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D E C I S I O N
of 17 March 1994

Case Number: T 0503/92 - 3.3.3

Application Number: 85305133.2

Publication Number: 0169073

IPC: C08G 63/60

Language of the proceedings: EN

Title of invention:

Components for joining or terminating optical fibers

Applicant:

Celanese Corporation

Opponent:

-

Headword:

-

Relevant legal norms:

EPC Art. 83, 84

Keyword:

"Clarity (yes) - definition not in functional terms"

"Sufficiency of disclosure (yes) - absence of an identified method for determining a usual parameter did not amount to an objection of non-feasibility"

Decisions cited:

T 0032/82, T 0340/88, T 0014/83

Catchword:

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Case Number: T 0503/92 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 17 March 1994

Appellant: Celanese Corporation
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New York, N.Y. 10036 (US)

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Decision under appeal: Decision of the Examining Division of the
European Patent Office dated 16 January 1992
refusing European patent application
No. 85 305 133.2 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: C. Gérardin
Members: R. Lunzer
M. Aúz Castro

Summary of Facts and Submissions

- I. European patent application No. 85 305 133.2, publication No. 169 073, filed on 18 July 1985, and claiming a priority date of 18 July 1984 derived from US application No. 631 966, was refused by a decision of the Examining Division dated 16 January 1992. That decision was based on a set of 8 claims filed on 19 November 1991, of which Claim 1 read as follows:

"A component for joining or terminating optical fibers which is a polymer molding, characterized in that the polymer is a thermotropic liquid crystalline polymer which (a) has a linear coefficient of thermal expansion of from -5 to 10 micrometer/meter $^{\circ}\text{C}$ at a temperature range of from -50°C to $+85^{\circ}\text{C}$, (b) has an inherent viscosity of from 1.0 to 15 dl/g when dissolved in a concentration of 0.1 percent by weight of pentafluorophenol at 60°C , (c) comprises not less than 10 mole percent of recurring units that include a naphthalene moiety, (d) is selected from wholly aromatic polyesters, aromatic-aliphatic polyesters, wholly aromatic poly(ester-amides), aromatic-aliphatic poly(ester-amides), aromatic polyazomethines, aromatic polyester-carbonates, and mixtures thereof and (e) contains a filler material in an amount from 5 to 60 percent by weight of the total composition."

Claim 2 to 8 were dependent product claims directed to preferred optical fibre components according to Claim 1.

- II. In that decision reference was made inter alia to the following documents as being relevant prior art:

D1: US-A-4 458 039, and
D2: US-A-4 186 999,

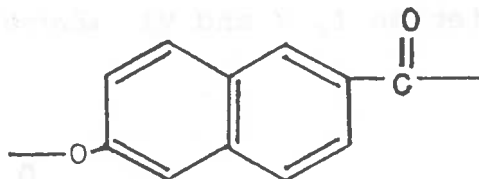
but the grounds for the decision were essentially non-compliance with the requirements of Articles 84 and 83 EPC. Regarding Article 84 EPC, it was held that the polymer compositions according to the alleged invention ought to have been more closely defined by reference to compositional and structural features, rather than by specifying the desired range for the CLTE (coefficient of linear thermal expansion). Regarding Article 83 EPC, it was held that the invention was not disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art because no method for determining the CLTE had been disclosed. Novelty was implicitly accepted, and the existence of any inventive step was questioned, it being observed that composites of liquid-crystalline polymers and wollastonite (as disclosed in D1) would be expected to have CLTEs falling within the range specified in accordance with the alleged invention, and thus would be well suited for making connectors such as those disclosed in D2.

III. An appeal against that decision was filed on 16 March 1992, the appeal fee was paid on 19 March 1992, and the Statement of Grounds of Appeal was filed on 15 May 1992. Together with that statement the Appellant filed an amended set of 4 claims to be considered as its sole request, of which Claim 1 reads as follows:

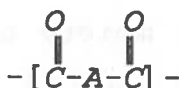
"A component for joining or terminating optical fibers which is a polymer molding, characterised in that the polymer is a thermotropic liquid crystalline polymer which (a) has a linear coefficient of thermal expansion of from -5 to 10 micrometer/meter $^{\circ}\text{C}$ at a temperature range off from -50°C to $+85^{\circ}\text{C}$, (b) has an inherent viscosity of from 1.0 to 15 dl/g when dissolved in a concentration of 0.1 percent by weight of pentafluorophenol at 60°C , (c) is selected from

(i) a melt processable poly(ester-amide) capable of forming an anisotropic melt phase at a temperature below 400°C and consisting essentially of recurring moieties I, II, III and, optionally, IV, wherein:

I is



II is



where A is a divalent radical comprising at least one aromatic ring or a divalent trans-1,4-cyclohexylene radical;

III is $-[\text{Y}-\text{Ar}-\text{Z}]-$ where Ar is a divalent radical comprising at least one aromatic ring, Y is O, NH, or NR, and Z is NH or NR, where R is an alkyl group of 1 to 6 carbon atoms or an aryl group; and

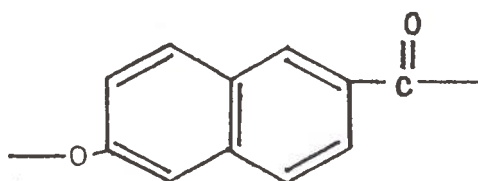
IV is $-[\text{O}-\text{Ar}'-\text{O}]-$ where Ar' is a divalent radical comprising at least one aromatic ring;

wherein at least some of the hydrogen atoms present upon the rings may be optionally replaced by substituents selected from alkyl groups of 1 to 4 carbon atoms, alkoxy groups of 1 to 4 carbon atoms, halogen, phenyl, and mixtures thereof, and wherein the said poly(ester-

amide) comprises 10 to 90 mole percent of moiety I, 5 to 45 mole percent of moiety II, 5 to 45 mole percent of moiety III, 5 to 45 mole percent of moiety IV,

(ii) a melt processable wholly aromatic polyester capable of forming an anisotropic melt phase at a temperature below 400°C and consisting essentially of recurring moieties I, V and VI, wherein:

I is



V is a dioxy aryl moiety of the formula -O-Ar-O- where Ar is a divalent radical comprising at least one aromatic ring, and

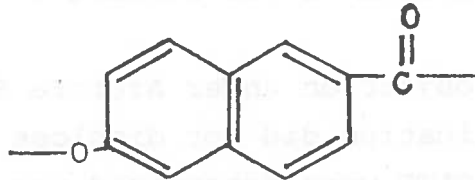
VI is a dicarboxy aryl moiety of the formula



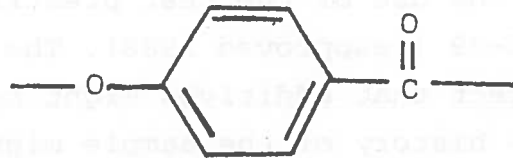
where Ar' is a divalent radical comprising at least one aromatic ring;
wherein at least some of the hydrogen atoms present upon the rings may optionally be replaced by substituents selected from alkyl groups of 1 to 4 carbon atoms, alkoxy groups of 1 to 4 carbon atoms, halogen, phenyl, and mixtures thereof, and wherein the polyester comprises 10 to 90 mole percent of moiety I, 5 to 45 mole percent of moiety V, and 5 to 45 mole percent of moiety VI,

(iii) a melt processable wholly aromatic polyester capable of forming a thermotropic melt phase at a temperature below 350°C and consisting essentially of the recurring moieties I and VII, wherein

I is



and
VII is



wherein at least some of the hydrogen atoms present upon the rings may optionally be replaced by substituents selected from alkyl groups of 1 to 4 carbon atoms, alkoxy group of 1 to 4 carbon atoms, halogen, phenyl, and mixtures thereof, and wherein the polyester comprises 10 to 90 mole percent of moiety I, and 10 to 90 percent of moiety VII,

and (iv) mixtures thereof,
and (d) contains a filler material, selected from wollastonite and fused silica, in an amount from 5 to 60 percent by weight of the total composition."

Claims 2 to 4 concern particular optical fiber components according to Claim 1.

IV. In support of the patentability of that subject-matter the Appellant argued essentially as follows:

- (i) The incorporation of the structural features (c) of the polymers overcame the ground of refusal under Article 84 EPC. The characterisation of a polymer by reference to its CLTE (parameter (a)) could not be equated with a functional definition of the claimed subject-matter.

- (ii) The objection under Article 83 EPC, that the application did not disclose how the values of the CLTE were determined was not justified, since that parameter could be determined by any standard method known in the art, in particular by the use of the test prescribed in ASTM D 696-79 (reapproved 1988). The arguments to the effect that additives might be present, and that the history of the sample might affect the ultimate value of the CLTE of the polymers were unfounded.

- (iii) As far as the issue of inventive step was concerned, reference was made to previous submissions, and emphasis was laid on the fact that the prior art documents cited by the Examining Division provided no incentive to manufacture a component for joining or terminating optical fibres which was a moulding comprising a thermotropic liquid crystalline polymer as now defined in the application in suit.

V. Following the Appellant's request for oral proceedings if the Board was inclined to uphold the decision under appeal (Statement of Grounds of Appeal, point 26), such proceedings were arranged for 20 April 1994.

Together with the summons to these oral proceedings issued on 23 November 1993, the Board sent a communication expressing the view that even if the grounds for refusal of the application were to be overcome by an appropriate redrafting of the claims, it remained doubtful whether any inventive step could be acknowledged.

On 4 March 1994 the Appellant informed the Board that it was content to have the issues in the appeal decided on the basis of its written submissions. It further argued that the essential function of an appeal was to consider whether a decision issued by a first instance department was correct on its merits. In that respect, a finding of lack of any inventive step was not part of the decision under appeal.

- VI. The Appellant requested that the decision under appeal be set aside and, implicitly from the latter submission, that the case be remitted to the Examining Division for further prosecution.

Reasons for the Decision

1. The appeal is admissible.
2. *Admissibility of amendments*

Claim 1 as amended combines all the features of Claims 1, 2, 3, 5, 7, 8 and 9 of the application as filed. As to the possibility of using mixtures of polymers of different classes, which corresponds to feature (c)(iv), it is supported by page 10, lines 10 to 16 of the application as filed. The combination of these features was thus disclosed in the application as filed,

and the amendment therefore meets the requirements of Article 123(2) EPC. Dependent Claims 2 to 4 correspond to Claims 4, 10, and 11 as originally filed, their numbers and appendancies having been adjusted.

3. *Objection under Article 84 EPC*

The first question which arises is whether the present version of Claim 1, which concerns a polymer moulding composition containing a thermotropic liquid crystalline polymer and a filler material, overcomes the objection under article 84 EPC that this composition is defined solely in terms of functional parameters.

3.1 Feature (a), i.e. the CLTE of the polymer, is a parameter described as essential to ensure that the polymer moulding composition has the desired properties (application in suit, page 8, lines 3 to 9). According to Article 84 EPC as interpreted in T 32/82, OJ EPO 1984, 354, such essential features should be incorporated into the relevant claim (Reasons for the Decision, point 15). The reference to CLTE in Claim 1 of the application in suit to define the polymer is thus in line with the principles laid down in that decision.

The polymer, which is one of the components of the composition, is here defined in terms of its CLTE. That is a positive definition of the polymer. As pointed out by the Appellant during the examination procedure (statement submitted on 10 July 1990, page 2, paragraph 6), CLTE is a measurable characteristic of the polymer, no different from other usual physical characteristics. Provided this parameter can be determined accurately, which issue is dealt with in point 4 below, the range mentioned in Claim 1 represents a clear teaching for the reader to select only polymers which meet that necessary condition.

- 3.2 Similar considerations apply to inherent viscosity, since the range indicated for that parameter concerns the polymer, i.e. an ingredient of the polymer moulding composition. The characterisation of the polymer by its inherent viscosity being obviously unobjectionable, further discussion of that feature is not necessary.
- 3.3 The incorporation of the structural features (c)(i), (c)(ii) and (c)(iii), as well as their combination (c)(iv), together with the requirement that naphthalene moieties should be present in a concentration of not less than 10 mole percent, result in a positive definition of the thermotropic liquid crystalline polymer. This amendment, which is broadly in line with the suggestions of the Examining Division (communication of 29 July 1991, point 1, paragraph 2), corresponds to the preferred definition of the polymers exhibiting optical anisotropy in the melt, and thus to a positive definition of the claimed subject-matter.
- 3.4 As indicated in the application as filed, the filler is the other important ingredient of the claimed moulding compositions, in that it causes coordination of the CLTE with the particular optical fibre contained in the components contemplated (page 16, lines 4 to 10). To that end, the filler should have a CLTE lower than 15 micrometer/meter $^{-\circ\text{C}}$, and preferably lower than 10 micrometer/meter $^{-\circ\text{C}}$. Wollastanite and fused silica, which have the lowest coefficients, are said to be particularly preferred (page 17, line 24 to page 18, line 3). It follows that, likewise, feature (d) amounts to a positive definition of the claimed subject-matter.
- 3.5 Analysis of features (a) to (d) shows that all of them aim at a positive characterisation of the appropriate ingredients to be used in order to ensure the anisotropic character of the polymer melt. There can

thus be no objection on the ground that these ingredients are defined by the results to be achieved, and hence the basis of the decision under appeal is inapplicable to Claim 1 as now amended. For these reasons, the Board concludes that the requirements of Article 84 EPC are now met.

4. *Objection under Article 83 EPC*

The second ground relied on in the decision refusing the application was non-compliance with the requirements of Article 83 EPC. It was objected both that the application does not disclose how CLTEs are to be determined, and that the results obtainable by following ASTM D696-79 (a standard method for the determinations of CLTE) are known to be inaccurate.

4.1 More specifically, the objection of insufficiency was based on the actual wording of Section 1.2 of ASTM D696-79 (Reapproved 1988), which reads as follows:

"The thermal expansion of a plastic is composed of a reversible component on which are superimposed changes in length due to changes in moisture content, curing, loss of plasticizer or solvents, release of stresses, phase changes and other factors. This test method is intended for determining the coefficient of linear thermal expansion under the exclusion of these factors as far as possible. In general, it will not be possible to exclude the effect of these factors completely. For this reason, the test method can be expected to give only an approximation to the true thermal expansion."

4.2 As pointed out by the Appellant in its reply filed on 27 May 1991 (page 1, paragraph 3 to page 2, paragraph 4) as well as in point 16 of the Statement of Grounds of Appeal, ASTM D696-79 is addressed to the testing of any

plastic, whether it be thermoplastic or thermoset. The thermoplastic liquid crystalline polymers used in the claimed compositions are a recognised class of polymers which form an anisotropic melt phase when heated to a sufficiently high temperature; such polymers possess rigid rod-like molecules which make possible the formation of an atypical ordered melt phase. Such ordered structure also is present in solid articles when the polymer solidifies.

When testing a moulded article comprising a thermotropic liquid crystalline polymer, there should be no appreciable superimposed changes in length, "due to changes in moisture content, curing, loss of plasticizer or solvents, release of stresses, phase changes and other factors". (The words quoted are taken from ASTM D696-79.) The polymers here involved exhibit an extremely low propensity to attract moisture, and no water is present when they are melt processed. Similarly, they do not contain plasticisers or solvents, since the articles are formed by simple melt-processing in the absence of such additives, and being thermoplastic do not undergo curing. When the polymers are cooled from above to below their melting temperatures, they simply solidify and incorporate the same molecular structure as was present in the melt; such solidification does not impart stresses and accordingly there are no stresses to relieve upon subsequent heating. Annealing to relieve stresses is never used with the claimed materials. Heating below the melting temperature will not change the internal structure of the claimed material. Accordingly, a thermotropic liquid crystal polymer because of its structure and characteristics is ideally suited for testing pursuant to ASTM D696-79 and is thus most appropriate for an accurate determination of its CLTE.

- 4.3 The possibility of incorporating additives, such as adhesion promoters and lubricants, mentioned in the application in suit (page 19, lines 4 to 6), cannot be regarded as having a serious adverse effect on the accuracy of determination of the CLTE since the passage in question clearly states that such additives "may be included so long as they do not deleteriously influence the composition."

The fact that a composition within the terms of Claim 1, but containing additionally ingredients having such a detrimental influence, may not exhibit the desired property, cannot amount to an objection of insufficient disclosure. In the Board's view, there can be no doubt that a skilled person, making use of common general knowledge, supplemented if necessary by routine tests and some trial and error, would be able to identify an additive responsible for unsatisfactory properties, and at the same time would be aware of equivalent additives which would not have that deleterious effect. As noted by the Board in the decision T 14/83, OJ EPO 1984, 105, "occasional lack of success does not impair feasibility in the sense of Article 83 EPC if, for example, some experimentation is still to be done to transform failure into success, provided that such experimentation is not an undue burden and does not require inventive activity." (Reasons for the Decision, point 6, paragraph 1.)

- 4.4 The reference in the Statement of Grounds of Appeal (point 21) to the decision T 340/88 [1990] EPOR 377 (not reported in OJ EPO) in support of the contention that there is sufficient disclosure is relevant to the present case, even though in that case the claim under consideration was a process claim, whereas here a product claim is being considered. In that earlier decision, the alleged insufficiency of disclosure was

based on the fact that a surface-active agent specified as an additive in a process claim was defined in terms of its HLB (hydrophile-lipophile balance). The experimental method for determining HLB values was not very accurate, and the description in the patent specification did not contain any information regarding the determination of the HLB values of surface-active agents. In that case, the Board took the view that since HLB was the parameter universally used to describe surface-active agents, and specific values were assigned in the literature in this field to surfactants, the skilled person would have had no difficulty in selecting appropriate surface-active agents having HLB values within the appropriate range (Reasons for the Decision, point 5.4). In spite of the above-noted difference in the claim category, the situation in the present case is not fundamentally different, since in both cases the absence of information regarding the determination of a parameter of a starting compound is not a genuine obstacle to carrying out the invention as claimed, or to ascertaining whether the final product, i.e. the polymer obtained by the claimed process in accordance with T 340/88, or the component for joining or terminating optical fibres in the present case, has the required properties.

Thus, from that viewpoint also, the objection of insufficient disclosure cannot be maintained.

- 4.5 In point 6 of the decision under appeal, reference was made to EP-A2-249 226 in order to illustrate that it was common practice to indicate the method of determination of parameters, and the apparatus used to measure them when these parameters were essential for the definition of the claimed subject-matter. In the present case, it would have been desirable to have had such information in the description of the application, if only for the

purpose of reproducing an example, or filing a report of comparative examples in the case of an opposition. However, for the reason given above, even in the absence of such information, an objection that it is not possible to carry out the invention cannot reasonably be sustained, whether additives are incorporated or not.

4.6 In the circumstances of the present case, the Board is thus satisfied that there is no need to define any method for determining the CLTE, which, in relation to the polymers here under consideration, can be determined by any of the known methods and apparatus. Accordingly, the requirements of Article 83 EPC must be regarded as met.

5. Although the Examining Division, after having acknowledged novelty, took a negative view on the question of whether there is any inventive step, that issue was not a ground of the decision refusing the application. The requirements of Articles 84 and 83 being met by the present version of the claims, it remains to be decided whether the claimed subject-matter involves an inventive step. To that end the Board makes use of its powers under Article 111(1) EPC and remits the case to the Examining Division for further prosecution.

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 consideration of whether the application satisfies the requirements of Article 56 EPC.

The Registrar:


E. Gorgmaier

The Chairman:


C. Gérardin