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Case Number: T 1943/11 - 3.4.03

Application Number: 02733259.2

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Language of the proceedings: EN

Title of invention:
ELECTROLYTIC CAPACITOR AND ELECTROLYTIC CAPACITOR−USE ELECTRODE FOIL USED THEREFOR

Applicant:
NIPPON CHEMI-CON CORPORATION

Headword:

Relevant legal provisions:
EPC Art. 123(2)
EPC 1973 Art. 56

Keyword:
Amendments - added subject-matter (yes) - main request, auxiliary requests I and III
Inventive step - (no) - auxiliary request II

Decisions cited:

Catchword:

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Case Number: T 1943/11 - 3.4.03

D E C I S I O N
of Technical Board of Appeal 3.4.03
of 7 March 2017

Appellant: (Applicant)	NIPPON CHEMI-CON CORPORATION 167-1, 1-chome, Higashiome Ome-Shi, Tokyo 198-8501 (JP)
Representative:	Müller Schupfner & Partner Patent- und Rechtsanwaltspartnerschaft mbB Bavariaring 11 80336 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 13 April 2011 refusing European patent application No. 02733259.2 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	G. Eliasson
Members:	T. M. Häusser
	C. Heath

Summary of Facts and Submissions

I. The appeal concerns the decision of the examining division refusing the European patent application No. 02 733 259 for lack of clarity and lack of novelty (main request), added subject-matter (first auxiliary request), and lack of inventive step (second auxiliary request).

II. In writing, the appellant (applicant) requested that the decision under appeal be set aside and that a patent be granted on the basis of the claims according to the main request, auxiliary request I, auxiliary request II, or auxiliary request III, all filed with the letter dated 10 August 2011 setting out the grounds of appeal.

Furthermore, the appellant notified the board that it would not attend the oral proceedings to which it had been summoned and that its request for oral proceedings was withdrawn. The oral proceedings took place in the absence of the appellant.

III. In a communication under Article 15(1) RPBA the board set out its provisional opinion, according to which claims of the main request and auxiliary requests I and III, among other objections, contained subject-matter going beyond the application as filed, in particular in relation to the feature that the "anode foil has a foil resistivity of 0.4-0.79 Ωm". Furthermore, the appellant was informed that inventive step of the subject-matter claimed according to the main request would be discussed at the oral proceedings in view of documents D2 and D4 and that the subject-matter claimed according to auxiliary request II would be discussed - in particular - in view of the disclosure in document D2

concerning a solvent consisting essentially of a bonded material comprising a water-soluble metal complex bonded with phosphoric acid ions and water.

IV. Reference is made to the following documents:

D2: WO 00/55876 A,
D2a: EP 1 170 761 A, regional application of D2,
D4: EP 272 926 A.

V. The wording of independent claim 1 of the respective requests is as follows (board's labelling "(a)" and "(b)"):

Main request:

"1. An anode foil for electrolytic capacitor, said anode foil comprising an aluminum etched foil of a void factor of not more than 51%,
wherein the void factor of the etched foil is defined to be a value calculated by dividing the volume of voids in the etched foil by the apparent volume of the etched foil, and
having a core thickness of 35-65 μm, wherein the core is the non-etched aluminum part of the foil,
characterized in that
(a) said anode foil has a foil resistivity of 0.4-0.79 Ωm."

Auxiliary request I:

Claim 1 of auxiliary request I differs from claim 1 of the main request in comprising the following additional feature:

"said electrolytic capacitor containing a solvent within a capacitor element provided with said anode foil,
said solvent consists essentially of a bonded material comprising a water-soluble metal complex bonded with phosphoric acid ions and water."

Auxiliary request II:

"1. An electrolytic capacitor containing a solvent within a capacitor element provided with an anode foil, characterized in that
(b) said anode foil comprising an aluminum etched foil of a void factor of not more than 51%, wherein the void factor of the etched foil is defined to be a value calculated by dividing the volume of voids in the etched foil by the apparent volume of the etched foil, and
said solvent consists essentially of a bonded material comprising a water-soluble metal complex bonded with phosphoric acid ions and water."

Auxiliary request III:

Claim 1 of auxiliary request III differs from claim 1 of auxiliary request II in comprising the additional feature of the anode foil "having a core thickness of 35-65 µm, wherein the core is the non-etched aluminum part of the foil, and having a foil resistivity of 0.4-0.79 Ωm."

VI. The appellant neither argued in relation to the examining division's decision that feature (a) contravened Article 123(2) EPC and the board's corresponding provisional opinion, nor in relation to the board's provisional opinion that document D2

disclosed a solvent consisting essentially of a bonded material comprising a water-soluble metal complex bonded with phosphoric acid ions and water. Hence, the appellant's submissions which are relevant for the present invention can be summarized as follows:

Claim 1 of auxiliary request II contained the feature that the solvent consisted of a bonded material comprising a water-soluble metal complex on it with phosphoric acid ions and water, which was not disclosed in any of the cited prior art documents. Moreover, it did not belong to the average technical knowledge of the person skilled in the art to provide such a specific solvent.

Reasons for the Decision

1. Main request, auxiliary requests I and III - amendments

1.1 Claim 1 of the main request contains the feature that the anode foil has a "foil resistivity of 0.4-0.79 Ωm" (see point V above, feature (a)).

In the decision under appeal the examining division held that the introduction of the unit "Ωm" contravened Article 123(2) EPC (section 2.2.1 of the decision). The appellant has not provided any basis in the application as filed for the above feature nor any arguments countering the opinion of the examining division.

1.2 The board cannot see any basis for the introduction of feature (a), either. The unit "Ωm" in this feature refers to ohm-meter. By contrast, on pages 8 and 9 of the description of the application, it is indicated

that the resistivity of the foil is "0.4~0.79mΩ, more preferably 0.5~0.61mΩ".

It is noted that the *electrical resistivity* is a material property which is independent of the shape or volume of the body made of the material and measured in units of ohm-meter. The anode foil disclosed in the description of the application is made of aluminum (see page 6, lines 14-16), which is known to have an electrical resistivity of $0.027 * 10^{-6}$ Ω m, i. e. a value which is seven orders of magnitude smaller than the values in the above disclosed ranges. Hence the corresponding unit "mΩ" cannot refer to "meter-ohm".

On the other hand, the *sheet resistance* is a measure of the resistance of a thin film that is uniform in thickness and is defined as the electrical resistivity of the film divided by its thickness. This implies that the unit of the sheet resistance is ohm. It is therefore considered evident for the skilled person that the above disclosure means that the anode foil has a sheet resistance of between 0.4 and 0.79 milli-ohm, more preferably between 0.5 and 0.61 milli-ohm. This is also in line with the fact that the foil is described to have a core thickness of "35~65µm, more specifically 45~55µm" (see page 9, second paragraph), which - in combination with the electrical resistivity of aluminum and allowing for some differences due to the void factors - is consistent with the above ranges of the sheet resistance.

1.3 In view of the above, there is no disclosure of feature (a) in the application as filed.

Consequently, claim 1 of the main request contains subject-matter extending beyond the content of the

application as filed, contrary to the requirements of Article 123(2) EPC.

1.4 Claim 1 of auxiliary request I also comprises feature (a) and claim 1 of auxiliary request III comprises a synonymous feature. Therefore, these claims also contain subject-matter extending beyond the content of the application as filed, contrary to the requirements of Article 123(2) EPC.

2. Auxiliary request II - inventive step

2.1 Closest state of the art

Document D2 discloses subject-matter that is conceived for the same purpose as the claimed invention, namely for providing an electrolytic capacitor containing a solvent within a capacitor element, and has the most relevant technical features in common with it, as detailed below. Document D2 is therefore considered the closest state of the art.

2.2 Distinguishing features

2.2.1 Document D2 discloses (see paragraphs [0015]-[0017], [0051]-[0052] and original claims 1 to 4 of the corresponding document D2a) an electrolytic capacitor comprising an anodic foil and a cathodic foil with a separator intervening therebetween. The anodic foil is obtained from an aluminum foil, which had been subjected to chemical or electrochemical etching in an acidic solution to enhance the surface area thereof and then subjected to a chemical treatment in an ammonium adipate aqueous solution, so as to form an anodic oxide film layer on the surface thereof. The cathodic foil used is an aluminum foil having been subjected to

etching to enhance the surface area thereof. The capacitor element is impregnated with an electrolytic solution and is housed in an aluminum cylindrical outer package.

The electrolytic solution contains a solvent containing water and a water-soluble aluminum complex having a phosphate ion combined thereto. As the compound forming a phosphate ion in an aqueous solution the following compounds are exemplified: phosphoric acid, phosphorous acid, hypophosphorous acid, or salts or condensates thereof.

2.2.2 Using the wording of claim 1 of auxiliary request II, document D2 discloses therefore an electrolytic capacitor containing a solvent (electrolytic solution) within a capacitor element provided with an anode foil (anodic foil).

The appellant argued that none of the known prior art documents disclosed a solvent consisting essentially of a bonded material comprising a water-soluble metal complex bonded with phosphoric acid ions and water.

However, as described above, document D2 discloses such a solvent, namely a solvent (electrolytic solution) consisting essentially of a bonded material comprising a water-soluble metal complex (water-soluble aluminum complex) bonded with phosphoric acid ions (phosphoric acid compounds) and water.

2.2.3 Hence, the subject-matter of claim 1 of auxiliary request II differs from the capacitor of document D2 in comprising the feature that said anode foil comprises an aluminum etched foil of a void factor of not more than 51%, wherein the void factor of the etched foil is

defined to be a value calculated by dividing the volume of voids in the etched foil by the apparent volume of the etched foil (see feature (b) in section V above).

2.3 Objective technical problem

The effect of the distinguishing feature (b) is that the resistivity of the anode foil is decreased, thereby achieving an electrolytic capacitor with low equivalent series resistance (see page 4, lines 4-9, of the description of the application). The objective technical problem to be solved by the invention is therefore to achieve this effect.

2.4 Obviousness

Document D4 concerns an aluminum capacitor plate for electrolytic capacitors, i. e. the type of capacitors disclosed in the closest state of the art document D2. The skilled person would therefore consider document D4 when attempting to solve the posed problem.

Document D4 discloses (see page 3, lines 28-39) a substratum 1 of aluminum having an etched layer 2 of sponge-like structure extending to a predetermined thickness. The sponge-like layer 2 contains a number of pores 2a and 2b and the volumetric percentage of the pores 2a and 2b is 30 to 80% of the whole sponge-like layer.

In the decision under appeal, the examining division held that feature (b) was disclosed in document D4 (see point 2.1.2 of the Reasons). The appellant has not provided any arguments countering this view. Indeed, as pointed out above, it is explicitly stated in document D4 that the volumetric percentage of the pores 2a and

2b is 30 to 80% of the whole sponge-like layer 2. Hence, the lower endpoint of the disclosed range falls within the claimed range of "a void factor of not more than 51%". Feature (b) is thus considered disclosed in document D4.

Moreover, it is evident for the skilled person from his common general knowledge that the resistance of the plate increases with increasing void factor and decreases with decreasing void factor. The skilled person would therefore use the plate disclosed in document D4 with a low value of 30% of the volumetric percentage of pores in the capacitor of document D2 in order to solve the posed problem, thereby arriving at the claimed subject-matter without exercising any inventive activity.

Therefore, the subject-matter of claim 1 of auxiliary request II does not involve an inventive step (Article 52(1) EPC and Article 56 EPC 1973).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

S. Sánchez Chiquero G. Eliasson

Decision electronically authenticated