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Datasheet for the decision of 14 January 2022

Case Number: T 0068/20 - 3.3.05

Application Number: 13857025.4

Publication Number: 2923395

IPC: H01M2/14, H01M2/16, H01M10/052, H01G11/52, B01D67/00

Language of the proceedings: EN

Title of invention:
METHODS OF MAKING SINGLE-LAYER LITHIUM ION BATTERY SEPARATORS HAVING NANOFIBER AND MICROFIBER COMPONENTS

Patent Proprietor:
Dreamweaver International, Inc.

Opponent:
Heinemann, Christoph

Headword:
Lithium ion battery separator/Dreamweaver

Relevant legal provisions:
EPC Art. 123(2), 123(3)

Keyword:
Amendments - allowable (no)

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

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Case Number: T 0068/20 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 14 January 2022

Appellant: (Patent Proprietor)	Dreamweaver International, Inc. 18 Brozzini Court Greenville, SC 29615 (US)
Representative:	Tomkinson, Alexandra Bailey Walsh & Co LLP 1 York Place Leeds, LS1 2DR (GB)
Respondent: (Opponent)	Heinemann, Christoph c/o Müller Schupfner & Partner Bavariaring 11 80336 München (DE)
Representative:	Heinemann, Monica Abitz & Partner Patentanwälte mbB Postfach 86 01 09 81628 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 10 October 2019 revoking European patent No. 2923395 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	E. Bendl
Members:	G. Glod
	R. Winkelhofer

Summary of Facts and Submissions

I. The patent proprietor's (appellant's) appeal lies from the opposition division's decision to revoke European patent No. EP 2 923 395 B1.

II. With the statement of grounds of appeal, the appellant submitted auxiliary requests 1 to 4.

III. Claim 1 as granted (present main request) reads as follows:

"*1. A method of forming a single layer battery separator (18), wherein said battery separator (18) exhibits a maximum thickness of 250 micrometers and wherein said battery separator (18) includes a combination of polymeric microfiber and nanofiber constituents, said method comprising in the following order the steps of:*
a) providing an aqueous solvent; characterised in that the method further includes the steps of:
b) introducing therein a plurality of nanofibers having an average width of less than 700 nm to form a nanofiber dispersion within an aqueous solvent;
c) processing said nanofibers through cutting and high shear processing sufficient to separate the fibers to enable them for wet laid non-woven processing;
d) introducing a plurality of microfibers having an average width of greater than 3000 nm to form a microfiber/nanofiber dispersion within an aqueous solvent, such that said microfiber/nanofiber dispersion has a concentration of fiber solids of less than 1% by weight of aqueous solvent;
e) mixing the nanofibers with the microfibers under a high shear environment by an amount sufficient to

introduce the nanofibers into and within the resultant microfiber non-woven substrate to provide entanglement between the different fiber types;
f) introducing said dispersion of step e) within a paper making machine;
g) producing a web of microfiber/nanofiber material; and
h) drying said web."

Compared with claim 1 of the main request, auxiliary request 1 includes, *inter alia*, the following amendments (underlined):

"*1. [...] a) providing water; characterised in that [...]*
b) *[...] to form a nanofiber dispersion within [...] having an average width of less than 700 nm to form a nanofiber dispersion within the water [...]*
d) introducing a plurality of microfibers having an average width of greater than 3000 nm to form a microfiber/nanofiber dispersion within the water, such that said microfiber/nanofiber dispersion has a concentration of fiber solids of less than 0.5% by weight of water [...]"

Compared with claim 1 of the main request, auxiliary request 2 includes, *inter alia*, the following amendments (underlined):

"*1. [...] g) producing a web of microfiber/nanofiber material, treating the resultant web in a calendaring procedure to produce a separator material exhibiting a thickness of at most 100 microns and a mean pore size of at most 2000 nm;[...]*"

Compared with claim 1 of the main request, auxiliary request 3 includes the amendments of auxiliary requests 1 and 2.

Compared with claim 1 of the main request, auxiliary request 4 includes, *inter alia*, the following amendments (underlined):

"*1. [...] a) providing water; characterised in that the method further includes the steps of:*
b) introducing therein a plurality of nanofibers made from fibrillated cellulose and acrylic fibers having an average maximum width of less than 700 nm to form a nanofiber dispersion within the water;[...]
d) introducing a plurality of fibrillated microfibers having an average maximum width of greater than 3000 nm to form a microfiber/nanofiber dispersion within the water and heating the dispersion in hot water to a temperature of at least 60°C, such that said microfiber/nanofiber dispersion has a concentration of fiber solids of less than 0.5% by weight of water;
e) mixing the nanofibers with the microfibers under a high shear environment by an amount sufficient to introduce the nanofibers onto and within the resultant microfiber non-woven substrate [...]"

IV. Oral proceedings took place on 14 January 2022.

V. The appellant's arguments, as far as they are relevant to the present decision, can be summarised as follows:

From the disclosure on page 10, lines 7 to 11, the skilled person understood that "width" was a mean average width, due to the non-uniformity of the fibers. Any reference to fiber width was an average along its

length. This was supported by the disclosure on page 9, lines 18 to 24.

The bimodal distribution referred not to the microfibers and/or the nanofibers alone, but to the combination of microfibers and nanofibers.

The expression "average maximum width" introduced in claim 1 of the fourth auxiliary request was a restriction of "average width", to ensure that the requirements of Article 123(3) would not be violated.

VI. The respondent's (opponent's) arguments are reflected in the reasoning below.

VII. The appellant (patent proprietor) requests that the impugned decision be set aside and that the opposition be rejected, or alternatively that the patent be maintained in amended form on the basis of one of auxiliary requests 1 to 4 filed with the statement of grounds of appeal.

The respondent (opponent) requests that the appeal be dismissed.

Reasons for the Decision

Main request

1. Article 100(c) EPC

The essential point at stake is whether the expressions "average width of less than 700 nm" and "average width of greater than 3000 nm" are directly and unambiguously derivable from the application as filed.

The value of 700 nm is disclosed as the upper limit for the maximum width of any nanofiber (page 10, line 6). The value of 3000 nm is disclosed as the lower limit for the maximum width of any microfiber (page 10, line 3). It is stated in the description (page 10, lines 7 to 10) that width **may** be considered to be the diameter, which should be considered a mean diameter. Maximum width is clearly presented as the primary definition (page 10, line 10). It is further disclosed that fibers can have different geometric shape(s) (page 10, lines 11 and 12).

The skilled person would understand that the maximum width relates to the maximum extension of a fiber of a specific shape along its length. This means that if the maximum width can be up to 700 nm, then no fiber, of any cross section, can have a maximum extension along its length of more than 700 nm.

On the other hand, average width would relate to an average of the different extensions (width distribution along the fiber length) of a fiber of a specific shape along its length. This means that if an average width can be up to 700 nm, then it is possible for a fiber to have a maximum extension of the cross section of more than 700 nm, as long as the average of all extensions is less than or equal to 700 nm.

For a cylindrical fiber there is no difference between the maximum width and the average width. Since the fibers at issue are not limited to a specific shape, however, the expressions "maximum width" and "average width" cannot be used interchangeably.

Average maximum width concerns an average of the maximum widths of all the different fibers. This means

that some fibers may have a maximum width which could be considerably more than 700 nm, as long as the maximum width of other fibers is considerably less, so that the average is less than or equal to 700 nm.

The skilled person understands from the application as filed that the sizes of the fibers are key for obtaining the desired properties (see, for example, the paragraph linking pages 10 and 11). Therefore, it cannot be argued that there is no technically significant difference between the different definitions.

The expressions "average width of less than 700 nm" and "average width of greater than 3000 nm" are not directly and unambiguously derivable from the application as filed, and therefore the ground of opposition under Article 100(c) EPC prejudices the maintenance of the patent as granted.

Auxiliary requests 1 to 3

2. Article 123(2) EPC

It was not contested that the concerns regarding the main request also apply to auxiliary requests 1 to 3, and therefore the requirements of Article 123(2) EPC are not met by these requests either.

These requests also fail.

Auxiliary request 4

3. Article 123(3) EPC

In claim 1 of auxiliary request 4, "average width" has been amended to "average maximum width".

As explained above (point 1), the average maximum width relates to the average of the maximum width of the different fibers, while the average width relates to the average of the width distribution of each fiber. The value of the average maximum width is higher than the average width. Consequently, different fibers are encompassed by the scope of claim 1 as granted than those encompassed by that of claim 1 of this auxiliary request, which would lead to different battery separators and consequently to an extension of the protection conferred. Therefore, the requirements of Article 123(3) EPC are not met.

This request fails as well.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

C. Vodz E. Bendl

Decision electronically authenticated