Internal distribution code:

(A) [-] Publication in OJ
(B) [-] To Chairmen and Members
(C) [-] To Chairmen
(D) [X] No distribution

Datasheet for the decision of 30 July 2015

Case Number: T 0555/12 - 3.3.09

Application Number: 01958213.9

Publication Number: 1317501

IPC: C08J5/24, C08J5/04

Language of the proceedings: EN

Title of invention:
FLEXIBLE POLYMER ELEMENT AS TOUGHENING AGENT IN PREPREGS

Patent Proprietor:
CYTEC TECHNOLOGY CORP.

Opponent:
Neumann, Nicole

Headword:

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

Keyword:
Sufficiency of disclosure - (yes)

Decisions cited:
T 0544/12, T 0323/13

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern
Boards of Appeal
Chambres de recours

European Patent Office
D-80298 MUNICH
GERMANY
Tel. +49 (0) 89 2399-0
Fax +49 (0) 89 2399-4465

Case Number: T 0555/12 - 3.3.09

D E C I S I O N
of Technical Board of Appeal 3.3.09
of 30 July 2015

Appellant: (Patent Proprietor)	CYTEC TECHNOLOGY CORP. 300 Delaware Avenue Wilmington, Delaware 19801 (US)
Representative:	Cockerton, Bruce Roger Carpmaels & Ransford LLP One Southampton Row London WC1B 5HA (GB)
Respondent: (Opponent)	Neumann, Nicole Nymphenburger Str. 127 80636 München (DE)
Representative:	Haggenmüller, Christian Maiwald Patentanwalts GmbH Elisenhof Elisenstraße 3 80335 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 22 December 2011 revoking European patent No. 1317501 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	W. Sieber
Members:	N. Perakis
	D. Prietzel-Funk

Summary of Facts and Submissions

I. This decision concerns the appeal filed by the patent proprietor against the decision of the opposition division to revoke European patent No. 1 317 501. The patent was granted with 28 claims. Claim 1 reads as follows:

"1. A support structure comprising a flexible polymer element in combination with reinforcing fibres for use in a curable composition with a resin matrix component wherein the flexible polymer element is in solid phase and adapted to undergo at least partial phase transition to fluid phase, by solution on contact with the resin matrix component of the curable composition in which the polymer is soluble at a temperature which is less than the temperature for substantial onset of gelling and/or curing of the curable composition characterised in that phase transition to fluid phase is by solution of the soluble polymer in the resin matrix component,
wherein the matrix resin is curable and is selected from the group consisting of an epoxy resin, an addition-polymerisation resin, especially a bis-maleimide resin, a formaldehyde condensate resin, especially a formaldehyde-phenol resin, a cyanate resin, an isocyanate resin, a phenolic resin and mixtures of two or more thereof, and
wherein the flexible polymer element comprises at least one polyaromatic sulphone comprising ether-linked repeating uints, optionally additionally comprising thioether-linked repating units, the units consisting of

$$-(PhAPh)_n-$$

and

$$-(Ph)_a-$$

wherein A = CO or SO_2, Ph is phenylene, n = 1 to 2 and can be fractional, a = 1 to 4 preferably a = 1, 2 or 3 and, can be fractional and when a exceeds 1, said phenylenes are linked linearly through a single chemical bond or a divalent group other than -CO- or -SO_2- or are fused together directly or via a cyclic moiety, such as acid alkyl group, a (hetero)aromatic or cyclic ketone, amide, imide, imine; and
wherein the flexible polymer element is in the form of a mono or multi fibre, filament, ribbon, or mixtures or weave thereof."

II. Opposition to the patent was raised on the grounds pursuant to Article 100(a) (both novelty and inventive step) and Article 100(b) and (c) EPC.

The documents filed during the opposition proceedings included the following:

By the opponent
D2: EP 0 311 349 A2; and
D5: EP 0 365 168 A2.

By the patent proprietor
D19: "Epoxy Resins, Chemistry and Technology", 2nd edition, edited by Clayton A. May, Marcel Dekker Inc, 1988, pages 1142-1146; and
D21: H.H. Winter, "Can the Gel point of a Cross-linking Polymer Be Detected by the G'-G" Crossover?", *Polymer Engineering and Science*, 1987, vol. 27(22), pages 1608-1702.

III. The opposition division acknowledged that claim 1 as granted did not extend beyond the content of the application as filed, but revoked the patent for lack of sufficiency of disclosure.

According to the opposition division, neither the temperature for substantial onset of gelling and/or curing of the curable composition, critical for the definition of the functional feature of the flexible polymer element, nor a method for its determination were defined in the patent. Since different methods led to different gelling temperatures, depending on the method used, a flexible polymer element could or could not undergo at least partial phase transition to fluid phase at a temperature which was less than the temperature for substantial onset of gelling and/or curing of the curable composition. Thus the skilled person did not know whether he was working within or outside the scope of the claim, with the consequence that the invention was insufficiently disclosed.

IV. On 1 March 2012 the patent proprietor (in the following the appellant) filed an appeal against the decision of the opposition division. The statement setting out the grounds of appeal was filed on 1 May 2012 and included auxiliary requests 1-12.

The appellant requested that the decision of the opposition division be set aside, that the board hold that the patent as granted meets the requirements of sufficiency - in the alternative on the basis of auxiliary requests 1 to 12 - and that the case be remitted to the opposition division for further prosecution.

V. By letter dated 15 November 2012, the opponent (in the following the respondent) filed its observations and requested that the appeal be dismissed.

VI. On 1 June 2015 the board issued a communication in preparation for the oral proceedings.

VII. On 30 July 2015 oral proceedings were held before the board in the absence of the respondent, who had announced that it would not be attending.

VIII. The relevant arguments put forward by the appellant in its written submissions and during the oral proceedings may be summarised as follows:

- The claimed invention was sufficiently disclosed when considering the patent disclosure as a whole and the general technical knowledge of the skilled person.

- On the one hand, there was no need to determine a specific temperature of gelling and/or curing of the curable composition, since there was not a single temperature at which gelling and/or curing took place.

- On the other hand, the temperature for the phase transition of the solid flexible polymer element to fluid phase (ie the temperature at which it dissolved in the curable composition), which should be less than the gelling and/or curing temperature of the curable composition, was determined by the test disclosed in the patent (see paragraph [0178]).

- In view of the wording of the claim and the physical properties of the other constituents of the flexible polymer element disclosed in the patent (see paragraph [0050]), it was obvious that the constituent of the solid flexible polymer element, which would undergo phase transition to a fluid phase by solution in the resin matrix component, referred to the polyaromatic sulphones.

- Furthermore, the patent disclosed that the skilled person was able to determine the solubility of a flexible polymer element by using Raman spectroscopy (see paragraphs [0034], [0184] and [0185]).

- Contrary to the assertions of the respondent, figure B1a of the patent did not show that the claimed invention was insufficiently disclosed. What it actually illustrated was that during phase transition of the flexible polymer element and during gelling/curing of the resin matrix component, there was an inverse relationship between time and temperature. On the basis of this figure, the skilled person would understand that, no matter what temperature was used for each of these process steps, the resin matrix would be far from completely cured and/or gelled by the time the solid flexible polymer element dissolved in the resin matrix.

- The determination of suitable "flexible polymer element/resin matrix component pairs" did not put an undue burden on the skilled person. There was no requirement for the skilled person to carry out every possible experiment on a theoretical basis. On the contrary, as a practical person looking from a real-life point of view, he would realise that the disclosure of the patent was sufficient to allow him to put the invention into practice across the full scope of the claim. So, he would start from selecting a single flexible polymer element and, following the instructions given in the experiments of the patent; he would determine which flexible polymer element/resin matrix

component pair satisfied the set functional requirement. Resin matrix components were specified in claim 1 and were of well-known types. D19 disclosed that much research had been carried out on the gelling and/or curing of such resin matrix components. Thus, selecting an appropriate resin matrix component was a matter of routine for the skilled person.

- Furthermore, the patent comprised examples of flexible polymer element/resin matrix component pairs which fulfilled the functional feature of phase transition from solid to fluid before the onset of gelling and/or curing of the resin matrix component. The respondent failed to provide even a single example of a flexible polymer element which did not dissolve in a resin matrix component of one of the types specified in claim 1.

IX. The relevant arguments put forward by the respondent in its written submissions may be summarised as follows:

- The functional feature regarding the phase transition of the solid flexible polymer element to fluid phase was ill-defined, and the skilled person was not in a position to identify without undue burden those flexible polymer element/resin matrix component pairs which solved the problem addressed in the patent. This was so, because one and the same pair of flexible polymer element/ resin matrix component might comply with the functional feature of claim 1 at a first heating program but might no longer comply with it when changing to a different program.

- Sufficiency of disclosure presupposed that the skilled person was able to obtain without undue burden substantially all embodiments falling within the ambit of the claims. However, the patent failed to provide a concept fit for generalisation which would put the skilled person into a position to reliably identify without undue burden all those embodiments fulfilling the functional requirement. No simple test was available in the patent for determining whether a given pair of flexible polymer element/resin matrix component complied with the functional feature or not.

- There were more or less an infinite number of different curing conditions the skilled person might use for curing one and the same resin matrix component. Testing all these curing conditions for a given pair of flexible polymer element/resin matrix component, so as to verify whether the solubility requirement of claim 1 was met, amounted to an undue burden.

- No solubility of a flexible polymer element in a resin matrix component did not mean that the same element might not dissolve in another resin matrix. So, the skilled person had to test a huge number of different curing conditions with another resin matrix component so as to verify whether the flexible polymer element did or did not dissolve in this resin matrix component. This also amounted to an undue burden.

- The wording of claim 1 did not specify which polymer of the flexible polymer element was to be dissolved in the resin matrix component. In

addition to polyaromatic sulphones, the flexible polymer element might contain a number of other polymers.

- Even if it was assumed that the polyaromatic sulphones were the soluble polymer referred to in claim 1, the test disclosed in paragraph [0178] of the patent did not help the skilled person to identify without undue burden those flexible polymer elements which complied with the functional feature of claim 1. A single fibre was used in that test, the diameter of which was not specified, despite the fact that the solubility properties of the flexible polymer element would be significantly affected by the fibre diameter chosen.

- Claim 1 did not include the specific curing conditions of paragraph [0178] of the patent. However, testing a more or less unlimited number of different curing conditions so as to verify whether the flexible polymer element did or did not dissolve at any of these potential curing conditions amounted to an undue burden.

- With regard to the measurement of the temperature for substantial onset of gelling, the appellant had submitted before the opposition division documents D19 and D21, which determined the gel temperature exclusively isothermally. How the skilled person might reliably determine this temperature under non-isothermal test conditions, such as continuously heating up the flexible polymer element/resin matrix component pair described in paragraph [0178] of the patent, was completely unknown. Moreover, there was no

indication in the patent which temperature was considered to be the temperature for substantial onset of gelling and/or curing when using non-isothermal curing conditions. In the absence of all this information, the skilled person was unable to reproduce the claimed subject-matter without undue burden.

- The appellant had not addressed the issues of
(a) what the difference was between gelling and curing,
(b) which the temperature was for substantial onset of curing and/or gelling, and
(c) how this temperature was measured.

X. The final requests of the appellant were identical to those submitted with the statement setting out the grounds of appeal.

The respondent requested in writing that the appeal be dismissed.

Reasons for the Decision

1. The only issue to be dealt with in this decision is the sufficiency of disclosure of the invention in relation to the subject-matter of the various requests.

According to the case law of the boards of appeal of the EPO, in order to determine whether the disclosure of a patent meets the requirements of Article 83 EPC it is necessary to consider the disclosure as a whole and with the benefit of the common general knowledge of the skilled person.

2. Background of the invention

The skilled reader of the patent is taught from paragraphs [0001] to [0020] that it was well known in the art to make fibre-reinforced composites. Such composites comprised reinforcing fibres embedded in a cured resin matrix. In particular in the preparation of composites for use under stringent conditions, there was a problem in ensuring that the curable composition completely penetrated the interstices between the reinforcing fibres and ensuring that all gases were expelled before the curable composition was cured.

Moreover, for a high quality composite, it was necessary to ensure that the reinforcing fibres were held in the correct orientation before and during the injection of the curable composition into the preform. There were proposals for ensuring that the fibre reinforcements were held in the correct orientation, but these led to further difficulties.

3. The invention

3.1 The prior art having been discussed in paragraphs [0001] to [0020] of the patent, the general idea underlying the present invention is set out in paragraph [0022], where it is stated that:

"We have moreover found a way to provide a support structure or carrier for a curable composition comprising a flexible polymer element in which fibres are held in a desired configuration, without use of a mould, by the element, which dissolves and disperses in the curable composition prior to or at the start of the curing process".

This concept is also set out in paragraphs [0027] and [0032], where it is stated that:

"[0027] We have now surprisingly found that flexible polymer elements may be provided in the form of fibres and the like, which are useful for stitching, which dissolve in the curable composition".

"[0032] The flexible polymer element is adapted to dissolve during the preliminary stages of the curing process, during temperature ramping to the temperature for onset of gelling and/or curing, whereby the composition is held in desired configuration by the flexible polymer element until the curable component viscosity increases, obviating the need for support by the flexible polymer element or by the mould".

3.2 Thus, the invention underlying granted claim 1 concerns a support structure (also called carrier in the description, see paragraphs [0078] and [0080]) for use, ie which is suitable to be used, in a curable composition containing a resin matrix component. The support structure comprises a flexible polymer element in combination with reinforcing fibres.

4. The insufficiency objection

The point on which the opposition division decided that the patent lacks sufficiency of disclosure relates to the flexible polymer element and its definition. Thus, it will have to be examined whether the patent in suit contains all the necessary technical information which, combined with the general technical knowledge of the skilled person, enables him to put the flexible polymer element into effect. In order to deal with this

question, it is necessary to analyse the features defining the flexible polymer element.

5. The flexible polymer element

5.1 As set out above, the concept of the invention is that the flexible polymer element should be chosen such that, in use, it dissolves in the curable composition before the onset of curing. In order to describe this concept, claim 1 uses both structural and functional features to define the flexible polymer element.

In general, the definition of a component of a product claim (in the present case the flexible polymer element) by both structural and functional features is acceptable under Article 83 EPC as long as the skilled person is able to identify,without undue burden, those components out of the **host components** defined by the structural features in the claim which also fulfil the claimed functional requirement(s) (e.g. T 544/12, point 4.2 of the reasons; T 323/13, point 7 of the reasons - neither of them published in the OJ EPO).

5.2 The structural features used for the definition of the flexible polymer element are the following:

- the flexible polymer element is in solid phase;

- the flexible polymer element comprises at least one type of polyaromatic sulphone as set out in claim 1; and

- the flexible polymer element is in the form of a mono- or multifibre, filament, ribbon, or mixtures or weave thereof.

As pointed out by the appellant, polyaromatic sulphone polymers were available at the priority date of the patent. And indeed no sufficiency objection was raised as regards the structural features of the flexible polymer element.

5.3 The functional feature used for the definition of the flexible polymer element reads as follows (highlighted by the board):

> "... **the flexible polymer element** is in solid phase and is adapted to undergo at least partial **phase transition to fluid phase**, by solution on contact with **the resin matrix component** of the curable composition in which the polymer is soluble at a temperature which is less than **the temperature for substantial onset of gelling and/or curing** of the curable composition ...".

In the following it will have to be examined whether the components of the functional feature (as highlighted above) are so defined that they do or do not allow the skilled person to put the functional feature into practice.

The resin matrix component

5.3.1 As regards the resin matrix component, which according to claim 1 is curable and is selected from a group of certain resins, it is not a structural part of the claimed support structure. The link between the flexible polymer element and the resin matrix component is to be found in the wording at the beginning of claim 1 "... for use in a curable composition with a resin matrix component ...". It is well established that "for use" simply indicates that the flexible

polymer element must be "suitable" for use in combination with a resin matrix component. The claim does not require the presence of a resin matrix component. All that is required for the flexible polymer element of claim 1 is that it is suitable for use with a resin matrix component specified later in claim 1. The respondent has not shown that any of the flexible polymer elements as defined in claim 1 is unsuitable for this use. Thus this component of the functional feature cannot be objected to for insufficiency.

The temperature for substantial onset of gelling and/or curing

5.3.2 The point on which the opposition division decided that the patent failed to meet the requirements of sufficiency related in particular to "the temperature for substantial onset of gelling and/or curing" referred to in the functional feature of the flexible polymer element. The opposition division apparently took this to mean that the exact temperature at which there is substantial onset of gelling and/or curing had to be determined. Furthermore, it acknowledged that one and the same curable composition could be cured at different temperatures. The latter position already raises doubts as to whether claim 1 requires an exact temperature at which there is substantial onset of gelling and/or curing.

5.3.3 As the appellant explained during the oral proceedings before the board, the temperature at which there is substantial onset of gelling and/or curing is the temperature at which the curable composition loses its liquid character and begins the transformation to a cured composite. This is illustrated in figure 50 of

D19. The appellant also explained that the skilled person would consider the terms "gelling" and "curing" as equivalent. The board did not have any reason to doubt this explanation.

5.3.4 The temperature for substantial onset of gelling and/or curing of a curable system is indeed not a single temperature at which gelling and/or curing of any curable composition would be expected to take place. As shown in figure B1a of the patent, curing of a particular curable composition was effected at temperatures between 100 and 140°C. In other words, one and the same curable composition was cured at 100, 110, 120, 130 and 140°C. At the same time, this figure shows the time/temperature relationship for a curable composition: it takes longer for the same composition to cure at lower temperatures than at higher temperatures.

5.3.5 This is consistent with the skilled person's common general knowledge as disclosed in D19. D19 is an extract from a textbook on the subject of epoxy resins, one of the resin matrix components of the claimed invention, published shortly before the priority date of the patent. Figure 51 on page 1145 shows that the rate at which the viscosity of a resin increases during curing (ie the rate at which the molecular weight increases) depends on both the time and the temperature at which the curing is effected. A curable composition at 180°C approaches effectively infinite viscosity (i.e. the composition is cured) after 10 minutes, whereas at 130°C the same curable composition is not cured until after 130 minutes. This shows that the point at which the composition cures depends both on temperature and on time.

5.3.6 This is also consistent with real-life practice. It was well known to the skilled person that each operator of a process for producing a composite would have operated this process under conditions he considered appropriate for the particular composite he was producing. One operator might have chosen to cure a curable composition by heating it to a first temperature at a first rate and then holding it at that temperature for a first time. A second operator might have chosen the same curable composition but might have chosen to cure it by heating it to a different temperature, perhaps at a different rate, and maintaining the curable composition at the final temperature for a different time. The skilled person would have used the known curing properties of curable compositions to enable him to design his process for producing his cured composites.

5.3.7 Also, by reading paragraphs [0142] to [0146] of the patent the skilled person would have been reinforced in his understanding that claim 1 does not require the determination of a single temperature at which the curable composition cures. In paragraph [0142], information is given about the ranges of times and temperatures used to effect phase transition (ie dissolution of the flexible polymer element). It can be seen that the broadest temperature range suggested for phase transition is up to 300°C and the time range suggested is up to 45 minutes. In contrast, it is indicated in paragraph [0146] that, for gelling and/or curing, the temperature range suggested is 180°C to 400°C and the time range suggested is from 1 to 4 hours. Thus, taking into account the above-mentioned inverse relationship between time and temperature, if a curable composition is to be cured at 400°C, the time taken to effect curing will be of the order of 1 hour.

If the cure temperature is to be 180°C, the time to effect curing will be of the order of 4 hours. Similarly, if phase transition is to take place at 300°C, the time required will be of the order of a few minutes, whereas phase transition at 60°C will take up to 45 minutes. The skilled person would have seen from this that, whatever temperature is used for curing, the curable composition will be far from completely cured by the time the polymer has dissolved. This again is in conformity with the teaching in paragraphs [0022], [0027] and [0032] of the patent.

5.3.8 The above is in agreement with the concept on which the claimed invention is founded, namely the provision of a flexible polymer element comprising a polyaromatic sulphone, which can remain in solid form, in the absence of curable composition, for as long as required, so that it can maintain the orientation of the fibre reinforcement in the preform prior to the application of the curable composition which will be used to form the cured composite. Once the curable composition has been applied and heating of the composition begins, the flexible polymer element begins to dissolve in the curable composition. As noted in paragraph [0180] of the patent, the fibre [ie the flexible polymer element] slowly dissolved as the temperature of the mould was increased to the final cure temperature.

Phase transition to fluid phase

5.3.9 The functional feature in claim 1 requires the flexible polymer element to undergo at least partial phase transition to fluid phase, by solution on contact with the resin matrix component of the curable composition at a temperature which is less than the temperature for

substantial onset of gelling and/or curing of the curable composition.

5.3.10 As set out in points 5.3.7 and 5.3.8 above, the patent teaches in paragraphs [0146] and [0180] that the temperature at which the flexible polymer element dissolves in the resin matrix component is well below the final cure temperature.

5.3.11 The patent provides a swift test which can be used to determine whether any particular pair of flexible polymer element/resin matrix component meets the requirements of the claim. This test is disclosed in paragraph [00178]. As can be seen from paragraph [0183], the results shown in figures B1a and B1b were obtained using this test. Carrying out this test is a matter of routine for the skilled person. It merely requires the skilled person to place a polymer fibre (ie the flexible polymer element) on a microscope slide, place the curable composition on the slide, places a second slide on top of the curable composition, and place the slide assembly into a hot stage microscope. The material is then heated according to the conditions specified in paragraph [0178], and the effect of the heating is visually observed. A skilled person would readily be able to see whether the flexible polymer element is dissolving in the curable composition merely by looking to see whether the diameter of the fibre is decreasing. If it is, then the polymer is dissolving. If the polymer fibre disappears completely, it has dissolved completely, as noted in paragraph [0179]. If the fibre is still discernible, the skilled person would know that it has not dissolved.

5.3.12 When carrying out this test, the skilled person has only to determine the time at which the polymer fibre dissolves in the curable composition at any particular temperature. As shown by D19, the skilled person is also able to determine the time at which substantial onset of gelling and/or curing of a curable composition occurs. The skilled person then only has to determine whether the time at which the polymer is dissolved is less that the time at which substantial onset of curing and/or gelling of the curable composition occurs at that temperature. If it is, then this particular pair of polymer fibre/curable resin meets the dissolution requirement of claim 1.

5.3.13 Apart from this hot stage microscope test, the patent refers also to Raman Spectroscopy to verify if dissolution took place or not (see paragraphs [0034], [0184] and [0185]).

5.3.14 Regarding the measurement of the temperature for the onset of gelling and/or curing, the appellant has explained that it could be determined by the standard "Isothermal Multiwave Test (IMT)" method and that the opponent had neither disclosed other methods nor stated that other methods would bring about different results.

Identification of the host flexible polymer element components

5.3.15 With regard to the functional definition of the flexible polymer element, it remains to be examined whether the skilled person is able to identify without undue burden those components out of the host of flexible polymer elements defined by the structural features in the claim which also fulfil the claimed functional requirement.

5.3.16 The respondent argued that the wording of claim 1 did not specify which polymer is to be dissolved in the resin matrix. In addition to the polyaromatic sulphone, the flexible polymer element might contain other polymers, as discussed in paragraph [0050] of the patent. Thus, one of these additional polymers might be soluble in the resin matrix, whereas the polyaromatic sulphone remained insoluble. However, the skilled reader would understand from claim 1 that the term "the polymer is soluble" in claim 1 can only refer to the polyaromatic sulphone of the flexible polymer element. It is the only polymer identified in the context of an at least partially soluble flexible polymer element. This is confirmed by various examples in the patent relating to the production and evaluation of soluble flexible polymer fibres where the soluble polymers comprise polyaromatic sulphones.

5.3.17 It logically follows from the above discussion regarding (a) the functional definition of the flexible polymer element, (b) the temperature of substantial onset of gelling and/or curing, and (c) a temperature which is less than the temperature of substantial onset of gelling and/or curing that it is a matter of routine trial and error experimentation to determine whether any polymer from the structurally defined host of flexible polymer elements is soluble in any of the curable compositions specified in claim 1.

All the skilled person had to do was to see whether the polymer element dissolves in the resin matrix before substantial onset of gelling and/or curing, as referred to in claim 1. This can be achieved using the sort of experiment shown in the patent and discussed above. As pointed out by the appellant, this does not require a vast number of experiments, and was actually

demonstrated in the examples in the patent. Apart from theoretical considerations, the respondent has not provided any evidence to the contrary, in particular no example of a flexible polymer element which meets the structural requirements of claim 1 but does not dissolve in the specified resin matrix component.

5.3.18 As regards the resin matrix component in which the flexible polymer element is soluble, claim 1 specifies a limited number of types of resin matrix components, all of which are of a well-known type. D19 (page 1143, last paragraph), for example, discloses that much research was carried out on the gelling and/or curing of these resin matrices. Thus, the skilled person knows the process conditions for manufacturing the resin matrix components and can select them accordingly.

5.3.19 The respondent argued that the patent failed to provide a concept fit for generalisation which would put the skilled person into a position to reliably identify without undue burden all those embodiments fulfilling the functional requirement. The board is not convinced by this.

Firstly, it is well accepted in the case law that a reasonable amount of trial and error testing is permissible when it comes to sufficiency of disclosure, as long as the skilled person has at his disposal, either from the specification or on the basis of his common general knowledge, adequate information leading necessarily and directly towards success through the evaluation of initial failures (T 14/84, OJ EPO 1984, 105). As set out above, the methodology for determining whether a flexible polymer element having the required structural features also meets the functional requirement is a simple and straightforward test.

Secondly, the patent does indeed provide a concept fit for generalisation, namely that the purpose of the patent is to provide a support structure containing reinforcing fibres and flexible polymer elements which hold the reinforcing fibres in position prior to impregnation with a resin matrix component. The flexible polymer elements are required to dissolve in the resin matrix component before substantial onset of gelling and/or curing. This easy-to-understand concept is reflected by the wording of claim 1.

5.3.20 The respondent's argument seems to be that the patent should have specified every combination of flexible polymer element, resin matrix component and heating program that would work and every combination that would not. However, this is not a requirement of Article 83 EPC. All that it requires is for the skilled person, acting in a rational manner, to be able to put the invention into effect without undue burden.

In the present case, the concept of the invention is clearly set out, as explained above. Taking this concept into account, the skilled person would have started with a specific flexible polymer element and would then have determined whether this concept could be achieved with that flexible polymer element. As set out above, this does not require a vast number of experiments. If it does not work the first time, the way to turn the failure into success is also clearly set out in the patent.

5.4 In summary, given the clear teaching in the patent, especially when read in the light of what has to be acknowledged as the knowledge of the skilled person, the skilled person would have no difficulty in putting the claimed invention into effect.

5.5 Broadness of the claim

5.5.1 Some of the respondent's arguments appear to be based on the objection that the definition, in particular with respect to the solubility requirement for the flexible polymer element, is too broad, which leads to a lack of sufficiency.

5.5.2 The board agrees that the definition of the solubility requirement is indeed very broad. If, for example, the test according to paragraph [0178] of the patent shows no dissolution of a flexible polymer element (A) in a resin matrix component (B), this does not necessarily mean that polymer (A) would not fall within the scope of claim 1. Theoretically, there might be another resin matrix component (C) wherein (A) is soluble, and then (A) would meet the requirement of claim 1. The same argument might apply to the use of different heating regimes.

5.5.3 Apart from the fact that these arguments are based on theoretical considerations, the board cannot see how the "broadness argument" could lead to a lack of sufficiency in the present case. If only the solubility requirement for the flexible polymer element was only fulfilled with resin (C) or a specific heating regime, the skilled person would put the invention into effect using resin (C) and/or this condition.

The patent even teaches that

- different resin matrix components have different dissolving powers (example 5)
- different heating temperatures can be used (paragraph [0142])

- the diameter of the fibre can be varied (paragraph [0045], fibres having a larger diameter could be expected to dissolve slower).

Thus, the skilled person knows that there is some flexibility when implementing the general concept of the invention.

5.5.4 Although the broadness of the definitions in the claim gives the patent proprietor an advantage at first glance, this might no longer be the case when it comes to assessing novelty of the claim. For a specific flexible polymer element disclosed in the prior art in combination with reinforcing fibres, the opponent could choose the conditions according to its liking to show that the disclosed flexible polymer element meets the solubility requirement of claim 1. At the oral proceedings the appellant concurred with this view.

6. Auxiliary requests

Since the main request (patent as granted) is considered to comply with the sufficiency requirements, any discussion of the auxiliary requests regarding this issue is redundant.

7. Remittal

7.1 As already set out in section IV above, the decision under appeal exclusively dealt with the grounds for opposition under Articles 100(b) and 100(c) EPC, whereas the patent had also been opposed for lack of novelty and inventive step under Article 100(a) EPC.

7.2 The appellant requested remittal of the case to the opposition division for consideration of the issues of

novelty and inventive step. In view of this request, the board, exercising its discretionary power under Article 111(1) EPC, decided to remit the case to the opposition 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 opposition division for further prosecution on the basis of the claims as granted.

The Registrar: The Chairman:

M. Cañueto Carbajo W. Sieber

Decision electronically authenticated