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**D E C I S I O N**  
**of 15 November 2000**

**Case Number:** T 0857/95 - 3.2.3

**Application Number:** 86102453.7

**Publication Number:** 0197279

**IPC:** F41H 1/02

**Language of the proceedings:** EN

**Title of invention:**

Complex composite article having improved impact resistance

**Patentee:**

ALLIED SIGNAL INC.

**Opponent:**

ACORDIS AG

E.I. Du Pont de Nemours & Company, Inc.

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 54, 56

**Keyword:**

"Novelty (yes)"

"Inventive step (yes)"

**Decisions cited:**

-

**Catchword:**

-



Case Number: T 0857/95 - 3.2.3

**D E C I S I O N**  
**of the Technical Board of Appeal 3.2.3**  
**of 15 November 2000**

**Appellant:**  
(Opponent I)

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(Proprietor of the patent)

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**Decision under appeal:**

**Interlocutory decision of the Opposition Division  
of the European Patent Office posted 14 August  
1995 concerning maintenance of European patent  
No. 0 197 279 in amended form.**

**Composition of the Board:**

**Chairman:** C. T. Wilson

**Members:** J. du Pouget de Nadaillac  
M. K. S. Aúz Castro

## Summary of Facts and Submissions

I. The appeal is directed against the interlocutory decision dated 14 August 1995 of an Opposition Division of the EPO, which maintained in an amended form the European patent EP-B1-0 197 279 having the priority dates of 29 February and 9 December 1985.

Claim 1 of this patent, as amended, reads as follows:

"A composite article of manufacture comprising a coated fibrous layer adjacent to and in the same plane as a rigid material,

a) the fibers in the fibrous layer having a tensile modulus of at least 160 g/denier and a tenacity of at least 7 g/denier; and

b) each filament of each fiber of the fibrous layer being substantially coated with an elastomeric material which has a tensile modulus (measured at about 23°C) of less than 41.1 MPa (6000 psi)."

According to the above decision, the grounds put forward by the Opponents, namely lack of novelty and inventive step of the subject-matter of the claims, were not convincing regarding the evidence filed by the Opponents.

II. Opponent 01 (hereinafter the Appellant) lodged the appeal, paid the appeal fee on 11 October 1995 and filed a statement of grounds on 12 December 1995.

Opponent 02, also, lodged an appeal, namely on 16 October 1995, paying the appeal fee at the same time, however he withdrew his appeal on 27 November 1995.

III. In the grounds of appeal, the Appellant essentially objected lack of inventive step having regard to two of the prior art documents cited during the opposition proceedings, namely D'3 (DE-A-2 916 745) and D'6 (US-A-3 444 033), and he further filed for the first time evidence concerning a prior use, which in his opinion is novelty-destroying for the subject-matter of Claim 1 (Unsworn declaration of Mr Meffert with invoices, confirmations of order, Ultrax prospects of VERSEIDAG, and Laboratory test report of Mr Daug, respectively referenced B14 to B18).

The Patentee, hereinafter the Respondent, challenged the relevance of the Appellant's arguments and further questioned the admissibility of the late filed evidence of the alleged prior use. He moreover filed further evidence (Attachments 3 to 6).

IV. The present appeal was mainly conducted together with a parallel case, namely the appeal T 279/95, concerning another European patent EP-B1-0 199 019 of the Respondent, the subject-matter of this patent being a slightly different invention and moreover applied to a ballistic resistant article, and not to a composite article. Litigious issues concerning both patents, namely the interpretation of the expression "tensile modulus" and the relevance of the alleged prior use, have led to a lengthening of the proceedings, including postponements of previous planned oral proceedings. It was finally established in the decision T 279/95, dated 17 November 1999, that *inter alia* the expression "tensile modulus" means the Young's modulus and that the alleged prior use, namely the selling by the firm VERSEIDAG-INDUTEX GmbH of antiballistic aramid fabrics ULTRAX® referenced W7630 and W7640 coated with a

NEOPRENE® mixture before the priority dates of EP-B1-0 199 019, is state of the art under Article 52(2) EPC.

During the years 1997 to 1999 and also during September 2000, the parties filed additional evidence.

On 14 September 2000, the Appellant filed "Kunststoff-Lexikon", 1961, pages 108 to 111, referenced B22, and a further declaration dated 8 August 2000 of Mr Veith (document B23).

V. With two letters, respectively dated 16 and 17 October 2000, the Respondent submitted a statement made by Mr Kavesh, the inventor, and concerning *inter alia* tests made on an Ultrax® product of the firm VERSEIDAG referenced W 7660. He further filed four sets of claims as auxiliary requests and a sample A of the tested product.

VI. On 15 November 2000, oral proceedings took place before the Board. During these oral proceedings, the following documents were mentioned:

Filed by the Opponent/Appellant:

D'3: DE-A-29 16 745

D'6: US-A-3 444 033

D'7: High Modulus Aromatic Fibers, pages 145 and 146.

B16: Invoice dated March 1983 and delivery note of the VERSEIDAG INDUTEXT GmbH to the Bavarian firm BMW in Munich.

B20: (first) Unsworn solemn declaration dated 18 August 1997 of Mr Veith from the firm VERSEIDAG INDUTEX GmbH with, as enclosure, a copy of a fax of DuPONT DOW Elastomers GmbH, 12 August 1992.

B22: Laboratory test report of the Institute for the processing of plastics, Rhein.-Westf. technische Hochschule in Aachen (DE), concerning a Neopren GRT® sample.

B23: (third) Unsworn declaration dated 8 August 2000 of Mr Veith.

B24: Kunststoff-Lexikon, Carl Hanser Verlag München 1961, third edition, pages 108 to 111.

Filed by the Patentee/Respondent:

D'12: Statement by Mr H Jackson Knight, Jr., from Du PONT Nemours and Co., concerning the results of tests made on the basis of Example III of D'6 (27 March 1995).

Attachment 4: Enginered Materials Handbook, vol. 1, pages 90 to 96, from the ASM Intern. Handbook Committee.

Attachment 5: Modern Plastics Encyclopaedia, pages 542 to 554.

Attachment 13: Report by Harpell, 15 August 1997, upon comparative tests between high and low modulus elastomeric materials with respect to their ballistic properties.

Attachment 16: Report by Kavesh upon the work of C.E.Morrison et al., "Factors Affecting Ballistic Impact Resistance of Kevlar® 49 reinforced Composites" including the corresponding article by Morrison et al.

VII. The arguments brought forward by the Appellant are as follows:

(a) mainly based on D'6:

This patent literature concerns a lightweight ballistic armour with a laminate base member resistant to delimitation. A plurality of fibrous layers embedded in an elastomeric material are located on one side of a rigid material made of ceramic tiles. The elastomeric material is indeed an epoxy or polyester resin mixed with an elastomer, but in the patent in suit, blends of elastomeric materials also are to be understood under the term "elastomeric material " of Claim 1, as acknowledged by the description. According to column 3 of document D'6, the laminates are made of fiberglass, which are fibers having the tenacity and tensile modulus within the ranges given in Claim 1 of the contested patent, as confirmed by D'7. Thus, this known article corresponds to the subject-matter of Claim 1 of the contested patent; however, this claim contains two further features, namely an upper tensile modulus limit for the elastomer and the coating of each filament of each fiber of the fibrous layer.

As far as the tensile modulus limit is concerned, the evidence D'12, based on Example III of D'6, shows that the particular epoxy resin mentioned in



this example, namely Epon 828® of the Shell Co., inside the laminate has a tensile modulus under the required limit; This was not contested by the Respondent. However, he argued that this example only relates to a masterbatch for impregnation, thus before the curing step, since no curing agent for the epoxy resin is mentioned in it. As a consequence, no curing step for the epoxy resin itself has also taken place in the test according to D'12, explaining the achieved low tensile modulus. These arguments are to be rejected, since a component given in said Example III is zinc oxide. Document B24, page 110, teaches two kinds of curing mechanisms and, in particular, indicates that an epoxy resin can self-cure in the presence of an appropriate catalysator, such as determined metal oxides, and that with temperatures above 160°C. Hence, the zinc oxide together with other cited components, namely sulfur and benzothiale disulfide, act as curing agents in Example III, which moreover indicates that all together they form a non neglectable part of the whole composition. In column 8 of this document, it is clearly stated that both examples II and III are additional masterbatch formulations for preparing the base member of the invention in the manner as described in Example I, which in particular mentions a moulding temperature of 160°C.

As to the coating, it is disclosed in the detailed Example I of D'6 that the impregnation process is continued until 40 percent by weight of the impregnated glass fabric is made up of the solid resin composition. Hence, an intensive coating is disclosed. In the patent in suit, comparatively,

only 10 to 30 percent is preferred. Since, otherwise, the pressing and temperature conditions are almost the same, even higher in Example I of D'6, the same result as in the present invention should be achieved in the coated fibrous layers according to D'6, namely a coating of each filament of each fiber. Claim 1 of the patent in suit merely requires a substantial, and not a complete coating. As further evidence, it can be seen that in Attachment 13, for the sample 25b in Table 2, a coating corresponding to that claimed was reached according to the Respondent, although the conditions of the curing process were more moderate than those of D'6.

Therefore, the subject-matter of Claim 1 is anticipated by D'6.

(b) Considering D'3:

This prior art tackles the same problem as the patent in suit. The solution found is a composite comprising a rigid material, for example made of steel, and adjacent thereto a fibrous layer, which consists of strong fibres either bonded together by means of a binding material, such as a resin of polyester or of elastomer, or firmly ("stoffschlüssig") embedded in a polymer. The same kind of fibre as in the patent in suit is mentioned, namely Kevlar® 29. It is moreover made clear that the resin or elastomer material has to be sufficiently soft, so that the skilled person knows that it has to choose elastomers with a low tensile modulus. The information in D'3 that only a small quantity of curing agents is used is also

found in the patent in suit and it does not change the nature of the elastomeric material.

Claim 1 of the patent in suit indeed gives additionally a precise value for the upper limit of the tensile modulus. However, many current elastomers fall below this limit and, further, this value is to be considered as the result of an arbitrary choice, as shown by Attachment 13: in the comparative tests according to this paper, the only elastomeric materials, which were tested, concern samples 1 to 3 and 5; the tensile moduli of the first three samples are between 100 and 2000 psi, whereas that of sample 5 is about 42000 psi. With such a difference, it is impossible to see any relevance of the claimed upper limit of 6000 psi, and moreover the ballistic properties between sample 3 and sample 5 are not significantly modified.

As to the coating, document D'3 uses the terms "embedded", "impregnation", "resin matrix" and "a firm (stoffschlüssig) binding between the elastomer and the fibres", which all show clearly that what is wanted is a good coating of the fibres, far from a spot bonding. The fact that moreover the fibrous fabric is to be loose for a better impregnation shows that an internal coating is wanted. In the patent in suit, it is indicated that any kind of coating method can be used and there is no disclosure of a method particularly suitable for obtaining a coating of each filament. Novelty of the subject-matter of a claim cannot be obtained by the mere modification of the terms, which are used; even if lack of novelty is not

recognised, then at least the presence of an inventive step is to be denied, since D'3 clearly suggests the two essential features of the present invention, namely the low tensile modulus and the coating requirement.

(c) Considering the prior use:

The VERSEIDAG specimen W 7660, which according to the recently filed statement of the inventor Dr Sheldon Kavesh, was tested, is not a fresh manufactured product, it is a stocked product, and it is known that the stocking of products comprising rubber or the like modifies their properties with time. It is also not a composite with several layers bonded together under pressure and heating, so that it cannot be compared to that claimed. Evidence B16 shows moreover that this specimen is made of yarns having diameters, which are twice these of the materials W 7630 and W 7640, subject-matters of the prior use, so that what is found for W 7660 is not necessarily valid for the prior use products.

Moreover, the test itself is open to criticism. A laminate was produced by a moulding step, thus under pressure and temperature as in the present invention, but by using layers which were already vulcanised. According to B23, such a laminate should have been manufactured on the basis of uncured layers. In the protocol for determining the Young's modulus, it is also not correct to mentally substitute in the sample W 7660 the 81 per cent of Kevlar® by rubber, obtaining then a elastomeric material only made of rubber. The

properties of a fabric is not that of a single one of its components. Moreover, the three-point flexing test and the used formula do not correspond to that of Example 7 of the patent in suit.

For all these reasons, the test and its result, i.e. the tensile modulus obtained therefrom, are to be rejected.

VIII. The Respondent defended the patentability of Claim 1 with the following arguments:

(a) As to D'6:

The object of D'6 is to obtain an armour which is not so heavy as metal armours and also to avoid the permanent deformation of lightweight armours having pure epoxy resin as matrix for the fibrous layers, once this armour has been exposed to the impact of a projectile. Metal and resins have very high tensile moduli, and there is no indication in D'6 that the mixture of resin and elastomer disclosed in this prior art must have a tensile modulus much lower than that of the epoxy resins, which already provide lightweight armours. The solution according to this prior art is merely to blend the resin by an elastomer. It has been proved that, in fact, the elastomeric material of the product according to Example I of this document has a very high tensile modulus and, consequently, it is not credible that, without a good reason, the two other examples would show a much lower tensile modulus. Moreover, the whole content of this prior art requires a cured epoxy

resin. Since Example III does not explicitly mention any of the usual curing agents for the epoxy resin, either is it implicit or the example is incomplete, or even can only concern the masterbatch for impregnation, see lines 21 to 25 of column 8. That it may be implicit results from the advice at the end of column 3 that the epoxy resin employed in the disclosed impregnation process contains one or more well-known epoxy curing agents. These well known curing agents are then listed in the following lines, and zinc oxide is not mentioned therein, whereas in column 4 it is disclosed as an accelerator activator, but only for the elastomer. Therefore, the result of D'12 is irrelevant, since at least based on an incomplete composition. B22 indicates only that metal oxides can assist the curing step, but does not mention which ones, so that zinc oxide is even not cited. Moreover, it teaches that these metal oxides act as catalysator, what means a quick reaction - in a few seconds -, contradictory to the time needed for mixing carefully the ingredients of the masterbatch of Example III.

This document also says nothing about coating requirements, so that it is not possible to know whether the filaments of each fibre are coated or not. The weight percentage of the elastomeric material is quite irrelevant in this respect, as well as the number of dipping steps of the fabrics into the elastomeric solution. Important, however, are the conditions selected by the skilled person, once he knows that each filament has to be coated. To achieve this result, he can for example bring the fibres of the yarns of a woven fabric into an

appropriate loose condition. In D'6, this is not disclosed or suggested, since it is not possible to have the fibres opened and simultaneously - by dipping the fabric into the solution - to increase its thickness, as required in the manufacturing process disclosed in Example I and said to be common to all examples of this prior art.

(b) As to D'3:

The disclosure of this patent specification is too vague, particularly as to the wanted degree of impregnation and the softness of the elastomeric material. The mere fact that a fibrous fabric is impregnated, does not mean that each filament of each fibre is coated. D'3 provides no teaching on the coating method, leaving open the questions as to the kind of fabric employed, whether it is made only of fibres or of yarns, and which result is obtained. The obtained coating can greatly vary when yarns are used instead of fibres. The indication that a "sufficiently soft resin is manufactured with merely a slight addition of a hardening agent" does not make clear whether the resin is soft before or after the curing step, and it could occur that, with a slight proportion of curing agent, the elastomeric material, once cured, is no more an elastomer. D'6, moreover, distinguishes between a polyester resin and an elastomer, as possible matrix materials, and only the resin should be sufficiently soft. It is nevertheless still a resin. The expression "sufficiently soft" is further quite undefined. Polyester in the form of an elastomer and elastomeric materials have a wide range of tensile

moduli, see Attachment 5, so that what is meant by "soft" in D'3 is quite indeterminate.

It may be that the claimed tensile modulus seems to be arbitrary; 8000 or 10000 psi could as well have been chosen. However, what is important with this feature is to give a line of transition, a limit. Important is to see that, nevertheless, the present invention fulfils the conditions of a selection invention, since a new range is given and this range is far from any preferred range of D'3, for the mere reason that this prior art discloses no preferred range, knowing nonetheless that polyester as such covers a wide range of tensile moduli, the upper limit being above 400.000 psi. That further this limit is not quite arbitrary is proved by the result of Sample 5 in Attachment 13; the Appellant sees only a slight improvement in the given results, but in this technical field in which human lives are involved, a slight increase of protection is already important.

(c) as to the prior use:

The fact that the fibres of the specimen W 7660 are coarse speaks in favour of the validity of the conducted test, since the fibres are more open than those of the specimen according to the prior use and thus the elastomeric material can better migrate into the fabric, so that at least the fibres should be better coated than those of the prior use. A mere visual examination of the submitted sample A shows however that, in the Verseidag products, the coating was only achieved



on each side or surface of the fabric, and not in the core. It indicates that a coating process by immersion of the fabric in an elastomeric solution, as was the case in the Verseidag processes according to B23 does not necessarily lead to a coating of each filament of each fibre of the fabric. When this is not the case within a solution, there is no chance that it would be better achieved during the following moulding process, since the elastomer material in this other step is only in a melted state, thus less fluid, and further the applied pressure brings the fibres closer to each other, making the migration even more difficult. The moulding step of the Verseidag fabrics has in fact only reinforced the sticking of the adjacent coatings between two layers, so that the layers are well bonded together. The test realized by Dr Kavesh has demonstrated that, when a pulling force is applied, the delimitation occurs at the interface between the uncoated fibres and the elastomeric material, and not between the adjacent coating layers. In the report of Mr Kavesh, it has further been demonstrated that there was not even enough elastomeric material in the sample to ensure the coating of at least all fibres of a laminate.

It is also clear from the statement of Dr Kavesh that the elastomeric material in the VERSEIDAG specimen has a much higher tensile modulus than in the present invention. It may be that, during the stocking period, the properties are slightly modified, but this is so negligible, that even the VERSEIDAG firm had not advised his customers of this disadvantage. To sum up, the prior use is

irrelevant to the present invention.

- IX. The Appellant requested that the decision under appeal be set aside and that the European patent No. 0 197 279 B1 be revoked.

The Respondent requested that the appeal be dismissed, by way of auxiliary request with the proviso that the patent be maintained on the basis of one of the auxiliary requests 1 to 4.

### **Reasons for the Decision**

1. The appeal is admissible.

*Main request (Claims as accepted by the contested decision)*

2. *Document D'6*

- 2.1 This document discloses an armour comprising a rigid material and adjacent thereto at least one fibrous layer made of plastic impregnated glass fibres, which according to D'7 have a tensile modulus and a tenacity falling in the ranges given in Claim 1 of the patent in suit. The plastic impregnating material is a mixture of curable epoxy or polyester resin and a compatible, elastomeric curable elastomer, so that it can be said that a coating of the fibrous layers with an elastomeric material is achieved. These features are not disputed by the parties.

The typical resins selected in this prior art are epoxy or phenol-formaldehyde resins, whereas the chosen elastomer is an acrylonitrile-butadiene copolymer or a

polyurethane rubber.

2.2 The Appellant has essentially based his arguments on the so called "masterbach formulation" of the mixture of epoxy resin and elastomer, which is disclosed in Example III of this document. This formulation of Example III consists of:

	Parts of weight
- acrylonitrile-butadien copolymer.....	100
- an epoxy resin (EPON 828® of the Shell Co.)...	50
- zinc oxide.....	5
- sulfur.....	1,5
- benzothiale disulfide.....	1,5
- stearic acid.....	1,5
- tricresyl phosphate.....	30

In order to support his line of arguments, the Appellant has submitted document B 24, which teaches that "determined metal oxides" can act as catalysator (curing agent) to allow epoxy resins to self-cure at temperatures between 160° and 200°C. Although B24 does not specify the appropriate metal oxides, the Appellant argued that, for the person skilled in the art, the ingredient 'zinc oxide' in the above formulation is therefore the curing agent for the epoxy resin also listed in said formulation. Then, with evidence D'12, in which the result of tests are given, which have been made on a reproduction of the product of D'6 manufactured on the basis of the mixture according to Example III as well as on the manufacturing process common to all examples and detailed in Example I, the Appellant tried to demonstrate that the tensile modulus of the elastomeric material of said product according to D'6 fulfils the tensile modulus requirement of

Claim 1 of the patent in suit, so that according to him the subject-matter of this claim is totally anticipated.

- 2.3 In the present case, this way of interpreting D'6 and arguing cannot be followed by the Board and is considered to be the result of inadmissible hindsight. The reason is that D'6 already offers to the person skilled in the art all the necessary information to manufacture the disclosed armour and, in particular, mentions for each one of the main ingredients of the elastomeric material the respective curing agents, which are to be used. This teaching does not correspond to the assumption made by the Appellant that zinc oxide is a curing agent for the epoxy resin. On the contrary, D'6 provides another teaching as explained in the following lines:

In the detailed description of D'6, the passage bridging columns 3 and 4 relates to the epoxy resin, that is to say to the second of the two main components of the mixture according to Example III. In this passage, it is said: "The epoxy resin employed in the impregnation process of this invention contains (underlined by the board) one or more well-known curing agents such as hexahydrophthalic anhydride, methyl nadic anhydride, benzylmethylamine, dodecanyl succinic anhydride, ethylen diamine and the like". Zinc oxide is not mentioned. A following paragraph (column 4, lines 13 to 26) relates to the other possible kind of resin, namely phenol-aldehydes, and here, once more, the specific curing agents are given at the end. Then, in the middle of column 4, a paragraph concerns the first kind of elastomer, namely that mentioned as first main component in Example III, and in the middle of

this paragraph, it is indicated: "Curing agents and curing accelerators such as **sulfur, benzothiozole disulfide,...** may be used with these copolymers. Likewise, accelerator activators such as **zinc oxide**, litharge and ...may also be used" (terms emphasized by the board). Several paragraphs then follow, dealing with the polyurethane rubbers, that is to say the other kind of elastomer, and at the end, in column 6, lines 18 to 20, here also the appropriate curing agents for these rubbers are given. Therefore, for each of the curable components of the described elastomeric mixture, D'6 each time mentions the specific curing agents. Zinc oxide is never disclosed as being a curing agent: as can be seen above, it is only said to be an accelerator activator, and moreover for an elastomer. It is also specified in D'6, at the end of column 3, that epoxy resin is to be considered as containing its curing agent. Thus, from the whole content of D'6, it can only be concluded that the ingredient 'epoxy resin' in the formulation of Example III is supposed to contain one of the curing agents disclosed in the passage bridging columns 3 and 4. In column 6, it is further indicated that the further ingredients mentioned in the formulation of Example III, namely the stearic acid and the tricesyl phosphate are respectively a mould release agent and a fire-retardant material, and not curing agents.

- 2.4 It follows that the evidence D'12 is irrelevant, since based on a wrong interpretation of D'6. The Appellant moreover has not proved that zinc oxide is one of the "determined metal oxides" according to B24, which further relates to an unusual "curing" process for epoxy resins, when mentioning the metal oxides.

Thus, the feature of Claim 1 of the patent in suit, which concerns the limitation of the tensile modulus, is not disclosed in D'6. This interpretation of the whole disclosure of this document is consistent with the object and solution of this prior art, which follows the example of the state of the art disclosed in the introductory part of the document and thus, still aims at having lightweight armours essentially formed of a plurality of fibrous layers impregnated with **resins**, which are materials having high tensile moduli, said resins however in the invention according to D'6 merely being blended with an elastomer, so that the laminate has a certain elasticity which impedes a permanent deformation of the armour once a projectile has impacted it. Flexibility is wanted, but at the same time the armour is sufficiently rigid to be useful as a structural or load bearing member (Column 8, lines 65 to 68).

2.5 Therefore, this prior art does not anticipate the subject-matter of Claim 1 of the patent in suit, and further it does not suggest it, since nothing in this prior art guides the skilled person to select an elastomeric material with a low tensile modulus in the sense of the patent in suit. There is also no suggestion for a substantial coating of each filament of each fibre in the fibrous layer.

3. *Document D'3*

3.1 According to this prior art, a composite armour comprises a rigid plate, for example made of steel, and bound to it another plate of resistant fibrous material, which consists of fibres, for example Kevlar® 29, as in the present invention; the fibres are (see

page 5) either combined by a binding material - such as a polyester resin or a resin of a natural or synthetic elastomer- or embedded in a polymer. For a better impregnation, the fibre fabric must be loose. Preferably, the fibres are firmly bonded to the polymer material (page 6). According to page 8, the binding material is made of a sufficiently soft resin, in which a low quantity of curing agent is provided. Polyester resins or an elastomer are suitable.

3.2 The text of this document is confusing. On the one hand, a single line of this document refers to a "sufficiently soft resin". On the other hand, it is already not clear from the whole content of this document whether its autor includes the elastomer under the term "resin" or not. Scientifically speaking, resins are not elastomers. However, the confusion is often made, as is also the case in the patent in suit. Whether the expression "sufficiently soft resin" in D'3 is to be understood as meaning a "sufficiently soft **elastomer**", as argued by the appellant, is therefore already doubtful.

3.3 Moreover, the expression "sufficiently soft" has no clear meaning, when no reference level is given, and at least three indications in this document contradict the interpretation of this prior art made by the appellant regarding the required tensile modulus of the elastomeric material:

- Since the author of this document has simultaneously envisaged both materials, namely polyester resin and elastomer, he would have specified a sufficiently soft elastomer, if this had been his intention. It is much more credible

that he wanted only to show as equivalent a soft resin and an elastomer, and in such a case, any kind of elastomer is concerned, whatever its tensile modulus is.

- This interpretation is supported by the mention of the second possibility for binding the fibres, namely to embed them in any kind of polymer. Polymer and polyester have a wide range of tensile moduli. Page 543 of Attachment 5, quoted by the Appellant, concerns indeed polyester, however only as elastomer, and thus does not concern the whole field of polyester mentioned as such in D'3. Attachment 5 shows moreover that, on the one hand, the tensile modulus of **elastomers** can vary from about 800 psi up to 235.000 psi. On the other hand, commonly used **polyesters**, such as Arnit A® (PET), show a tensile modulus of more than 400.000 psi, and crystalline polyester resins even much higher values (Encyclopaedia of Polymer Science and Engineering, second edition, Vol. 12, John Wiley & Sons, pages 22 and 55).
- Page 8 of D'3, further, mentions the possibility of adding glass fibres, which substantially increase the tensile modulus of the plastic matrix.
- The term "plate" is used in D'3 for the finally obtained fibrous material, which has a thickness of about 22 mm, and this plate can be fixed to the rigid plate by means of screw or rivets. The resulting composite can be used as a carrier structure in a tank, which is one aim referred to in this document to be solved. Why a limited low



tensile modulus of the elastomeric material should be useful for these objects is not clear.

Thus, this document is too vague. Any information about the necessity of considering the tensile modulus of the elastomeric material and even more of determining an upper limit of it cannot be deduced from this prior art.

3.4 The same conclusion is to be reached as to the coating of each filament of each fibre, namely the second distinguishing requirement of Claim 1 of the patent in suit. It is not possible to derive from the terms "embedded", "impregnation", "loose fabric", that the fibres themselves have to be made so loose, so that each of their filaments is coated. It is true that the patent in suit does not indicate how this result is obtained, but nevertheless it teaches this particular requirement, and the Board is of the opinion that, as soon as it is taught, it is possible for the person skilled in the art to find and adopt the appropriate steps for reaching it.

3.5 Finally, even if D'3 gives both the idea of having the fabric loose for the impregnation by the elastomeric material and the idea of choosing a substantially soft resin, these two informations cannot suggest the more precise combination of a limited tensile modulus for the elastomer with an elastomeric coating of each filament of each fibre.

#### 4. *Prior use*

It has been proved by means of evidence B16 that composite articles using Kevlar® 29 as fibres were

sold, having most of the features of Claim 1. However, here also, the features concerning the coating of the filament of the fibres as well as the tensile modulus of the elastomeric material are still disputed.

In view of the sample A filed by the Respondent, it clearly appears that the core of the Verseidag products was not penetrated by the elastomeric material. This sample is a single cured fabric and constitutes therefore a proof that, contrary to the assertions of the appellant, it is not sufficient to simply compare the main conditions of the coating processes of a fabric by immersion in a solution, as disclosed in the present patent and in the prior use, to conclude that, when a coating of each filament of each fibre is achieved in one case, it must inevitably be achieved in the other case. The substantial coating of each filament of the fibres requires additional measures. The board, nevertheless, does not see why a teaching of the appropriate measures should have been given in the patent in suit, and in particular why some information about the elastomeric material are consequently missing in the patent in suit, as further argued by the Appellant. As already mentioned above, the Board is of the opinion that, as soon as a person skilled in the art is advised that a coating of each filament of each fibre is to be achieved, there is no problem for him to find the appropriate measures which are necessary to obtain this result. The choice of adequately loose fibres for each fabric is one possibility.

It also follows that during the moulding process, i.e. the last step of the manufacturing of a laminate comprising several fabric layers, the elastomeric material as a melt would have less possibilities to

migrate through the layers and the fibres thereof and, thus, a substantial coating of each filament cannot be achieved.

Consequently, the Board concludes that, at least, the feature of Claim 1 of the patent in suit, according to which each filament of each fibre of each of the coated layers is substantially coated with an elastomeric material, is not fulfilled in the fabrics according to the *Verseidag* prior use and, consequently, in the composite articles comprising said fabrics.

5. Thus, the article according to Claim 1 of the patent in suit is new *vis-a-vis* each of the above cited prior art evidence.
  
6. As seen above, neither D'3, D'6 nor the prior use suggests a substantial coating of each filament of each fibre of the fabric. Therefore, even if the skilled person were to combine the teaching of document D'3 with that of the prior use or to combine any of the other cited document, he would not arrive at the composite article according to Claim 1 of the patent in suit.

Therefore, the subject-matter of Claim 1 involves an inventive step as required by Article 56 EPC. Thus, Claim 1 can be maintained as well as Claims 2 to 13, which are dependent on it.

7. The main request being allowable, it is not necessary to discuss the merits of the Respondent's auxiliary requests.

**Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:

A. Counillon

C. T. Wilson