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D E C I S I O N
of 26 January 1994

Case Number: T 0805/92 - 3.3.3

Application Number: 86117763.2

Publication Number: 0230631

IPC: C08G 73/12

Language of the proceedings: EN

Title of invention:
Intermediate for composite material

Patentee:
Mitsubishi Rayon Co., Ltd.

Opponent:
BASF Aktiengesellschaft

Headword:
-

Relevant legal norms:
EPC Art. 56

Keyword:
"Inventive step (yes)"

Decisions cited:
T 0198/84, T 0017/85, T 0296/87

Catchword:
-

Case Number: T 0805/92 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 26 January 1994

Appellant: Mitsubishi Rayon Co., Ltd.
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Decision under appeal: Decision of the Opposition Division of the European Patent Office dated 19 May 1992, issued on 1 July 1992 revoking European patent No. 0 230 631 pursuant to Article 102(1) EPC.

Composition of the Board:

Chairman: F. Antony
Members: C. Gérardin
F. Benussi

Summary of Facts and Submissions

I. The mention of the grant of the patent No. 0 230 631 in respect of European patent application No. 86 117 763.2 filed on 19 December 1986 and claiming the priority of 20 December 1985 from two earlier applications in Japan, was published on 1 August 1990 on the basis of nine claims.

Claim 1 for the Contracting States DE, FR, GB, IT, NL and SE read as follows:

"An intermediate for a composite material comprising a reinforcing material impregnated with a resin composition which comprises: (A) 100 parts by weight of a mixture of (I) a polyfunctional maleimide and (II) a polyfunctional cyanate or an oligomer thereof, or a preliminary reaction product of (I) and (II); (B) from 5 to 100 parts by weight of an epoxy compound; and (C) from 5 to 50 parts by weight of a polyester compound."

Claims 2 to 9 were dependent product claims directed to preferred intermediates for a composite material according to Claim 1.

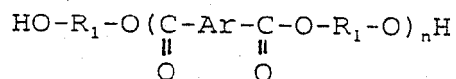
The claims for the Contracting State ES corresponded to these claims, but were drafted as process claims for the preparation of this intermediate.

II. On 26 February 1991 the Opponent filed a Notice of Opposition against the grant of the patent and requested revocation thereof in its entirety for lack of novelty and inventive step as well as public prior

use (Article 100(a) EPC). These objections were based essentially on the following documents:

- (1) DE-A-3 509 220, and
- (2) US-A-4 110364.

In the course of the opposition procedure the objection of public prior use was waived and three different versions of Claim 1 were submitted as the basis of the main, first auxiliary and second auxiliary requests. In particular, Claim 1 according to the second auxiliary request differed from Claim 1 as granted in that (i) the upper limit of the range specifying the amount of the polyester compound (C) was lowered to 25 parts by weight, and (ii) the definition of the polyester was limited to compounds (C) "represented by formula (V)



wherein Ar is a phenylene group; and R₁ is the same divalent aliphatic group".

III. By a decision delivered orally on 19 May 1992, with written reasons posted on 1 July 1992, the Opposition Division revoked the patent on the grounds that the subject-matter as defined in the main and first auxiliary requests was not novel with regard to the teaching of document (1), and that the subject-matter as defined in the second auxiliary request did not involve any inventive step with respect to the combined teachings of documents (1) and (2). This combination was obvious in view of the cross-reference to document

(2) given in document (1). In the absence of evidence of any technical effect, the use of a homopolyester instead of a copolyester in otherwise identical compositions could not be regarded as inventive.

IV. The Appellant (Patentee) thereafter filed a Notice of Appeal against this decision on 1 September 1992 and paid the prescribed fee at the same time. Together with the Statement of Grounds of Appeal filed on 29 October 1992 the Appellant submitted, as the basis of its sole request, the two sets of claims which corresponded to the second auxiliary request before the Opposition Division. It further provided comparative test reports from which it appeared that, all other compositional features being identical, a composite material containing 30 to 35 parts by weight of polyester had a poorer compressive strength after treatment with water and heat than a composite material containing only 25 parts by weight of polyester. This effect, which was regarded as surprising, was evidence that the claimed subject-matter involved an inventive step.

V. In its written submissions the Respondent (Opponent) argued that, as far as the results of the test reports were concerned, the better mechanical properties obtained with a lower amount of polyester were to be expected in view of the known sensitivity of that type of polymer to hydrolysis. It further pointed out that the range of 5 to 25 parts by weight of polyester in the patent in suit could not be regarded as a selection with regard to the range of 5 to 50 parts by weight mentioned in document (1); in particular, the criteria for a selection invention as specified in the decisions T 198/84 (OJ EPO 1985, 209) and T 17/85 (OJ EPO 1986,

406) were not met in the present case. Even the difference in terms of compressive strength between compositions comprising 25 and 30 parts by weight of polyester could not justify an inventive step according to the decision T 296/87 (OJ EPO 1990, 195), since there was an incentive to reduce the amount of polyester and that effect would have come to light automatically by simply carrying out routine experiments.

- VI. The Appellant requested that the decision under appeal be set aside and the patent be maintained on the basis of the two sets of claims filed on 29 October 1992.

The Respondent requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is admissible.
2. The wording of the claims does not give rise to any objections under Article 123 EPC.

With regard to Claim 1 as granted, the current version of Claim 1 differs by the fact that (i) the upper limit of the range specifying the amount of the polyester compound (C) has been lowered from 50 to 25 parts by weight, and (ii) the definition of the polyester has been restricted to what are essentially homopolymers.

Feature (i) is supported by Example 4 as granted and originally filed. Although this is the only disclosure

of that figure in the description of the patent in suit, it appears from Table 1 that most examples, including Example 4, are based on compositions comprising 10 parts by weight of a poly-functional maleimide, 90 parts by weight of a poly-functional cyanate and 12.5 parts by weight of an epoxy resin. The figure of 25 parts by weight can thus be regarded as disclosed in a context more general than the specific embodiment described in Example 4, and therefore as adequately supported by the original application.

Feature (ii) corresponds to the subject-matter of Claim 5 as granted and originally filed, with the additional requirement that R_1 should have only one meaning for any given polyester. This restrictive definition, which aims at excluding copolyesters, is justified in view of the fact that mixtures of polycarboxylic acids and polyfunctional alcohols are not envisaged in the preparation of the polyester compound (C) (page 3, line 58 to page 4, line 5 of the patent as granted corresponding to page 9, line 12 to page 10, line 12 of the application as originally filed) and that in all the examples, with the exception of Example 2, only homopolyesters are used.

It is evident that none of these amendments extends the protection conferred.

Further, the dependent Claims 2 to 8 correspond to Claims 2 to 4 and 6 to 9 of the patent as granted, which in turn are based on Claims 2 to 4, 6 and 9 to 11 of the application as originally filed.

These considerations apply to both sets of claims of the request.

3. After examination of documents (1) and (2), the Board has come to the conclusion that the subject-matter of the patent in suit as defined in Claim 1 of either set of claims is not disclosed therein and is, therefore, novel. Since the issue of novelty has not been disputed for these claims (see decision under appeal, point 3.3), it is not necessary to consider this matter in further detail.

4. The patent in suit concerns an intermediate for composite material or (claims for ES) a process for the preparation of such an intermediate. Similar subject-matter is disclosed in document (1) which the Board, like the Opposition Division, regards as the closest state of the art. The basic ingredients used according to this citation are a polyfunctional cyanate and a thermoplastic saturated polyester of low crystallinity (Claim 1); a polyfunctional maleimide and/or an epoxy resin may be incorporated as optional ingredients, as well as reinforcing fillers (Claims 6 and 8; page 2, paragraph 3; page 15, paragraph 1). Example 5 describes a hardenable composition comprising 675 parts by weight of an aromatic dicyanate, 75 parts by weight of an aromatic dimaleimide, 50 parts by weight of an epoxy resin derived from bisphenol A and 250 parts by weight of a polyester, corresponding to (A) 100 parts by weight of a mixture of (I) a difunctional maleimide and (II) a difunctional cyanate, (B) 6.7 parts by weight of an epoxy resin and (C) 33.3 parts by weight of a polyester. The laminates obtained from such intermediates are said to exhibit a desirable

combination of properties, in particular high flexibility, good processability and outstanding resistance to chemicals (page 1, paragraph 1 and page 2, paragraph 3); however, their compressive strength after treatment with water and heat was not regarded as entirely satisfactory.

On the basis of that shortcoming the technical problem underlying the patent in suit may thus be seen in the provision of an intermediate for a composite material, or respectively in the definition of a process for the preparation of such intermediate, having improved compressive strength after treatment with water and heat.

According to the patent in suit this problem is to be solved by using from 5 to 25 parts by weight of a polyester derived from a phenylene dicarboxylic acid and a polyhydric alcohol, which is practically a

homopolyester (neglecting the possibility of isomeric mixtures of dicarboxylic acid).

In view of (i) the experimental data in the patent in suit (Tables 1 and 2), (ii) Comparative Example A filed together with the Statement of Grounds of appeal, and (iii) Comparative Example B filed together with a later submission on 13 July 1993, the Board is satisfied that the above-defined problems are effectively solved. This point has not been disputed by the Respondent.

5. It remains to be decided whether the claimed subject-matter involves an inventive step having regard to the teaching of the documents relied upon by the Respondent.

5.1 In spite of a close similarity in the compositional features of the composition according to Example 5 of document (1) and the claimed subject-matter, the latter cannot be derived from the teaching of this citation for several reasons.

The first results from the definition of the polyester in document (1), which specifies that this polymer should be non-crystalline, practically non-crystalline or of low crystallinity (page 10, lines 9 to 14). This applies in particular to the polyester used in Example 5. This requirement of low crystallinity is conventionally achieved by using either a mixture of dicarboxylic acids or a mixture of polyhydric alcohols in the preparation of the polyester (page 11, lines 12 to 26). This contrasts with the definition of the polyester in the patent in suit, which can be essentially regarded as that of a homopolymer.

The second is that the authors of document (1) do not regard the amount of polyester as important for the properties of the composition. According to the general teaching of this citation, the ratio component (A): polyester is not critical and may vary between 10:90 and 99:1 (page 11, lines 32 to 35). The compositions mentioned in the examples comprise 33, 36, 43, 70 or 122 parts of polyester per 100 parts by weight of component (A), thus significantly more than the range required in the patent in suit.

The third is that, although various fillers (page 15, paragraph 1) corresponding broadly to those mentioned in the patent in suit (compare page 4, lines 33 to 38) may be incorporated, their addition is only optional. This means that the compositions described in this citation are not primarily intended to serve as intermediates for composite materials, i.e. resin compositions impregnating with a reinforcing material within the range of 0.5 to 80 vol.% (patent in suit, page 4, lines 46 to 51), but merely as adhesive compositions. As a consequence, the balance of properties of the compositions according to document (1) and the patent in suit is not necessarily the same; this is in line with the fact that the prior art disclosure makes no reference to impact strength properties, let alone to such properties after treatment of the composition with water and heat.

It is thus evident that the teaching of document (1) taken in isolation cannot lead the skilled person to the claimed subject-matter.

5.2 Document (2) describes curable compositions with good adhesive properties comprising (a) a polyfunctional cyanate ester or prepolymer thereof, (b) a bismaleimide or prepolymer thereof, the weight ratio of component (a) to component (b) being 1:99 to 99:1, and optionally (c) an epoxy compound, and (d) an amine hardening agent (column 1, line 52 to column 2, line 5). The cured resins are said to have a desirable combination of properties, in particular superior adhesion, mechanical properties, thermal stability and moisture resistance (column 12, lines 55 to 60). These compositions may further contain various reinforcing fillers, whereby laminated materials are provided (column 11, lines 48 to 66), as well as various natural, semi-synthetic or synthetic resins in an amount of not more than 30% by weight of the total amount of the resin, whereby the general properties of the resin in adhesives may be improved (column 11, lines 32 to 47). Although polyester resins are mentioned, among many others, as suitable resin additives, there is neither a compositional definition of these polyesters, nor one single example illustrating that embodiment.

In the Board's view, the mere mention of the possibility of incorporating polyester resins, without any definition thereof and without any reference to the particular effect to be expected, cannot be equated with the addition of a specific class of polyesters, namely homopolyesters derived from an aromatic dicarboxylic acid and an aliphatic diol according to formula (V), in order to improve the compressive strength after treatment with water and heat. It follows that feature (C) as defined in Claim 1 of the patent in suit is not rendered obvious in the light of

the teaching of this document, taken either in isolation or in combination with document (1).

5.3 The Respondent's argument that, in view of the well-known sensitivity to hydrolysis of polyesters, it was self-evident to lower the amount of that component in the composition (statement filed on 25 February 1993, paragraph bridging pages 1 and 2; statement filed on 30 September 1993, page 2, paragraph 2), cannot be accepted for the following reasons.

5.3.1 The first is that the skilled person, having come to the conclusion that the insufficient compressive strength after treatment with water and heat was caused by the hydrolytic degradation and poor stability of the polyester component, would have had promising alternatives at his disposal. As stated above (point 5.2), document (2) mentions many resins which, like polyesters, are said to improve the general properties of adhesives based on a polyfunctional cyanate and a polyfunctional maleimide (column 11, lines 32 to 47). In the Board's view, it would have been more obvious to select one or more of these resins according to criteria of stability and to substitute it or them for the non-crystalline polyester used in document (1).

5.3.2 The second reason is that the solution proposed by the Appellant does not confine itself to the use of lower amounts of the polyester mentioned in Example 5 of document (1), but additionally requires another compositional definition of the polyester, which is not suggested by either of the documents relied upon by the Respondent.

5.3.3 The third reason is that the experimental data provided by the Appellant in the patent in suit and the comparative test reports submitted subsequently do not support the Respondent's argument. This data shows the influence of the amount of polyester on the compressive strength after treatment with water and heat at 121°C according to ASTM D-695 of compositions comprising 10 parts by weight of a polyfunctional maleimide, 90 parts by weight of a polyfunctional cyanate, 12.5 parts by weight of an epoxy resin (Epikote 807), and varying amounts of polyester, as follows:

	Amount of polyester (parts by weight)	Compressive strength (kg/mm ²)
Comparative Example 1	0	140
Example 1	12.5	140
Example 4	25	130
Comparative Example B	30	104
Comparative Example A	35	93
Comparative Example 2	75	60

Contrary to the Respondent's assumption, from which one would expect the compressive strength to decrease steadily with increasing amounts of polyester, the Appellant has found that (i) the range up to 25 parts by weight corresponds to an area of stability practically independent from the amount of polyester, and (ii) outside that range there is a significant drop of the compressive strength. In the Board's view, this result must be regarded as surprising.

5.4 The reference by the Respondent to the decisions T 198/84, T 17/85, and T 296/87 is not appropriate.

The first two concern the question of novelty of a selection from a numerical range, requiring in particular that the selected sub-range is narrow and sufficiently far removed from a preferred range illustrated by means of examples. In the present case, as specified above in point 3, the issue of novelty is not a matter of dispute between the parties, and a selection from a numerical range (polyester content) is not the only novel feature. The said two decisions are therefore not applicable.

Similarly, even if the skilled person had identified the shortcomings of the composition according to Example 5 of document (1) as being caused by a relatively large amount of its polyester and carried out routine experiments in order to determine the upper limit of a range combining optimal stability with the general advantages provided by polyesters, there would have been no incentive to choose the particular polyesters of formula (V) as required in the patent in suit. For this reason, the present situation cannot be compared with that of the decision T 296/87.

- 5.5 It follows that feature (C) as defined in Claim 1 must be regarded as non-obvious and, therefore, as involving an inventive step. This conclusion applies to Claim 1 of each of the two sets of claims, since they are both based on the same inventive concept, whether drafted as intermediate product claim or as process claim.
6. Claim 1 being allowable, the same applies to the dependent Claims 2 to 8, which are directed to preferred embodiments of the subject-matter of their

respective Claim 1 and whose inventiveness is supported by that of the main claim.

7. The description still requires adaptation to the amended claims. In particular, Example 2 and the references thereto in Tables 1 and 2 will require deletion.

Order

For these reasons, it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the Opposition Division with the order to maintain the patent on the basis of the two sets of claims filed on 29 October 1992 and a description yet to be adapted.

The Registrar:

The Chairman:

E. Görgmaier

F. Antony