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D E C I S I O N
of 13 June 1994

Case Number: T 0347/91 - 3.3.3

Application Number: 87104191.9

Publication Number: 0239044

IPC: D01F 6/14

Language of the proceedings: EN

Title of invention:
Method of preparing high strength and modulus poly(vinyl alcohol) fibers

Applicant:
Biomaterials Universe, Inc.

Opponent:
-

Headword:
-

Relevant legal norms:
EPC Art. 54

Keyword:
"Novelty (yes) - admissible disclaimer"
"Remitted for examination of inventive step"

Decisions cited:
-

Catchword:
-

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Case Number: T 0347/91 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 13 June 1994

Appellant: Biomaterials Universe, Inc.
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Decision under appeal: **Decision of the Examining Division of the European Patent Office dated 8 November 1990 refusing European patent application No. 87 104 191.9 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: F. Antony
Members: R. Lunzer
M. Aúz Castro

Summary of Facts and Submissions

I. European patent application No. 87 104 191.9, Publication No. 0 239 044, filed on 21 March 1987, claiming a priority date of 24 March 1986 derived from Japanese Application No. 66136/86, was refused by a decision of the Examining Division dated 8 November 1990. That decision was based on a set of 8 claims, consisting of Claims 1 to 6 filed on 11 September 1990, and the original Claims 7 and 8. Claims 1 and 3 read as follows:

1. High stength and modulus fibers of poly(vinyl alcohol) having a tensile strength higher than 15 g/d, a tensile modulus higher than 300 g/d, a density (30°C) higher thatn 1.315 g/cm^3,d-lattice spacings (100) plane and (001) plane smaller than 7.830 Å and 5.500 Å, respectively (determined by wide-angle X-ray diffraction), a melting temperature higher than 240°C (determined by DSC, the end of the melting peak of DSC curves), and a heat of fusion (ΔH) higher than 20 cal/g (determined by DSC).

3. A method of preparing high strength and modulus poly(vinyl alcohol) fibers, comprising the steps:

   (a) forming a solution of poly(vinyl alcohol) in a mixed solvent from an organic solvent and water having a mixing ratio ranging from 90 : 10 to 10 : 90 (organic solvent : water) by weight,

(b) extruding the solution with dry, wet, or the combined dry-wet spinning method to yield fibers,

(c) drawing the fibers."

II. The ground for the refusal was that the fibres claimed in Claims 1 and 2 lacked novelty over the disclosure of EP-A-0 146 084 (document (1)); that Claim 1 was not novel either over the disclosure of EP-A-0 105 169 (document (2)); while Claim 3, although novel, lacked any inventive step having regard to the disclosure of document (1). In particular it was stated that document (1) described polyvinyl alcohol (PVA) fibres possessing a tensile strength higher than 15 g/d and a tensile modulus higher than 300 g/d. Although that document was silent as to the other features specified in Claim 1, such features were inherent in its products, the process of which differed only in that an organic solvent alone was used, and not a mixture of an organic solvent with water. Although the application in suit included comparative Example 1, which was intended to show that dry-wet spinning of PVA from a solution of dimethyl sulphoxide (DMSO) alone led to inferior results falling just outside the scope of Claim 1, that comparison was not convincing because a draw ratio of 4:1 had been used, instead of the draw ratio of 20:1 disclosed in document (1), or the draw ratio of at least 10:1 used in the examples in accordance with the alleged invention.

Furthermore, although the test report filed by the Appellant with its letter of 7 September 1990 was intended to demonstrate that superior mechanical properties were obtained with mixed solvents, i.e. DMSO with water, rather than DMSO on its own, in fact those results showed that it was only when the draw ratio of

the fibres was increased beyond about 12:1 that the superiority of fibres spun from a solution of mixed solvents became apparent. Below that ratio, the results shown for the DMSO as sole solvent were actually superior. Hence, although Comparative Example 1 of the application in suit showed that poor results were obtained when fibres were spun from the single organic solvents identified in Table 4 when using a draw ratio of 4:1, still worse mechanical properties were to be expected if the mixed solvents of the alleged invention had been used. Significantly better results with mixed solvents were only to be expected at draw ratios above 40:1. Finally, arguments in support of the novelty of the remaining features not explicitly disclosed in document (1) had not been submitted.

The same objections could be based on document (2). Even though this document related to a different process for making PVA fibres, the other fibre features were also considered to be inherent to the obtained features.

Although the process Claim 3 was novel, it lacked any inventive step because document (1) disclosed the use of organic solvents, and aqueous solutions of inorganic salts.

The decision was issued without taking into account the wish of the Appellant to be informed if the newly filed claims were not acceptable.

III. An appeal against that decision was lodged on 14 December 1990, the appeal fee was paid on the same day, and the Statement of Grounds of appeal was filed on 18 March 1991. Together with its Statement of Grounds of appeal, the Appellant filed as a Main Request an amended Claim 1 which, in substance, replaced the lower limits

of tensile strength and modulus (formerly 15 and 300 g/d), with an explicit disclaimer of fibres having a tensile strength less than 20 g/d, and modulus of less than 480 g/d, the alleged basis for that disclaimer being the reference on page 2 of the application to certain Japanese prior art identified at page 2 lines 24 to 28 of the application in suit. These are identified by number in the Table set out in paragraph 4 below. (For the sake of consistency, in this decision "g/d" is used throughout, despite the fact that in the appeal the form "g/den" was adopted by the Appellant.)

The Appellant argued that neither document (1) nor (2) disclosed fibres having properties falling within the increased limits imposed by Claim 1 as amended. Whereas document (2) was concerned with using as a starting material PVA having a molecular weight of more than 500,000, and preferably 1,000,000 to 4,000,000 (cf. Claim 15) in order to achieve the desired mechanical properties, it was an object of the alleged invention to achieve comparable properties starting with PVA of a lower degree of polymerisation. This was achieved in accordance with Claim 3 by using the mixed solvents there defined. There was no pointer in the literature towards the use of the mixed solvents now claimed.

A further experimental report showed that if the solvents mentioned in document (2) were employed, but in place of the PVAs having a molecular weight of the order of 3,000,000 there disclosed a PVA having a degree of polymerisation as low as 4,600 were used, the mechanical properties were well below the levels now claimed.

Insofar as concerned the procedure followed by the Examining Division, the Appellant complained that as it had expressed a clear desire to be informed if the newly

filed claims were acceptable, the application ought not to have been rejected without any further communication.

IV. Following suggestions from the Board, the Appellant filed with its letter of 28 January 1994 a new set of 9 claims. A translation of one of the Japanese prior art documents said to be the justification for making restrictive amendments was filed with that letter, and translations of a further two of them with a letter of 6 April 1994. In Claim 1 the limits respectively of 15 g/d and 300 g/d for tensile strength and modulus were replaced by the values 1.79 N/tex (20.2 g/d) and 42.36 N/tex (480 g/d), Claim 2 was unaltered, while Claim 3 was defined as, "A method of preparing high strength and modulus poly(vinyl alcohol) fibres as defined in Claims 1 and 2, comprising the steps:", followed by the sub-paragraphs (a) to (c) set out above.

V. The Appellant requested that the decision under appeal be set aside, and the case referred back to the Examining Division for further examination on the basis of the set of claims mentioned in IV above.

Reasons for the Decision

1. The appeal is admissible.

2. *Procedural Position*

During the course of substantive examination the Appellant had met a minor objection raised by the Examining Division under Article 84 EPC against Claim 3, but had failed altogether to meet more serious objections, in particular to the novelty of Claim 1. In those circumstances, the Examining Division was fully

justified in refusing the application, notwithstanding the request on the part of the Appellant for a further communication.

3. *Admissibility of Amendments*

3.1 At page 2, lines 31 to 32 of the application as published it is stated with respect to all of the prior art there discussed, that in all cases a strength lower than 20 g/d and a modulus lower than 480 g/d is exhibited. That statement is not strictly accurate and in due course will require amendment, given the disclosure in Example 5 of document (1) of the combination of 20.2 g/d and 480 g/d respectively for those two properties. However, the Board is satisfied that in the circumstances of the present case the limit to **more than** 1.79 N/tex (20.2 g/d) and **more than** 42.36 N/tex (480 g/d) is justifiable as being a legitimate disclaimer of prior art.

3.2 The amendment of Claim 3 by the introduction of a restriction to the preparation of fibres as defined in Claims 1 and 2 has the effect of limiting the scope of the Claim accordingly. Hence no objection exists under Article 123(2) EPC to the amendments to either Claim 1 or Claim 3. The same applies to the dependent claims, all of which have their counterparts in the claims in the application as filed.

4. *Novelty*

Having now seen translations of the Japanese prior art referred to in the description, and also relied on in the Statement of Grounds of appeal (page 2, 4 paragraph) as being the basis for the proposed limitation to Claim 1, the Board is satisfied that Claim 1 as now

formulated is novel over the disclosures of the best combinations of tensile strength and modulus to be found in those documents, and also novel over the values to be found in documents (1) and (2). The relevant figures are tabulated below:

Document No.	Example No.	Tensile strength g/d	Tensile modulus g/d
(1)	5	20.2	480
(2)	6	19.0	628
(3) JP-B-9768/1962	4	5.0	---
(4) JP-A-126 311/1985	2	20.2	480
(5) JP-A-126 312/1985	3	20.2	450

5. *Inventiveness of process claim*

On the material then before it, the Examining Division concluded that Claim 3 could not be considered to involve any inventive step unless a surprising advantage could be achieved by the process there defined. It further observed that as the Claim was not limited to any specific draw ratio, it could cover fibres produced by using low draw ratios, which would have poor mechanical properties. Those objections are now overcome by the limitation of Claim 3 to a method of preparing the fibres defined in Claims 1 and 2. It remains for consideration by the Examining Division whether Claim 3 as amended involves an inventive step.

6. *Conclusion*

As the Appellant has now overcome the objections which were the basis of the Examining Division's decision refusing the application, the case is remitted for further examination.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the Examining Division for further examination.

The Registrar: The Chairman:

E. Goergmaier F. Antony