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D E C I S I O N
of 7 March 2002

Case Number: T 0172/99 - 3.3.3

Application Number: 90303267.0

Publication Number: 0390508

IPC: C08F 279/02

Language of the proceedings: EN

Title of invention:
Styrene-based resin composition

Patentee:
IDEMITSU PETROCHEMICAL COMPANY LIMITED

Opponents:
Bayer AG, Leverkusen Konzernverwaltung RP Patente Konzern
THE DOW CHEMICAL COMPANY
BASF Aktiengesellschaft, Ludwigshafen

Headword:
-

Relevant legal provisions:
EPC Art. 83, 100(b)

Keyword:
"Disclosure - sufficiency (no)"

Decisions cited:
T 0123/85, T 0010/86, T 0435/91

Catchword:

In the case of claimed subject-matter relying on a newly formulated and, hence, unfamiliar parameter to define the solution of a technical problem by which a relevant effect is achieved, the applicant or patentee, who has the duty of making a full and fair disclosure of his invention to the public (Article 83 EPC), is under a particular obligation to disclose all the information necessary reliably to define the new parameter not only (i) in a formally correct and complete manner such that its values can be obtained by a person skilled in the art without undue burden, but also (ii) in a manner which reliably retains the validity of the parameter for the solution of the technical problem for the application or patent in suit as a whole in the sense that the values routinely obtained will not be such that the claimed subject-matter covers variants incapable of providing the relevant effect or, therefore, of solving the associated technical problem (see points 4.5.6 and 4.5.8 of the Reasons; T 435/91 followed).



Case Number: T 0172/99 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 7 March 2002

Appellant:
(Proprietor of the patent)

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Decision under appeal:

Decision of the Opposition Division of the
European Patent Office dated 24 April 1998 and
issued in writing on 21 December 1998, revoking
European patent No. 0 390 508 pursuant to
Article 102(1) EPC.

Composition of the Board:

Chairman: R. Young
Members: A. Däweritz
J. van Moer

Summary of Facts and Submissions

- I. The grant of European patent No. 0 390 508 in respect of European patent application No. 90 303 267.0 filed on 27 March 1990 and claiming priority of 31 March 1989 of an earlier application in Japan (78142/89), was announced on 29 December 1993 (Bulletin 93/52) on the basis of six claims.

Claim 1 as granted read as follows:

- "1. A rubber-modified styrene-based resin composition comprising a styrene-based resin as a continuum of the matrix phase and a diene-based rubbery polymer as a dispersed particulate phase in the matrix, in which the particles of the rubbery polymer have an average particle diameter in the range from 0.08 to 1.00 μm , a peripheral parameter, as defined in the description, in the range from 0.1 to 2.5 $(\mu\text{m})^{-1} \cdot (\% \text{ by weight})^{-1}$ and a relaxation time T_2 , as defined in the description, in the range from 300 to 2000 μ seconds, said styrene-based resin being selected from homopolymers of aromatic monovinyl monomers; copolymers of two or more aromatic monovinyl monomers; and copolymers of one or more aromatic monovinyl monomers with one or more other types of monomer which are copolymerised therewith, provided that said copolymer of aromatic monovinyl monomer(s) with other type(s) of monomer copolymerisable therewith contains at least 55% by weight of the monomeric moiety derived from the aromatic monovinyl monomer."

Claims 2 to 6 related to preferred embodiments of the composition according to Claim 1.

II. Notices of Opposition were filed by three Opponents:

Opponent 01: Bayer AG on 2 February 1994,

Opponent 02: The Dow Chemical Company on 27 September 1994, and

Opponent 03: BASF Aktiengesellschaft on 28 September 1994.

In all Notices of Opposition, revocation of the patent in its entirety was requested on the grounds of lack of novelty within the meaning of Article 54(1) and (2) EPC and insufficiency of disclosure under Article 100(b) EPC. Additionally, an objection of lack of inventive step within the meaning of Article 56 EPC was raised by Opponents 01 and 02. Twelve documents were cited by the Opponents including

D1: DE-A-29 27 572,

D2: US-A-4 513 120 and

D11: A. Echte, "Rubber-Toughened Styrene Polymers" in Advances in Chemistry Series 222, pages 15 to 64 (1989).

III. By decision announced orally on 24 April 1998 and issued in writing on 21 December 1998, the Opposition Division revoked the patent in suit in accordance with Articles 100(b) and 102(1) EPC for insufficiency of disclosure. The decision was based on two sets of claims appended to the decision as "Annex A" and "Annex B", which had been submitted on 14 July 1995 and amended in the oral proceedings before the Opposition Division on 24 April 1998. Claim 1 of "Annex A" (main request) read as follows:

"1. A rubber-modified styrene-based resin composition comprising a styrene-based resin as a continuum of the matrix phase and a diene-based rubbery polymer as a dispersed particulate phase in the matrix, in which the particles of the rubbery polymer have an average particle diameter in the range from 0.08 to 1.00 μm , a peripheral parameter, as defined in the description, in the range from 0.1 to 2.5 $(\mu\text{m})^{-1} \cdot (\% \text{ by weight})^{-1}$ and a relaxation time T_2 , as defined in the description, in the range from 300 to 2000 μ seconds, said styrene-based resin being selected from homopolymers of aromatic monovinyl monomers and copolymers of two or more aromatic monovinyl monomers."

Claim 1 of "Annex B" (auxiliary request) differed therefrom in that the lower limit of the average particle diameter read "0.32" instead of "0.08".

In substance, the Opposition Division held that the patent did not comply with the requirements of Article 83 EPC. In view of this insufficiency of the disclosure, the Opposition Division found that novelty and/or inventive step of the claimed subject-matter could not be assessed at this stage of the opposition proceedings.

More particularly, the decision was based on the reason that one of three essential parameters used in Claim 1 to define the particles of the rubbery polymer, the so-called "peripheral parameter" (" C_1 ") which was admittedly a newly formulated parameter, was neither defined nor explained in such a way that a skilled worker received all information necessary to carry out the polymerisation by means of process features which led clearly and unambiguously to predetermined values of the said parameter. It was further held that the

measurement of this parameter had to be clear and unambiguous in itself, a requirement which was not complied with by the specification either.

The Opposition Division found that the meanings of the "total (or overall) peripheral lengths" ("L") and the referential area "A", both being used in the calculation of the said "C₁", had not been clear from the wording of the specification, and that the measurements apparently depended on the apparatus used. In the latter connection, the examples did not clarify the situation either.

IV. On 11 February 1999, an appeal was lodged by the Appellant (Patentee) who requested that the decision be set aside in its entirety. The prescribed fee was paid simultaneously.

In the Statement of Grounds of Appeal, filed on 29 April 1999, the Appellant requested that the patent be maintained on the basis of Patentee's main request or, according to a subsidiary motion, that oral proceedings be held. Two further auxiliary requests were also submitted. The main request and the first auxiliary request were based on the sets of claims in "Annex A" and "Annex B" of the decision under appeal (see section III, above). According to the second auxiliary request, the "C₁" range of "0.1 to 2.5" in Claim 1 of the patent in suit was to be replaced by "0.3 to 2.0".

In substance, the Appellant argued essentially as follows:

The peripheral parameter "C₁" was clearly defined in the patent specification to be a value obtained from a transmission electron microscope (TEM) photograph. The

value was the result of "L" of the rubber particles in a unit area "A" given in the unit of $(\mu\text{m})^{-1}$, divided by the content of the rubbery polymer in the composition given in the unit of % by weight (page 4, lines 45 to 49).

Additionally, the specification clearly disclosed that "C_i" could be obtained by determining "L" of the images of the rubber particles within area "A" on the basis of a TEM photograph, which gave the peripheral density "C_a = L/A", separately determining the concentration of the dienic constituent on the basis of ¹³C-NMR spectroscopy and finally dividing "C_a" by this concentration. The methods of measuring the "C_a" and the concentration of the dienic constituent were clearly disclosed in the patent in suit (page 5, line 55 to page 6, line 11).

Since, however, one of the Opponents had alleged insufficiency of disclosure with respect to "L", Inventors' declarations had been submitted (annexed to a letter dated 13 July 1995) wherein further details were elaborated and, while incorporating the common knowledge of the skilled person, they supplemented the disclosure of the patent in suit without exceeding the scope thereof.

The incorporation of these details would have rendered the disclosure of the method of measuring the parameter in the specification extraordinarily vast, and such requirement would have put an excessive burden on the applicant at that time. Moreover, such a vast disclosure was not required by the EPC, and the patent in suit did not require more than routine experimentation to implement it.

As regards the area "A", the Appellant argued that Declaration II by Mr Kohsaka, one of the inventors, demonstrated that it was a certain area in a TEM photograph containing at least 1 500 rubber particles which had to have diameters of at least 0.02 μm to be analyzed and measured.

Furthermore, the patent in suit specified the use of an "image analyzer" and the above declaration explained that the image analyzer was a generally used apparatus capable of measuring rubber particles of external peripheral lengths. An example of such a device had also been given in the declaration. Although it was possible that the external peripheral lengths might depend on the kind of image analyzer, the differences between measurements of different analyzers would be minute and would not pose any significant problem.

The Appellant believed that "C₁", as well as the other two parameters in Claim 1, could be controlled by the method disclosed in the specification, ie by appropriately selecting the velocity of agitation in each of the series of the reactors, defined in terms of revolutions per minute of the agitator, and the temperature in the devolatilisation treatment of the polymerisation mixture discharged from the last reactor. This point was then set out in further detail by reference to factors which determined the parameter in question, "such as particle diameters and forms of rubber particles, number of the rubber particles (rubber content (non-hydrogenated diene group amount), and the like" (page 4, item IV(2)). The number of rotations would affect the size and form of the rubber particles, when the kind of rubber and the content of rubber were constant.

Thus, the Appellant (Patentee) referred to Table 1 in the specification, which was to demonstrate that " C_1 " was increased with the increase of velocity of agitation. This was also demonstrated in Referential Figure 2 enclosed with a letter dated 17 July 1997, refiled as Referential Figure 1 with the Statement of Grounds of Appeal. Moreover, the examples in the patent in suit showed that the parameter would be increased with an increase of the devolatilisation temperature.

The repetition of measurements of all the parameters by employees of the Opponents furthermore demonstrated that these parameters were described sufficiently for a skilled person to measure them.

V. In their counterstatements dated 21 July 1999 (BASF, Respondent 03), 31 August 1999 (Bayer, Respondent 01) and 11 November 1999 (Dow, Respondent 02), respectively, the Respondents (Opponents) supported the findings of the decision under appeal substantially as follows:

A newly formulated parameter should be disclosed in a manner which allowed a skilled person to verify and measure it beyond all doubt. The two auxiliary requests did not remove the deficiencies of the specification in this respect either.

The patent in suit did not contain a clear and unambiguous description of " C_1 ", newly formulated by the Patentee, which would allow reliably to repeat the measurements of the parameter. Thus, the following features were not disclosed: how large the size of the area "A" should be, which particles had been taken into account, which "image analyzer" had been used and which method had been applied to determine " C_2 ". According to the declarations submitted by the Patentee in the course of the opposition proceedings, the morphology of

the rubber particles had an influence on "L". However, the specification was silent in this respect and did not provide any information necessary to determine "C₁" in a reliably repeatable manner.

It was not clear whether both the internal and external peripheries of rubber particles containing occlusions of the matrix polymer (due to the phase inversion during the manufacture of the composition) had to be taken into account for the calculation of "L" in "C₁".

Furthermore, reference was made to the processing or mechanical history of the specimen to be measured which would have an influence on the distortion of the perimeter of the particles in the TEM image (Opponent 02's letter dated 23 February 1998, pages 2/3).

Moreover, the stirring speeds disclosed in the patent in suit did not provide any assistance either. To specify a particular speed of stirring would only be meaningful for a particular reactor size, shape and configuration, as well as for a particular configuration of stirring paddles. It was well known that the stirring speed to be employed in any reactor of this kind would depend on the geometry of the reactor. Hence, in the absence of these particulars it was not possible to duplicate the results obtained by the Patentee, to produce a "C₁" value within the specified range, simply by using the same velocity of agitation.

In summary, the skilled person was not able to ascertain from the patent in suit what to do in order to obtain a "peripheral parameter" ("C₁") within the range required.

The measurements of the parameters of commercial products provided by the Opponents for the purpose of complete submission of all arguments within the opposition period were carried out based on certain assumptions ("to the best of Dr. Loth's knowledge and belief"). Therefore, it could not be concluded from these experimental data that the parameters were disclosed in a manner sufficiently clear and complete for it to be carried out by a skilled person.

The Appellant had conceded that "C₁" had to be brought into the defined range as a matter of trial and error.

- VI. In a reply, dated 7 September 2000, to the statements of the Respondents, the Appellant confirmed its previous position and further explained that in accordance with Webster's Dictionary, "periphery" was to mean "external boundary" alone, and that the essential criterion for the periphery of a rubber particle was its contact with the matrix, but excluded occlusions of polymer inside the rubber particles.

Furthermore, the Appellant emphasised that the subject-matter of the patent in suit did not primarily relate to a process invention but rather to an invention of a rubber-modified polystyrene product *per se*, and that the general method of producing the type of substance concerned did not, therefore, need to be so detailed, because the skilled person was already generally familiar with the process and on the basis of the guidance in the specification could vary the process and needed only to carry out routine experimentation to check whether the product met the requirements of the claims.

The significance of the numerical limitations and their criticality were addressed in the specification and in the letter dated 13 July 1995, further supported by an Inventor's declaration (Declaration III).

- VII. By letter dated 15 January 2002, the Representative of the Appellant informed the Board that he would resign from acting on behalf of the Appellant and that the Appellant neither wished to be represented nor intended to be present at the oral proceedings which had been arranged for 7 March 2002. By letter of 30 January 2002, these statements were amended to confirm that the Representative would continue the representation until a new representative was appointed by the Appellant.

On 14 February 2002, the Appellant withdrew its request for oral proceedings.

- VIII. On 7 March 2002, oral proceedings were held before the Board, at which the Respondents, but not the Appellant, were represented. In accordance with Rule 71(2) EPC, the oral proceedings were continued in the absence of the Appellant.

In addition to their written submissions, the Respondents essentially produced the following arguments, focusing in particular on "C₁":

- (i) The question of whether the claimed subject-matter fulfilled the requirements of Article 83 EPC or whether there was a valid ground for opposition according to Article 100(b) EPC, respectively, could only be answered on the basis of the content of the application as originally filed. This was especially true for a parameter which was to serve as a key feature for the assessment of novelty and inventive step. Consequently, it was considered indispensable

that a skilled person was taught by the application as originally filed how to obtain the claimed product without undue burden of experimental work as a matter of trial and error. Further explanations provided during the proceedings, as eg in the Inventors' declarations, should not be allowed to heal any deficiencies in the original disclosure. The fact that, during the discussions, reference was often made to these declarations obviously demonstrated that the original disclosure and its teaching were insufficient.

The argument should not be accepted either that the skilled person would know how to measure a parameter, which admittedly had neither been considered nor disclosed before. It would have been the onus of the Appellant as Proprietor initially to define the essential requirements for the determination of the new parameter.

It was noteworthy that the Appellant had conceded in its letter dated 13 July 1995 that it was a matter of trial and error to control "C₁" in the defined range.

- (ii) In the original disclosure, "C₁" was defined in terms of unclear and ambiguous terms such as "overall value of the peripheral lengths", an area "A" and "dienic constituent". Furthermore, the reference to a "diameter" would presuppose a circular cross-section of the particles and the "image analyzer" was not further explained. Such devices of different brand or type would, however, give different results.

The method of determination of "C₁" as described in paragraph "(5)" on page 5, line 55 et seq. of the patent in suit would only refer to the taking of the TEM photograph in accordance with the way described in the preceding paragraph dealing with the determination of the average particle diameter, but not to the particulars of how the photograph was treated and evaluated.

The results derived from a TEM photograph would, however, depend on the treatment of the samples, eg on the knife used for their preparation. Moreover, photographic measures such as exposure time, development of the negative, magnification and background of the photograph, as well as the area of the photograph chosen for evaluation and the way of tracing the interfaces would be real choices to be made, all of which would have a significant influence on the value of the parameter calculated from the measurements.

In view of the different structures of particles (as eg on the photograph AL 94-301549 annexed to Dow's letter of opposition, dated 27 September 1994, which showed *inter alia* capsules occluded in larger capsules), it was argued that the "normal" meaning of "periphery" as relating to outer circumference only did not apply under these circumstances. The contribution of a particle depended on the interface between the rubber and the polystyrene, regardless of whether the interface was inside or outside a dispersed particle.

In particular, the passage on page 5 of the description referred only in general terms to an "overall value L" within "an area of A μm^2 " determined by using an image analyzer to

calculate " C_d ". It was not evident from any part of the original disclosure that for the calculation of " C_i " the area would have to contain at least 1 500 particles and that those having a diameter of up to 0.02 μm should be ignored. According to the description as originally filed, any area containing some or only one particle of any size could be arbitrarily selected as a basis for such a calculation which, consequently, yielded an arbitrary " C_d " value.

The determination of the rubber content as specified in the patent in suit would give rise to additional questions and doubts. Thus, it was considered not clear from the disclosure in the specification which NMR signals were to be taken into account. Moreover, the evaluation of the signals to determine the amount of units derived from the diene could only be based on the integration of the NMR spectrum, which incurred a margin of error of about 10%. It was further argued that any such concentration calculated according to the passage on page 6, paragraph 1, would yield an average, but that it was not evident that this average would necessarily apply to the arbitrarily selected area "A".

The Respondents concluded that the skilled reader was left alone to find out in which way the peripheral parameter " C_i " was to be accurately measured.

- (iii) According to the Respondents, the specification also lacked sufficiency with respect to the controlling of the parameters. In particular, it was not credible to them that each of the three parameters used to define the claimed product, ie

average particle size, peripheral parameter and relaxation time, could be controlled separately by the only two measures originally described, ie the velocity of agitation and the temperature in the devolatilisation treatment (patent in suit: page 4, line 57 to page 5, line 1). Thus, whilst the methods of preparation of the rubbery polymer and of the claimed resin composition were not particularly limitative and the latter included equally the batchwise or continuous methods of emulsion, bulk, solution and suspension polymerisation (page 3, lines 27 to 29 and, more particularly, lines 37 to 45), it was, however, known to the skilled person that the particle size and structure of the rubber particles depended on these methods. Thus, these characteristics of rubber particles prepared in emulsion polymerisation were fixed before the particles were added to the reaction mixture for the emulsion polymerisation of the styrene polymer and they would not be significantly changed by the agitation during that polymerisation or by the devolatilisation temperature which only had an influence on the degree of crosslinking. The other polymerisation methods, on the contrary, which started from solutions of the rubber in the styrene monomer, included a phase inversion during the polymerisation of the styrene monomer, and it was only then that the rubber particles formed according to the conditions in the reaction mixture at that time.

- (iv) Apart from the discussion about the "C₁" value, the Respondents argued that the method of determination of the relaxation time T₂ was insufficient in that it was based on a device which had already been outdated on the filing

date. This would render it more or less impossible for the skilled reader to repeat these measurements, because the old device, ie the 90 MHz NMR machine, was no longer available nor, if available by chance, supported by their producers. Similarly, the Hahn echo method was considered outdated.

IX. According to its written submissions, the Appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of Claims 1 to 6 of either the main request or the first auxiliary request, according to "Annex A" and "Annex B", respectively, enclosed with the decision under appeal, or on the basis of the second auxiliary request submitted on 29 April 1999.

The Respondents requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.
2. *Procedural matters*
 - 2.1 Since the three requests differ from each other in the limits of the ranges of two parameters only, but not with respect of the parameters as such, they can be dealt with together. This is, in particular, true for the peripheral parameter "C₁" the definition of which was the basis for the revocation in the decision under appeal.
 - 2.2 During the oral proceedings, reference was made to D11. Having regard to the facts that this document was published at some time during 1989, that the patent in

suit claims a priority of 31 March 1989 and that no evidence had been provided as to what in fact had been made available to the public during the symposium in 1987, from which D11 was - according its front page - "developed", the Board has decided not to take this document into account, because it has not been proven that its content is state of the art in accordance with the definition in Article 54(2) EPC.

3. *Wording of Claim 1 and passages in the description relevant to its interpretation*

3.1 Claim 1 of the main request relates to a composition comprising

- (a) a continuum of a matrix phase of a styrene-based resin, which is selected from homopolymers of aromatic monovinyl monomers and copolymers of two or more aromatic monovinyl monomers, and
- (b) a particulate phase of a diene-based rubbery polymer dispersed in the said matrix.

The particles of the said rubbery polymer are further defined in the claim to have

- (1) an average particle diameter in the range of from 0.08 to 1.00 μm ,
- (2) a peripheral parameter, as defined in the description, in the range from 0.1 to 2.5 $(\mu\text{m})^{-1} \cdot (\% \text{ by weight})^{-1}$ and
- (3) a relaxation time T_2 , as defined in the description, in the range from 300 to 2000 μ seconds.

3.2 As the decision under appeal focuses on the sole question whether the "peripheral parameter" is disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (Article 100(b) EPC), the Board will also concentrate on this feature.

3.3 Since the claim refers to the description rather than defining the methods of determination of the parameters, the relevant passages have been taken into consideration for the interpretation of the claim.

3.4 The description of the patent in suit contains the following relevant passages:

(I) "The peripheral parameter here implied is a value obtained from a transmission-type electron microscopic photograph showing the state of the dispersed rubber particles in the matrix of the styrene-based resin. Namely, the value is obtained from the total of the peripheral lengths of the rubber particles in a unit area given in the unit of $(\mu\text{m})^{-1}$ divided by the content of the rubbery polymer in the composition given in the unit of % by weight" (page 4, lines 45 to 49).

(II) "(4) Average diameter of rubber particles

A transmission-type electron microscope was used to take a photograph showing the dispersion of the rubber particles in an ultrathin section of the composition having a thickness of $0.1 \mu\text{m}$ as prepared by using an ultramicrotome from the composition stained with osmium tetroxide. The diameters D_1 in μm of the image profiles on the photograph of at least 1500 rubber particles

having a diameter of 0.02 μm or larger were determined by using an image analyzer and the area-average particle diameter D_s in μm was calculated by using the equation

$$D_s, \mu\text{m} = (\sum n_i D_i^3) / (\sum n_i D_i^2),$$

in which n_i is the number of the particles having a diameter of D_i μm . The particle diameter here implied is the largest distance between any two points on the circumference of the image of a rubber particle.

(5) Peripheral parameter C_i

An electron microscope photograph was taken in the same manner as above and the overall value L in μm of the peripheral lengths of the images of the rubber particles within an area of A μm^2 was determined by using an image analyzer to calculate the peripheral density C_d in $(\mu\text{m})^{-1}$ which is given by $C_d (\mu\text{m})^{-1} = L/A$.

Separately, the concentration of the dienic constituent in % by weight in the resin composition was determined by the ^{13}C -NMR spectrometry ... from which the concentration of the dienic constituent in % by weight in the sample was calculated from the comparison of the integrated intensities of the signals in the spectrum inherent to the styrene and the diene moiety.

The peripheral parameter C_i in $(\mu\text{m})^{-1} \cdot (\% \text{ by weight})^{-1}$ is given as the ratio of the peripheral density C_d in $(\mu\text{m})^{-1}$ to the above-mentioned content of the dienic constituent in % by weight" (page 5, line 43 to page 6, line 11).

3.5 On page 4, line 53 *et seq.*, reference is made to the effects of the mandatory parameters of the composition according to Claim 1, ie average particle diameter, peripheral parameter and relaxation time. If the latter two are outside the respective ranges as defined in Claim 1, the impact strength of a shaped article of the resin composition may not be high enough. The passage also refers to the way by which they may be controlled: "Each of these three parameters can be controlled by appropriately selecting the velocity of agitation in each of the series of the reactors and the temperature in the devolatilization treatment of the polymerization mixture discharged out of the last reactor in the series."

In the examples, the reaction temperatures and the agitation by means of stirrers having anchor-type blades in a sequence of three reactors having a capacity of 7.8, 11.0 and 11.0 l, respectively, are numbered in terms of degrees Celsius and revolutions per minute, respectively. Some examples (Examples 1, 5 and 6 of the original version) also give the extent of conversion of the reactants at which the reaction mixtures were discharged from the first and third reactors, respectively. Finally, the pressure and the temperatures in the devolatilisation step are disclosed.

3.6 According to page 3, lines 37 to 45, the claimed composition may be prepared by "any of the conventional methods used in the preparation of rubber-modified styrene-bases resin compositions" including batchwise and continuous methods of emulsion, bulk, solution and suspension polymerisation, as referred to by the Respondents during the oral proceedings (see section VIII(iii), *supra*).

4. *Sufficiency of disclosure*

All references to an Appellant's letter in this section relate to the letter dated 13 July 1995, unless otherwise stated.

4.1 In the course of the present opposition and appeal procedures, the objection under Article 100(b) EPC, raised by the Opponents and Respondents, respectively, has, to a large extent, been based on questions about the meaning of the basic measurements for the calculation of "C₁", ie "L", "A" and the "content of the dienic constituent". That the parameter "C₁" was newly formulated by the Appellant has not been in dispute between the parties.

4.2 According to the Respondents, their objections raised with respect to this new parameter were twofold: First, the skilled reader could not properly evaluate whether a given product fell within the scope of Claim 1, because the specification by itself did not provide all the necessary information about the meaning of "L", "A" and the "dienic constituent". Secondly, it was not clear from the specification which process features were to be carried out in order to provide a product meeting all the requirements defined in Claim 1 (see sections VIII(ii) and VIII(iii) *supra*).

4.3 Although, *prima facie*, the questions concerning the meaning of "L", "A" and "dienic constituents" may constitute objections falling to some extent under Article 84 EPC which is not a ground of opposition (cf. Article 100 EPC), the Board considers them to be objections to be decided under Article 100(b) EPC ("in a manner sufficiently clear and complete") in accordance with established jurisprudence (see Case Law, 3rd ed., 1998, Chapter II. A., sections 1 to 7, in particular 6.1 and 6.2). Thus, in T 123/85 of

23 February 1988, it was required that the application documents contained all essential features necessary for the skilled person to put the teachings of the patent in suit into effect. In T 435/91 (OJ EPO 1995, 188) it was held, that the available information had to enable the skilled person to achieve the envisaged result within the whole ambit of the claim containing the respective functional definition without undue difficulty in order to meet the requirement of sufficient disclosure.

4.4 During the opposition proceedings, particular emphasis was put by the Patentee on a specific range of the peripheral parameter, when, regarding D1 (identified there as Opponent 03's D4), it was stated that "it [ie D1] does not disclose or suggest *the most important essential feature of the present patent invention* that the rubber particles have a peripheral parameter of from 0.1 to 2.5 (μm)⁻¹ (% by weight)⁻¹ ..." (Appellant's letter: page 22, paragraph 5 and page 4, lines 1/2; emphasis added by the Board). In this letter, the Patentee also emphasised that "Table 1 in the present patent specification demonstrates that when only the peripheral parameter is outside the limit, the impact strength of the product is extremely low". This importance and criticality was further stressed by reference to Declaration III (Appellant's letter: page 4, lines 21 to 23; page 5, lines 12 to 19):

Data from Table 1 or Declaration III	average diameter	C ₁	T ₂	surface gloss	Planar impact strength	melt flow
Comp.Ex. 3	1.25	0.07	1820	83	0	3.5
Comp.Ex. 4	0.06	3.47	1710	99	0	3.8
Declaration III	0.96	0.07	1780	88	0	3.6

These experiments demonstrate that at least the planar impact strength is severely affected by the " C_i " values of the respective compositions, and the technical problem underlying the patent in suit (to obtain "a good balance between impact strength and gloss", patent in suit: page 2, lines 28/29 and 40/41) is only overcome if the value of this parameter is in line with the range of values given in Claim 1.

4.4.1 It follows from this finding, that the definition of the peripheral parameter " C_i " in the description of the patent in suit must be such that the skilled person can apply it, together with the other two parameters specified in Claim 1, reliably to identify those compositions which will solve the relevant technical problem by exhibiting the required balance between impact strength and surface gloss.

4.4.2 In particular, the description of how the parameter " C_i " is measured must contain all the information necessary to generate the corresponding appropriate values of " C_i ".

4.5 It is, however, conspicuous to the Board, that there is an inconsistency in the definition of the area "A" used in the calculation of " C_i " as between the disclosure of the patent in suit itself, on the one hand, and Declaration II, offered by the Appellant in response to the criticism, by the Respondents, of lack of sufficiency, on the other.

4.5.1 In particular, it is explicitly stated in the Declaration that, in the determination of the overall peripheral length "L" of the rubber particles in area "A", the number of rubber particles analyzed was 1500 or more (page 3, lines 3/4). This means that the area "A" is set large enough to accommodate at least 1500 rubber particles in the TEM image evaluated by means of

the image analyzer. Further according to the Declaration, rubber particles having a particle size of at least $0.02 \mu\text{m}$ are to be analyzed and measured (page 3, lines 4 to 6), ie, in other words, particles below $0.02 \mu\text{m}$ in size are ignored and do not contribute to the determination of "L".

4.5.2 In the description of the measurement of the parameter "C₁" in the patent in suit, in contrast, whilst mention is made of the "overall value L in μm of the peripheral lengths of the images of the rubber particles within an area of $A \mu\text{m}^2$ ", no requirement is made to the number of particles requisite to be present in such an area, or to the minimum size of any such particles necessary to qualify them for contributing to the measurement of the overall length "L".

4.5.3 It follows from the absence of limitation in these respects that the number of rubber particles and hence the area "A" is arbitrary. This in turn means, as pointed out by Respondent 03 during the course of the oral proceedings, that in principle only a very small number of particles, indeed even a single particle of any size (even below $0.02 \mu\text{m}$) could be chosen, and the area "A" in which this particle was found could be determined accordingly.

It is furthermore evident from even a cursory glance at the pictures of assemblies of such particles (so in Figure 2 of D1 or in Figure C submitted with the Appellant's letter), that the size of individual particles varies by at least one order of magnitude, and some of the smallest particles are surrounded by the largest free area.

Clearly, under such conditions of freedom of choice of particle populations and area "A", the resulting values of both "L" and "A" are not subject to any sensible

limitation. In particular, it is self-evident that they could equally vary by an order of magnitude, depending on which particle or which group of particles was chosen.

4.5.4 The Board has considered whether, in view of the crucial significance for the resulting value of " C_1 ", the definition of the way of measuring "L" and "A" in the patent *in suit* should not be understood in any case as implying the limitation to a population of at least 1500 particles having a particles size of 0.02 μm or greater, as is evidently necessary to obtain a relevant effect according to the additional details given in Declaration II. Whilst it is true that such limitations are stated explicitly to apply to the measurement of the parameter "(4) Average diameter of rubber particles" in the patent *in suit* (page 5, lines 43 to 54), the Board accepts the argument of the Respondents at the oral proceedings that, although the definition "(5) Peripheral parameter C_1 " on page 5, lines 55 to 59, immediately follows the definition (4); it cannot be regarded as grammatically subordinate to such previous definition nor, therefore, as to be read as incorporating its limitations. On the contrary, whilst the latter definition states that "An electron microscope photograph was taken in the same manner as above ...", there is no suggestion that it was evaluated in the same manner. Nor would this be expected, since the crucial "area of $A \mu\text{m}^2$ " referred to is not mentioned in the previous definition.

4.5.5 The Board has also considered whether the definition (5) should be regarded as implying the relevant limitations described in Declaration II as something which would have been "read into" the definition by the skilled person, on the basis of his common general knowledge. The Board has, however, come to the conclusion that the Appellant is not entitled to any

such "benefit of the doubt". This is because the "peripheral parameter C_1 " is admittedly a newly formulated parameter, the precise significance of which does not relate in a simple way to any more conventionally known parameter such as ordinary particle size.

4.5.6 It is precisely in the case of claimed subject-matter relying on such a newly formulated and, hence, unfamiliar parameter to define the solution of a technical problem by which a relevant effect is achieved, that the applicant or patentee, who has the duty of making a full and fair disclosure of his invention to the public (Article 83 EPC), is under a particular obligation to disclose all the information necessary reliably to define the new parameter not only (i) in a formally correct and complete manner such that its values can be obtained by a person skilled in the art without undue burden, but also (ii) in a manner which reliably retains the validity of the parameter for the solution of the technical problem for the application or patent in suit as a whole in the sense that the values routinely obtained will not be such that the claimed subject-matter covers variants incapable of providing the relevant effect or, therefore, of solving the associated technical problem (sections 4.4.1 and 4.4.2, above).

4.5.7 Whilst the first of these conditions may be regarded as fulfilled, in the sense that it will presumably be possible to generate a value for "L" and for "A" and hence for " C_1 " in relation to any assembly of rubber particles, however chosen, the second condition is, in the Board's view, not fulfilled. This is because, due to the complete freedom of choice of particle population and hence of "L" and "A", allowed by the

definition (5) in the patent in suit, the value of "C₁" generated by any sample composition is essentially unrestricted.

Put another way, any particular sample containing rubber particles can evidently generate, depending on the population of rubber particles chosen, a series of values for "C₁", some of which will fall within, and some outside, the range claimed for this parameter in Claim 1, whether this is 0.1 to 2.5 (μm^{-1}) · (% by weight)⁻¹ as in the main request and first auxiliary request or 0.3 to 2.0 (μm^{-1}) · (% by weight)⁻¹ as in the second auxiliary request. This in turn means that even samples of rubber particles which, when measured according to the more complete criteria set out in Declaration II, would not fall within the claimed range of "C₁" or, therefore, within the group of samples providing the required combination of gloss and impact strength, would nevertheless be capable, upon choice of a "suitable" individual particle or small group of particles in a chosen area "A", of generating a value of "C₁" which did fall within the claimed numerical range.

4.5.8 In other words, the absence, from the disclosure of the patent in suit, of an essential piece of information regarding the conditions for measuring the peripheral parameter "C₁" means that the ranges routinely obtained for the latter will be such that the claimed subject-matter inevitably covers variants which, according to the evidence of the Appellant itself (section 4.4, above), will be incapable of providing the promised effect of combined gloss and high impact strength or, therefore, of solving the relevant technical problem.

4.5.9 Furthermore, the Board is convinced that the question of whether the requirements of Article 83 EPC are fulfilled in relation to the claimed subject-matter or

whether there is a valid ground for opposition according to Article 100(b) EPC, respectively, can only be answered on the basis of the content of the application as originally filed. Further information cannot be relied upon to heal any deficiencies in the original disclosure (see T 10/86 of 1 September 1988, point 4 of the reasons).

Any addition to or modification of the original disclosure in this respect would result in further information which was not unambiguously derivable from the application as originally filed, would add subject-matter which extended beyond the content of the application as filed and would give an unwarranted advantage to the patentee by obtaining patent protection for something he had not properly disclosed on the date of filing contrary to Article 123(2) EPC.

Therefore, the various declarations submitted during the opposition proceedings before the EPO, ie after the filing date of the application, cannot remedy the deficiencies of disclosure and cannot be taken into account in favour of the Appellant.

4.5.10 In summary and following the principles laid down in T 435/91 (*supra*), the terms of Claim 1 of all requests are such that the relevant effect is not available over the whole range claimed. The disclosure must in this respect be regarded as insufficient in the sense of Article 83 EPC.

4.6 Since the disclosure of the patent in suit is insufficient in this respect, it is consequently not necessary for the Board to consider in further detail, whether the disclosure might also be insufficient in one or more of the other numerous respects additionally put forward by the Respondents, for instance: the meaning of "peripheral" and of "dienic constituent",

the determination of the rubber content, the morphology of the rubber particles, the treatment of the samples prior to the taking of the TEM photograph, the photographic measures, the device used and the method applied in the evaluation of the photograph, the separate control of the three parameters required in Claim 1 by only two process features, ie velocity of agitation and devolatilisation temperature, or the determination of the relaxation time T_2 .

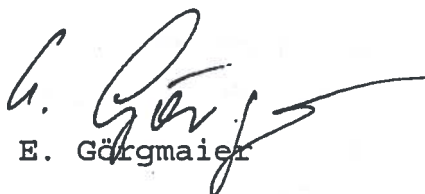
- 4.7 Since, furthermore, the insufficiency applies to the definition of the peripheral parameter *per se* which means equally all the requests of the Appellant, there is no need for the Board to examine the first and second auxiliary requests separately, since they equally suffer from the fatal defect of the main request.
5. For these reasons, the Board comes to the conclusion that the patent in suit does not comply with the requirements of Article 83 EPC and, therefore, in accordance with Articles 100(b) and 102(1) EPC, none of the requests of the Appellant is successful.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:


E. Görgmaier

The Chairman:


R. Young