in the patent under consideration and are given in the customary column:lines format.

[3] Three independent claims remain: 1, 29, and 35.

[4] Claim 1 is (App. Br. at 30, amendments indicated using underlining for additions and brackets for deletions):

> Claim 1 **(once amended)**: An integral air impermeable composite membrane comprising:
>
> a <u>fluorinated</u> polymeric support having a microstructure of micropores, said microstructure defining a porosity in the range of about 70% to 98% within said polymeric support,
>
> at least one ion exchange resin filling <u>and thereby occluding said micropores</u> of said microstructure such that <u>said resin filled microstructure of</u> said composite membrane is air impermeable, said composite membrane having a thickness of at most 0.8 mils and an ionic conduction rate of at least 5.1 µmhos/min.

[5] Independent claim 29 does not expressly require any ionic conduction rate.

[6] Claim 29 is otherwise similar, but requires "a <u>fluoropolymer</u> [polymeric] support <u>capable of processing at temperatures up to 140° C</u>" (App. Br. at 33, original emphasis).

[7] Claim 35 substantially restates claim 1 as a product-by-process claim (App. Br. at 34).

[8] The ionic conduction rate limitation in claims 1 and 35 also appears in those claims as originally issued.

<u>The rejection</u>

[9] The examiner has held (Ex. Ans. at 2-3) all of the claims to be unpatentable under § 103 over:

S. Ito, K. Saeki & K. Kawano, "Thin film electrolyte", JP 64-22932 A (pub'd 25 Jan. 1989) [Ito].[2]

in view of various combinations of:

Robert S. Mallouk & Phillip A. Branca, "Composite membrane", US 4,902,308 (granted 20 Feb. 1990) [Mallouk].

Kenichi Okamoto, Hidetoshi Kita, Yasuo Tanaka & Shigeru Iimuro, "Method for preparing bisphenol A", US 5,087,767 A (granted 11 Feb. 1992) [Okamoto].

Raimund H. Silva, "Membrane, electrochemical cell, and electrolysis process", GB 2.091.166 A (pub'd 28 Jul 1982) [Silva].

Ito

[10] Ito teaches (trans. at 2) the use of thin-film electrolytes for use in systems requiring low film resistance and outstanding mechanical strength, such as fuel cells.

[11] The examiner compares Ito to the limitations of claim 1 as follows:[3]

Claim 1	Ito (translation)
An integral air impermeable composite membrane comprising:	"...preparing a thin porous film from polyolefin of a weight average molecular weight of 5×10^5 or more and filling the holes therein with an ion exchange resin." At 3.
a fluorinated polymeric support	[difference]
having a microstructure of micropores, said microstructure defining a porosity in the range of about 70% to 98% within said polymeric support,	"Similarly, the porosity of the porous thin film is preferably 40% to 90%, and more preferably 60% to 90%." At 4.

[2] All citations to Ito are actually to the English translation of record.

[3] The examiner's answer does not provide much in the way of specific citation to the relevant portions of the references. Thus, the reference citations reflect our inference regarding the examiner's intent.

at least one ion exchange resin filling <u>and thereby occluding said micropores</u> of said microstructure	At 3, cited above; also the list and method at 5-6 and at 9.
such that <u>said resin filled microstructure of</u> said composite membrane is air impermeable,	The examiner appears to treat this limitation as inherent in the description "filled".
said composite membrane having a thickness of at most 0.8 mils	"...the thickness of the thin film is preferably 0.1 µm to 50 µm [0.004-2 mils], and more preferably 2 µm to 25 µm [0.08-0.98 mils]. At 4.
and an ionic conduction rate of at least 5.1 µmhos/min.	[The examiner contends this limitation would be inherent in a material so constructed.] At 6.

[12] Ito uses unfluorinated ultra high molecular weight polyolefin (e.g., UHMWPE) rather than PTFE.

[13] Ito teaches various methods to ensure that the resin replaces the air in the membrane (e.g., trans. at 9).

[14] Ito teaches processing the polyolefin support at a high temperature (trans. at 8):

> The heating temperature is preferably in a range from the crystal dispersion temperature of the starting olefin sheet to the crystal melting point + 20°C. More specifically, in the case of polyethylene it is preferably in the range 90°C to 160°C, and more preferably in the range 110°C to 140°C.

[15] The examiner relies on Silva and Mallouk for the suggestion to use PTFE films as Ito's polyolefin (Ex. Ans. at 4).

[16] The examiner relies (Ex. Ans. at 14-15) on Ito example 3 (trans. at 11-12; Table 1) to bolster the inherency of the conduction rate limitation.

[17] Ito example 3 shows:

a. Porosity of 80.5% (vs. claimed 70-98%);

b. Thickness of 12 µm (vs. claimed 2-25 µm); and

c. Pore size of 0.025 µm (vs. disclosed as less than 10 µm, but "preferably between 0.05 and 5 µm", 978 patent at 4:37-40, emphasis added).

[18] Gore contends that Ito example 3 is not enabled (App. Br. at 8-10), citing the reexamination requester-submitted declaration of Gijs Calis.

The Calis declaration

[19] Dr. Calis is an employee of the reexamination requester (Calis at 1, item 3).

[20] Dr. Calis opines (Calis at 1, item 8), based on his experience in ion-exchange membrane [IEM] technology:

> that the IEM produced by the process disclosed in[Ito] is an integral air impermeable composite membrane as set forth in the claims of [Gore's patent under reexamination] and has substantially identical properties to the IEM which would be produced from microporous polyolefin by the process disclosed in [Gore's patent].

[21] Dr. Calis describes an attempt to replicate Ito examples 1-5 (Calis at 1-5), a NAFION® control (Calis at 6), 978 patent example 6 (Calis at 7 & 8), and another NAFION® control (Calis at 9).

[22] Gore notes that the Calis data on the Ito examples diverge from Ito's own data (App. Br. at 9).

[23] The examiner insists that reproducing the Ito examples is well within the ordinary skill in the art (Ex. Ans. at 15).

[24] We note that the Calis data on the 978 patent examples diverge from the patent's data (compare Calis at 5 with 978 patent Table 4).

[25] The unexplained divergences in the Calis data compared to Ito and Gore's 978 patent lead us to discount the Calis declaration rather than attribute the divergences to a lack of enabling disclosure by Ito and Gore.

[26] The Calis declaration does not offer evidence on the key question raised in the comparison of Ito's example 3 to the claimed invention: what is the ionic conductance rate (µ℧/min)?

[27] The Calis declaration is accompanied by photomicrographs 1 and 2, which Dr. Calis uses to compare Ito's UHMWPE membrane to Ito's membrane impregnated using Gore's process.

[28] Since the reexamination request and the rejection posit modifying Ito by using a PTFE membrane, the more relevant comparison would have been between Gore's claimed membrane and a PTFE membrane prepared using Ito's process.

[29] Dr. Calis states that Ito's UHMWPE cannot be processed at 140°C (Calis at n. 3).

[30] Dr. Calis does not discuss Ito's preferred step (trans. at 8) of heating the polyethylene substrate at up to 140°C or higher.

<u>The Frydrych declaration</u>

[31] Gore has submitted the declaration of Daniel J. Frydrych in support of the proposition that the membranes of Gore and Ito are significantly different.

[32] Dr. Frydrych is a Gore associate (Frydrych at 1).

[33] Dr. Frydrych explains that the process for applying the ion exchange resin to the membrane to produce a composite membrane is significantly different.

[34] Dr. Frydrych bases his opinion on a comparison of one alternative Gore method and one alternative Ito method.

[35] In particular, Dr. Frydrych states (at 3-4) that Ito does not require repeated application of the ionomer solution or a step of boiling the membrane in water to swell the membrane.

[36] Dr. Frydrych does not explain how boiling in water to swell the membrane will affect the conductance.

[37] Ito provides that the ion-conductive material is preferably in a solution so it can be used in "a method such as impregnation, coating or spraying" to fill the membrane (trans. at 5-6).

[38] Ito further teaches that the resin solution replaces the air (trans. at 9).

[39] Both Ito (trans. at 9) and Gore (978 at 6:39-40) teach drying after filling.

[40] Dr. Frydrych also states (at 4-6) that the Calis photomicrographs show structural differences in the final product.

[41] The electronic copies of the photomicrographs in the administrative record do not show sufficiently clear detail to reveal the details Dr. Frydrych finds meaningful.

[42] In any case, as noted above, the photomicrographs do not provide the relevant comparison.

Silva

[43] Silva teaches an ion-exchange membrane based on a microporous PTFE sheet (Silva at, e.g., 1:32-44).

[44] Silva teaches (at 6:13-17) a PTFE ion-exchange membrane that is 01.-10 mils, preferably 0.5-3.0 mils, thick.

[45] Like Ito, Silva is directed to solving the problem of providing an effective thin ion-exchange membrane with adequate mechanical strength (Silva at, e.g., 1:10-28).

[46] Augmented mechanical strength is sufficient motivation to use PTFE as the material for the membrane of Ito.

[47] Silva discloses that PTFE film can be processed at temperatures well in excess of 140°C (at 7:51-52; at 8:7-9).

Mallouk

[48] Mallouk teaches (at 1:62-66):

> [a] porous composite membrane...comprising a film of porous, expanded polytetrafluoroethylene whose surfaces, both exterior and within its pores, are coated with a metal salt of perfluoro-cation exchange polymer.

[49] Mallouk's metal salt is a perfluoro-cation exchange resin (at 2:49-55).

[50] Mallouk's film has a thickness of 1-6 mils and a porosity exceeding 60% (at 2:6-12).

[51] Mallouk is concerned with making a nerve-gas sensor (at 1:6-10).

[52] Mallouk's membrane is specifically designed to permit air flow through the membrane (at 2:15-24).

[53] Gore cites Mallouk for the proposition that the references all teach air-permeable membranes (App. Br. at 17).

[54] Mallouk does teach making a porous membrane (at 3:55-59).

[55] Mallouk subsequently exposes the membrane to a metal-ion solution to convert the cation exchange groups from proton form to the desired metal-ion form (at 3:60-4:20).

[56] Since Mallouk is air-permeable by design, and also needs to be porous at an intermediate stage to permit proton-to-metal-ion conversion of the cation exchange groups, it is not clear how the specific design of Mallouk inherently requires membranes designed for other purposes to also be air permeable.

[57] Mallouk teaches that the high internal surface area of the membrane provides more exposed metal salt and thus a longer product life (at 3:28-32).

[58] The examiner cites product life as motivation to select PTFE as the material for the membrane of Ito (Ex. Ans. at 7).

[59] Since Mallouk is concerned with reactions between the metal ions and gas components, it is not clear how Mallouk's product life teaching has relevance for the claimed membranes.

Level of skill in the art

As is usually the case in ex parte prosecution, the best evidence of the level of skill in the art at the time of filing comes from the cited references. In re GPAC, 57 F.3d 1573, 1579, 35 USPQ2d 1116, 1121 (Fed. Cir. 1995) (permitting inference from the prior art references for the level of skill in the art).

[60] A person having ordinary skill in the art would have known about the production and performance of polyolefin films for ion-exchange membranes.

[61] A person having ordinary skill in the art would have particularly known about the production and performance of expanded PTFE for ion-exchange membranes.

[62] A person having ordinary skill in the art would have known that polytetrafluoroethylene is a fluorinated polyolefin.

[63] A person having ordinary skill in the art would have understood the benefits of making the membrane as thin and porous as possible.

[64] A person having ordinary skill in the art would have also understood that thinness and porosity impose costs in terms of loss of mechanical strength, which would have to be addressed in any practical device.

DISCUSSION

The examiner bears the burden of establishing obviousness. The burden can be met by showing objective teaching in the prior art or knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. The applicant may then attack the examiner's showing or may present objective evidence to support a conclusion of nonobviousness. In re Fritch, 972 F.2d 1260, 1265, 23 USPQ2d 1780, 1783 (Fed. Cir. 1992). Gore attacks the rejection on four bases: (1) the ionic conductance rate has not been shown to be inherent, (2) the micropores are not filled and occluded, (3) PTFE cannot be substituted into Ito, and (4) proper motivation to combine the references is lacking. We determine that the examiner has not shown that the recited ionic conductance rate is an

inherent property of the suggested combination for claims 1 and 35. For claim 29, Gore further argues that Ito's membrane cannot be processed at 140°C. We determine that the substitution of PTFE for Ito's polyolefin addresses this limitation.

Inherency

A property stated in a claim may be inherently present in the combination the examiner suggests. It is not, however, enough that the putative inherent property is possibly present: it must necessarily be present in the combination and susceptible to recognition by those in the art. Extrinsic evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference and that it would be recognized by persons skilled in the art. In re Robertson, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999). Since the examiner does not have the resources to test the combination, the examiner may rely on structural or compositional identity of the combination with the claimed invention to provide the basis for the inherent property. In re Spada, 911 F.2d 705, 708, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990); In re King, 801 F.2d 1324, 1327, 231 USPQ 136, 138-39 (Fed. Cir. 1986). Inherency arguments are particularly difficult to make successfully for a property that may be altered by a substitution or modification suggested in the art.

Gore urges that Spada requires identical processing of identical starting materials to support a finding of inherency. We do not read the case quite that narrowly. The examiner is basically right that Spada stands for the proposition that identical materials may be presumed to have identical properties. In Spada, the fact of similar processing of the same starting material

supported the finding that the material was the same, but identical or similar processing is just one possible way to establish that a material is the same.

The question presented here is whether the examiner has shown sufficient similarity to support an inference that the properties would be the same. We accord little weight to the Calis declaration because it provides little analysis for its results, which are ambiguous at best.[4] On the other hand, the Frydrych declaration is entitled to some weight. Frydrych's relationship to Gore and the lack of explanation make Frydrych's broader conclusions uncompelling, but the narrower discussion of the differences between sample Ito and Gore membranes is more persuasive.

Ultimately, the examiner has the burden of proof on the question of inherency. We cannot say that a preponderance of the evidence shows structural or compositional similarity such that the modified Ito membrane would necessarily have an ionic conductance rate of at least 5.1 µmhos/min. The fact that Ito and Gore has similar thicknesses is not dispositive because the examiner has not shown that thickness alone accounts for the ionic conductance rate. Consequently, the rejection of claims 1 and 35 and their dependent claims cannot be sustained.

Claim 29 does not have an ionic conductance rate limitation. Instead, Gore relies on the 140°C processing limitation and the "filling and thereby occluding said micropores" limitation to respond to the rejection. Even assuming Ito's UHMWPE film cannot meet the temperature

[4] It is at least a source of frustration that Calis measures ionic conductance rate when replicating Gore's example 6, but not when replicating Ito's examples, since it is a limitation of many of Gore's patent claims as issued. Since we accord little weight to the Calis declaration, we do not consider it to be compelling evidence that the Ito reference is not enabling as Gore argues. The confusion appears to lie with Calis, not Ito. Cf. In re Epstein, 32 F.3d 1559, 1568-69, 31 USPQ2d 1817, 1823-24 (Fed. Cir. 1994).

limitation, this would be the wrong focus because the rejection posits the substitution of PTFE for Ito's polyolefin. As Silva shows, PTFE can be processed at temperatures well over 140°C.

Ito teaches filling the membranes with resin such that the resin solution replaces the air in the membrane. Gore cites Mallouk to argue that evaporating the solvent from the resin solution after impregnating the membrane would necessarily create a porous membrane. Mallouk, however, is intentionally trying to make an air permeable membrane. Mallouk's relevance if any is to the motivation to substitute PTFE for Ito's polyolefin, not Mallouk's resin impregnation process. To the extent that Gore is arguing that Ito's membrane is inherently air-permeable based on Mallouk's teaching, the argument is inconsistent with what Ito says and is not otherwise supported by actual data. In this instance, the examiner has shown enough to shift the burden of production to Gore to show that PTFE impregnated as Ito teaches would not be filled and thereby occluded.

Gore argues that there is no motivation to combine Ito and Silva, but the question is not whether the references are physically combinable, but rather whether Silva provides a motivation to substitute PTFE for Ito's UHMWPE. Ito notes that strength is a desirable attribute in a film. Ito's objection to fluorinated films is that they are expensive. Silva, however, notes that they are strong. It is routine in most arts to balance considerations like cost versus strength and make a selection based on the needs of the application. Consequently, a person having ordinary skill in the art faced with an application in which strength, reliability, or durability was sufficiently important to justify increased expense would have been well motivated to select PTFE over

UHMWPE for the film in the ion-exchange membrane. On the basis of the record before us, and despite Gore's arguments, we see no justification for removing this choice from the art.

The patentability of the claims depending from claim 29 has not been separately argued. Consequently, we sustain the rejection of claims 30-34 along with claim 29.

HOLDING

The rejection of pending claims 1, 4-7, 11-28, 35-42, 45-47, and 51-60 is REVERSED.

The rejection of pending claims 29-34 is AFFIRMED.

cc:

Michael S. Marcus, Morgan & Finnegan, of Washington, D.C., for Gore Enterprise Holdings, Inc., patent owner.

Richard A. Steinberg, Mayer Brown Rowe & Maw, of Washington, D.C., for DSM Solutech, reexamination requester.