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Datasheet for the decision of 27 October 2016

Case Number: T 2096/13 - 3.3.09

Application Number: 07251469.8

Publication Number: 1844927

IPC: B32B5/28, B32B5/26, B29C70/34

Language of the proceedings: EN

Title of invention:
Lightweight thermoplastic sheets including reinforcing skins

Patent Proprietor:
Azdel, Inc.

Opponent:
Quadrant Plastic Composites AG

Headword:

Relevant legal provisions:
EPC Art. 54, 123(2)

Keyword:
Main request and auxiliary requests 1 to 4: novelty - no
Auxiliary request 5: added subject-matter - no; novelty - yes
remittal for further prosecution

Decisions cited:

Catchword:

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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 2096/13 - 3.3.09

D E C I S I O N
of Technical Board of Appeal 3.3.09
of 27 October 2016

Appellant: (Patent Proprietor)	Azdel, Inc. 2000 Enterprise Drive Forest, VA 24551 (US)
Representative:	Jennings, Michael John A.A. Thornton & Co. 10 Old Bailey London EC4M 7NG (GB)
Respondent: (Opponent)	Quadrant Plastic Composites AG Hardstrasse 5 Postfach CH-5600 Lenzburg 1 (CH)
Representative:	Kleinschmidt, Michael Schmauder & Partner AG Patent- und Markenanwälte VSP Zwängiweg 7 CH-8038 Zürich (CH)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 12 June 2013 revoking European patent No. 1844927 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	W. Sieber
Members:	N. Perakis
	E. Kossonakou

Summary of Facts and Submissions

I. This decision concerns the appeal filed by the patent proprietor (in the following: the appellant) against the decision of the opposition division revoking European patent No. 1 844 927.

Independent claim 1 as granted reads as follows:

"1. A multi-layered fiber reinforced sheet for automotive vehicle interior structural components, said multi-layered fiber reinforced sheet comprising:

a porous fiber reinforced thermoplastic core layer (12) comprising a plurality of reinforcing fibers bonded together with a thermoplastic resin, said permeable core layer having a density of 0.1 g/cm^3 to 1.8 g/cm^3 and comprising a first surface (14) and a second surface (16);
the at least one first reinforcing skin (18) applied to said first surface; and
the at least one second reinforcing skin (20) applied to said second surface;
each said first and second reinforcing skin comprising a matrix of reinforcing fibers and a thermoplastic resin wherein said reinforcing fibers in each said first reinforcing skin are arranged in a bi-directional orientation, and said reinforcing fibers in each said second reinforcing skin are arranged in a bi-directional orientation."

Independent claim 7 relates to an automotive vehicle interior structural component comprising a multi-layered fiber reinforced material as set out in claim 1, and independent claim 13 relates to a method

of making an automotive vehicle interior structural component as described in claim 7.

II. With the notice of opposition the opponent requested revocation of the patent in its entirety on the grounds of Article 100(a) EPC (lack of novelty and of inventive step).

The documents filed with the notice of opposition included:

D1: WO 2005/070664 A1;

D2: DE 195 20 477 A1; and

D5: EP 0 758 577 A1.

The opposition division revoked the patent because claim 1 as granted (main request) lacked novelty in view of D1 and because none of the five auxiliary requests met the requirements of the EPC.

III. The notice of appeal was filed 12 August 2013 and the appeal fee paid on the same date. The statement setting out the grounds of appeal was filed on 21 October 2013, including six auxiliary requests. As main request the appellant requested that the decision under appeal be set aside and that the patent be maintained as granted.

Claim 1 of auxiliary request 1 is identical to claim 1 as granted (point I above).

Claims 1 of auxiliary requests 2 to 4 differ from claim 1 as granted only in the wording describing the arrangement of the reinforcing fibers in each first and second reinforcing skin. The respective part of claims

1 of these requests reads as follows (amendments struck through and underlined):

Auxiliary request 2:

"... each said first and second reinforcing skin comprising a matrix of reinforcing fibers and a thermoplastic resin wherein said reinforcing fibers in each said first reinforcing skin are ~~arranged~~ bonded together in a bi-directional orientation, and said reinforcing fibers in each said second reinforcing skin are ~~arranged~~ bonded together in a bi-directional orientation."

Auxiliary request 3:
"... each said first and second reinforcing skin comprising a matrix of reinforcing fibers and a thermoplastic resin wherein said reinforcing fibers in each said first reinforcing skin are ~~arranged~~ bonded together by the thermoplastic resin in a bi-directional orientation, and said reinforcing fibers in each said second reinforcing skin are ~~arranged~~ bonded together in a bi-directional orientation."

Auxiliary request 4:
"... each said first ~~and second~~ reinforcing skin comprising a matrix of reinforcing fibers and a thermoplastic resin wherein said reinforcing fibers in each said first reinforcing skin are ~~arranged~~ bonded together by the thermoplastic resin in a bi-directional orientation, and each said second reinforcing skin comprising a matrix of reinforcing fibers and a thermoplastic resin wherein said reinforcing fibers in each second reinforcing skin are ~~arranged~~ bonded together by the thermoplastic resin in a bi-directional orientation."

Claim 1 of auxiliary request 5 differs from claim 1 as granted by further defining the reinforcing fibers of the core layer. The relevant part of the claim reads as follows:(added features underlined):

"a porous fiber reinforced thermoplastic core layer (12) comprising a plurality of reinforcing fibers of average length 5-50 mm and average diameter of 7-22 microns bonded together with a thermoplastic resin, said permeable core layer having a density of 0.1 g/cm^3 to 1.8 g/cm^3 and comprising a first surface (14) and a second surface (16)".

Auxiliary request 6 is not relevant for the present decision.

IV. With letters dated 27 February 2014 and 31 March 2014, the opponent (in the following: the respondent) filed observations on the appeal.

V. On 12 August 2016 the board issued a communication in preparation for the oral proceedings scheduled for 27 October 2016.

VI. With letter dated 27 September 2016, the appellant filed observations on the board's communication.

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

- The subject-matter of claim 1 as granted was novel over D1. This document did not disclose that the reinforcing fibers of each film layer applied on each first and second surface of the substrate were arranged in a bi-directional orientation. D1

clearly disclosed that the reinforcing fibers were uni-directionally arranged in each of these film layers. Furthermore, the lay-up of the film layers on each surface of the substrate could not be considered to form a matrix of fibers in a thermoplastic resin, since D1 disclosed that good bonding occurred only between the substrate and the film layers. D1 did not disclose bonding between adjacent film layers, and an interface existed between them. This interface distinguished the product of D1 from the claimed product.

- The same arguments applied to claim 1 of auxiliary requests 1 to 4, which thus was novel.

- The subject-matter of claim 1 of auxiliary request 5 fulfilled the requirements of Article 123(2) EPC since the additional features were disclosed in the application as filed. It also fulfilled the requirements of Article 54 EPC since D1 did not disclose the average diameter of the reinforcing fibers in the core layer.

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

- The subject-matter of claim 1 as granted lacked novelty in view of D1. The lay-up of the film layers on each surface of the substrate was such that the reinforcing fibers in the thermoplastic resin formed a matrix of fibers in a bi-directional orientation. This was exactly what the patent disclosed in paragraph [0023]. There was no interface created between adjacent film layers since the thermoplastic resin, which according to

the specific embodiment of D1 was the same in the substrate and the film layers, melted under the applied conditions of temperature and pressure and bonded not only the substrate to the film layers but also a film layer to the adjacent film layer.

- The subject-matter of claim 1 of auxiliary requests 1 to 4 was not novel over D1 for the reasons set out in the context of the main request and thus these requests were not allowable.

- The subject-matter of claim 1 of auxiliary request 5 did not fulfil the requirements of Articles 123(2) and 54 EPC.

IX. The appellant requested that the decision under appeal be set aside and that the patent be maintained as granted or on the basis of any of auxiliary requests 1 to 6, filed on 21 October 2013 with the statement setting out the grounds of appeal; subsidiarily, that the case be remitted to the opposition division for further prosecution on the basis of any one of the preceding requests.

X. The respondent requested that the appeal be dismissed.

Reasons for the Decision

1. Main request (claims as granted)

1.1 The subject-matter of claim 1 as granted relates to a multi-layered fiber reinforced sheet comprising a porous fiber reinforced core layer and, applied to each major surface of the core layer, at least one reinforcing skin, namely at least one first reinforcing

skin (18) to the first surface (14) and at least one second reinforcing skin (20) to the second surface (16). The reinforcing fibers in each first reinforcing skin and in each second reinforcing skin are arranged in a bi-directional orientation.

Thus, it is clear from the wording of claim 1 as granted that, if a multi-layered fiber reinforced sheet comprises more than one first or second reinforcing skin, **each of said first or second reinforcing skins** must contain the reinforcing fibers in a bi-directional orientation. To this extent the board agrees with appellant.

1.2 Regarding the first and second reinforcing skins, paragraph [0023] of the description discloses the following:

- "Referring also to Figures 2 and 3, first reinforcing skin 18 includes a matrix 30 of reinforcing fibers bonded together by a thermoplastic resin. The reinforcing fibers are arranged in a bi-directional orientation. Similarly, second reinforcing skin 20 includes a matrix 32 of reinforcing fibers bonded together in a bi-directional orientation." (lines 18-24)

- "If the reinforcing fibers are in a unidirectional orientation in first reinforcing skin 18, another first reinforcing skin 18 with reinforcing fibers in a unidirectional orientation is applied and positioned so that the reinforcing fibers in the additional reinforcing skin 18 is [sic] at an angle to the first reinforcing skin 18, thereby creating a matrix of reinforcing fibres that are bi-directional. Similarly, more than one second

> reinforcing skin 20 with unidirectionally orientated reinforcing fibers is used to form a matrix bonded together in a bi-directional orientation." (lines 30-39).

Thus, the second embodiment describes the preparation of a matrix of bi-directionally oriented reinforcing fibers from two separate reinforcing skins containing uni-directionally oriented reinforcing fibers. In view of this embodiment, the opposition division held that the result of two superposed reinforcing skins was also considered as one reinforcing skin (reasons 1.2). The appellant argued that the opposition division had construed the term "reinforcing skin" incorrectly. A skilled person would still consider the product of two superposed skins as a product containing two reinforcing skins and not only one. Neither of the two skins contained bi-directionally oriented reinforcing fibers. Although the patent specification described the use of two separate reinforcing skins containing uni-directionally oriented reinforcing fibers, that embodiment was not what was claimed in the granted claims.

The board cannot accept the appellant's argument in this universality. There may very well be situations where two separate reinforcing skins containing uni-directionally oriented reinforcing fibers merge into a single reinforcing skin when two separate "starting" skins are put one on top of the other, and in the final product two skin layers are no longer discernible. The "merged" skin would be a single reinforcing skin containing reinforcing fibres that are bi-directional. In such a situation, a reinforcing skin as required by granted claim 1 would be formed "*in situ*".

1.3 The novelty of claim 1 was disputed on the basis of the disclosure of D1. This document discloses a multilayered product made out of a substrate and at each side at least one cover layer (claim 1).

The substrate of D1 is a fiber reinforced thermoplastic product with randomly distributed fibers, which are kept together by the thermoplastic material. It has a density of less than 1.2 g/cm^3 (claim 1), which falls within the density of 0.1 to 1.8 g/cm^3 required by claim 1 as granted . The substrate of D1 is also air permeable (claim 1, page 3 "THE SUBSTRATE"). Thus, the substrate of D1 corresponds to the porous fiber reinforced thermoplastic core layer (12) of claim 1 as granted.

The at least one cover layer at each side of the substrate is a long or continuous fiber reinforced thermoplastic film with the fibers being oriented approximately parallel to one another within each layer (claim 1, pages 3 to 4 "THE COVER LAYER"). A product that for practical purposes can be considered isotropic can be obtained if more than one cover layer is applied to each side of the substrate, wherein the orientation of the long or continuous fibers in each adjacent cover layer is different, e.g. a 0°/90° lay-up (page 2, lines 8-11; page 4, last paragraph; claim 9). This means that at least two cover layers on each side of the substrate form a matrix comprising the reinforcing fibers in a bi-directional orientation.

1.4 The only issue regarding the disclosure of D1 on which the parties disagreed was whether the multi-layer arrangement of the cover layers as disclosed on page 4 of D1 corresponds to a first reinforcing skin and a

second reinforcing skin, respectively, as set out in claim 1 as granted.

1.5 It should be borne in mind that a 0°/90° lay-up as disclosed in D1 results in a matrix of reinforcing fibers in bi-directional orientation. The decisive question is whether this matrix of bi-directionally oriented reinforcing fibers is present in **each** first and each second skin.

1.6 As regards the preparation of a product having more than one cover layer, D1 discloses that the substrate and the film layers are heated together under pressure at a temperature to ensure good bonding between the substrate and the film layers (page 4, last paragraph).

1.6.1 The appellant argued that the multi-layer arrangement did not form a "single" first and second reinforcing skin. On the contrary, an **interface** between the "starting" layers remained in the final lay-up of D1, so that each of the cover layers still contained the reinforcing fibers in a uni-directional orientation.

The appellant also argued that the process conditions mentioned on page 4 of D1 did not point to the formation of a "single" first and second reinforcing skin. In fact, this passage only emphasised bonding between the film and the substrate by melting of the thermoplastic material in the substrate. Nothing was said about enhancement or promotion of film-to-film bonding.

1.6.2 The board cannot accept the appellant's argument for the following reasons:

Both the patent in suit and D1 are concerned with laminates where good bonding between all layers is required. Thus, the skilled person would appreciate that the teaching of the relevant passage on page 4 would also bear upon film-to-film bonding.

Furthermore, if the thermoplastic material of the core layer of D1 is heated to allow good adhesion, the cover layers, which can be of the same material as the core layer, will also be heated. The material of the cover layer will inevitably melt and fuse at least at the periphery of the cover layers, all the more so as the cover layers have a thickness of only 0.1 to 1.0 mm. The board agrees with the respondent that in these circumstances it is no longer possible to refer to separate layers. In view of this, the appellant's assertion that there would be still an interface between the "starting" layers is not convincing, in particular in view of the absence of any corroborating evidence.

The board can also not accept the appellant's argument based on the penultimate paragraph of page 1 that D1 teaches away from using high temperatures because at high temperatures the fibers would tend to protrude through the surface of the film layer and diminish the surface quality of the multilayer product. In fact, this passage of D1 relates to the background art. As regards the invention, D1 is quite explicit about the application of higher temperatures, as set out on page 4 (paragraph headed "THE THERMOPLASTIC MATERIAL"):

"The thermoplastic material of the substrate and of the cover layer can be the same or different. They should however be selected so that the substrate and the cover

layer bond together upon heating them under pressure and at elevated temperatures".

Thus D1 does not contain any technical prejudice teaching away from using high temperatures and pressures when bonding the film layers to the substrate.

1.7 On the basis of the above, the subject-matter of claim 1 of the main request is not distinguished from the disclosure of D1 and therefore lacks novelty. As a result, the main request is not allowable.

2. Auxiliary requests 1 to 4

2.1 In auxiliary request 1 only the part of paragraph [0023] of the patent specification relating to the creation of a matrix of reinforcing fibers from skins with fibers in a unidirectional orientation has been deleted. Claim 1 of auxiliary request 1 is identical to claim 1 of the main request. The deletion of the passage in the description, however, does not change the finding on the subject-matter of claim 1. Therefore it lacks novelty in view of D1 as set out above.

2.2 Claim 1 of each of auxiliary requests 2 to 4 differs from claim 1 of the main request in the wording used for the definition of the each first and each second reinforcing skin (see point III above). The purpose of a different wording was to make it clearer that in each first and each second reinforcing skin the reinforcing fibers were in a bi-directional orientation. The board, however, considers that the subject-matter of claim 1 of the main request is clear on this point and that claim 1 of these auxiliary requests has the same

meaning as the subject-matter of claim 1 of the main request. Therefore, claim 1 of each of auxiliary requests 2 to 4 lacks novelty in view of D1 for the reasons set out above with regard to the subject-matter of claim 1 of the main request.

2.3 Thus, auxiliary requests 1 to 4 also are not allowable.

3. Auxiliary request 5

3.1 Claim 1 of this request fulfils the requirements of Article 123(2) EPC. The additional features of this claim, regarding the average length and the average diameter of the reinforcing fibers in the core layer (see above point III), are respectively disclosed in paragraphs [0013]and [0018] of the application as filed. The skilled reader would clearly and unambiguously understand that the features of the average length and the average diameter of the reinforcing fibers are not disclosed in the above-mentioned paragraphs in relation to a specific embodiment but relate to the core layer in general. Therefore, contrary to the respondent's view, the insertion of the disclosed average length and average diameter into the definition of the core layer in claim 1 does not add subject-matter extending beyond the content of the application as filed.

3.2 Furthermore, the subject-matter of claim 1 of auxiliary request 5 is novel in view of D1. Although this document discloses that the fibers have an average length of about 7 to 200 mm (see page 3, line 14 and claim 2) - claim 1 of auxiliary request 5 requires an average length of 5 to 50 mm - there is no explicit or implicit disclosure in D1 of these fibers' average

diameter. Consequently claim 1 of this request is novel over D1.

3.3 Independent claims 7 and 13 also include the amendments of claim 1. For the reasons set out above the subject-matter of these independent claims also fulfils the requirements of Articles 123(2) and 54 EPC.

4. Remittal

Since the decision under appeal had dealt only with the novelty of claim 1 in view of D1, the board in agreement with both parties 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 claims 1 to 17 filed as auxiliary request 5 on 21 October 2013 with the statement setting out the grounds of appeal.

The Registrar: The Chairman:

M. Cañueto Carbajo W. Sieber

Decision electronically authenticated