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Datasheet for the decision of 8 August 2017

Case Number: T 2009/14 - 3.3.06

Application Number: 05848915.4

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Language of the proceedings: EN

Title of invention:
Composite thermoplastic sheets including natural fibers

Patent Proprietor:
Hanwha Azdel, Inc.

Opponent:
Ahlstrom-Munksjö OYJ

Headword:
Composite sheet material / HANWHA AZDEL

Relevant legal provisions:
EPC Art. 52(1), 56, 114(2)
RPBA Art. 12(2), 12(4)

Keyword:
Late filed document admitted by the opposition division: no reason to overrule discretionary decision of the opposition division
Inventive step (main request and auxiliary requests 1 to 5 and 10): no
Admittance of auxiliary requests 6 to 9 and 11 into the proceedings: no
Admittance of auxiliary request 10 into the proceedings : yes

Decisions cited:
T 1634/06, T 0308/09, T 0217/10

Catchword:

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Case Number: T 2009/14 - 3.3.06

D E C I S I O N
of Technical Board of Appeal 3.3.06
of 8 August 2017

Appellant: (Patent Proprietor)	Hanwha Azdel, Inc. 2000 Enterprise Drive Forest, VA 24551 (US)
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Representative:	Hoffmann Eitle Patent- und Rechtsanwälte PartmbB Arabellastraße 30 81925 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 30 July 2014 revoking European patent No. 1812637 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	B. Czech
Members:	L. Li Voti
	J. Hoppe

Summary of Facts and Submissions

I. The present appeal is from the decision of the Opposition Division to revoke the European patent No. 1 812 637.

II. Claim 1 of the patent as granted reads as follows:

"*1. A composite sheet material comprising:*
a permeable core comprising a web of open cell structures formed by random crossover of reinforcing fibers held together by a thermoplastic resin material said reinforcing fibers comprising discontinuous natural fibers, said natural fibers having an average diameter of 7 µm to 22 µm, said permeable core having a density from about 0.3 gm/cc to about 1.0 gm/cc, and a void content of about 1% to about 95%, said permeable core including a surface region, said composite sheet moldable into various articles;
said natural fibers selected from the group consisting of kenaf fibers, jute fibers, flax fibers, hemp fibers, cellulosic fibers, sisal fibers, coir fibers, and mixtures thereof; and
an adherent layer adjacent to said surface region, said adherent layer comprising at least one of a thermoplastic film, an elastomeric film, a metal foil, a thermosetting coating, an inorganic coating, a fiber based scrim, a non-woven fabric, and a woven fabric."

Independent claim 8 as granted is directed to:

"*A method of fabricating a porous, natural fiber-reinforced thermoplastic sheet ...*"

III. The Opponent had raised *inter alia* added matter and inventive step objections (Article 100(a),(c) EPC). The

evidence relied upon by the parties includes the following prior art documents:

O1: US 6 777 482 B2;
O2: EP 1 211 138 A1;
O13: US 5 393 379 A.

IV. The Opposition Division found that none of the sets of claims (requests) then on file complied with the requirements of the EPC. In particular, the subject-matters of the respective product claims 1 according to the then pending auxiliary requests 2b and 4 were found to lack an inventive step in the light of O1. The other claim requests were refused on the ground that the independent product or method claim was objectionable under Article 123(2) EPC.
Regarding the independent product claims held to be objectionable for lack of inventive step, the Opposition Division remarked the following (decision under appeal, Reasons, 2.5.3.1):
"... *claim 1 does not exclude a third layer. The Division is therefore convinced that O1 is a suitable starting point for the assessment of inventive step. The fact that other documents like O2 may be equally suitable as closest prior art is irrelevant in this respect*."

The Opposition Division also decided to admit document O13 into the proceedings. In particular, it held (Reasons, 2.9) that O13 could "*be seen as a reaction to the annex to the summons*".

V. With its statement setting out the grounds of appeal the Appellant filed twelve sets of amended claims as main request and first to eleventh auxiliary requests, respectively.

The Appellant considered that the claimed subject-matter met the requirements of the EPC. As regards inventive step, it maintained that document O2, and not document O1, represented the closest prior art and that the prior art, including O2, did not point towards a product as claimed according to the patent. Moreover, the process according to O2 was very different from the one claimed according to the patent in suit.

It also considered that document O13 should not be admitted into the proceedings in view of its lack of relevance and belated filing in opposition.

VI. The Respondent rebutted all the Appellant's arguments and requested the non-admittance of the sixth to eleventh auxiliary requests in view of their late filing. It maintained inventive step objections (*inter alia*) against the independent product claims 1 according to the main request and the first to ninth auxiliary requests, and added matter objections against the independent method claims 1 of the tenth and eleventh auxiliary requests.

VII. In a communication issued in preparation for oral proceedings the Board expressed its preliminary opinion concerning *inter alia* admittance of the Appellant's pending claim requests and document O13 into the proceedings and pointing out that claim requests admitted into the proceedings may also have to be addressed as regards inventive step.

VIII. In its reply to the Board’s communication the Respondent complemented its objections against the pending requests, arguing *inter alia* that the subject-matter of the independent claims (including the independent method claims according to the tenth and

eleventh auxiliary requests) lacked inventive step (or even novelty) over O1, taking into account common general knowledge. In this respect, the Respondent also relied on the further document

O14: DICTIONARY OF SCIENCE AND TECHNOLOGY Revised Edition 1974, Editors T. C. Collocott et al., Reprinted 1982; Entry: "powder".

IX. The Appellant did not submit any further arguments in writing. By letter dated 27 June 2017 it merely informed the Board that it would not attend the scheduled oral proceedings.

X. Oral proceedings were held on 8 August 2017 in the absence of the Appellant.

XI. Requests

The Respondent requested that the appeal be dismissed.

The Appellant requested in writing that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of the set of claims filed as main request
or, if that is not possible,
on the basis of one of the sets of claims filed as first to eleventh auxiliary requests with the grounds of appeal dated 9 December 2014.

XII. The amended independent product claim 1 according to the main request (herein below **MR**) differs from claim 1 as granted (wording I, *supra*) in that it reads as follows (amendments made apparent by the Board):

"*1. A composite sheet material comprising:*

a permeable core ~~comprising~~formed from a web made up of open cell structures ...comprising at least one of a thermoplastic film, ~~an~~ elastomeric film...".

Claim 1 according to the pending first auxiliary request (AR1) differs from claim 1 according to MR in that it comprises, inserted after the wording "*said natural fibers having an average diameter of 7 µm to 22 µm*", the additional feature "*and having an average length of about 5 mm to about 50 mm ,...*".

The second, third and fourth auxiliary requests (AR2, AR3 and AR4) all comprise the same claim 1, differing from claim 1 according to AR1 in that the features relating to the permeable core are amended to read "*... core having a density from about 0.3 gm/cc to about 1.0 gm/cc, ~~and a~~ wherein said permeable core has an open cell structure with a void content of about 1% to about 95% of the total volume of said permeable core, said permeable core including...*".

The fifth auxiliary request (AR5) differs from claim 1 according to AR2 to AR4 in that it is amended by insertion of an additional, quantitative requirement and reads as follows:
"*1. A composite sheet material ... said core including about 20% to about 80% by weight natural fibers ...*".

The sixth and seventh auxiliary requests (AR6 and AR7) differ from AR4 and AR5, in that the respective claims 1 require a more limited "*void content of about ~~1~~ 5% to about 95% ...*".

Claim 1 according to the eighth auxiliary request (AR8) differs from claim 1 according to AR7 insofar as it is

restricted to a "*composite sheet material ~~comprising~~ consisting of ...*".

Claim 1 according to the ninth auxiliary request (AR9) differs from claim 1 according to AR5 insofar as it comprises the additional inserted requirement "*said core further including up to 10 percent of inorganic fibers,*".

Independent method claim 1 according to the tenth auxiliary request (AR10) differs from claim 8 as granted as follows:

"*~~8~~ 1. A method of fabricating a porous, natural fiber-reinforced thermoplastic sheet, said method comprising:*

adding natural fibers having an average length of about 5 mm to about 50 mm and an average diameter of 7µm to 22 µm, and thermoplastic resin powder particles that are not coarser than 1.5 mm to an agitated aqueous foam containing a surfactant to form a dispersed mixture, the natural fibers selected from the group consisting of kenaf fibers, jute fibers, flax fibers, hemp fibers, cellulosic fibers, sisal fibers, coir fibers, and mixtures thereof;

laying the dispersed mixture of natural fibers and thermoplastic resin particles down onto a wire mesh;

evacuating the water to form a web;

heating the web above the glass transition temperature of the thermoplastic resin;

and

pressing the web to a predetermined thickness to form a porous thermoplastic composite sheet having a void content of about 1 percent to about 95 percent of the volume of the composite sheet and having a density from about 0.3 gm/cc to about 1.0 gm/cc; and

adhering a skin to at least a portion of a surface

of the porous thermoplastic composite sheet, the skin comprises at least one of a thermoplastic film, an elastomeric film, a metal foil, a thermosetting coating, an inorganic coating, a fiber based scrim, a non-woven fabric, and a woven fabric."

Claim 1 according to the eleventh auxiliary request (AR11) differs from claim 1 according to AR10 insofar as it comprises the following additional features, inserted after the wording "... *to form a porous thermoplastic composite sheet*":
"... *comprising from about 20 to about 80 weight percent by weight of the natural fibers and from about 20 to about 80 percent by weight of the thermoplastic resin, said porous thermoplastic composite sheet ...*".

XIII. The **Appellant**'s arguments, submitted in writing, and of relevance here can be summarised as follows:

All claim requests - inventive step

- The closest prior art was represented by O2, which concerned the provision of a sheet material comprising a thermoplastic felt core comprising natural fibers. This composite sheet material was to be employed in the molding of shaped articles.

- O1 did not provide sheet materials directly moldable as such into articles, but concerned the provision of surface-modified shaped articles obtained from separate feed materials. Moreover, the problem to be solved identified in O1 was the enhancement of the bonding of a polyolefin substrate to a fibrous mat.

- Therefore, even considering that O1 had some (incidental) similarity with the subject-matter of the

patent in suit, it was not directed to the same purpose or intended effects as the claimed invention and did thus not qualify as the closest prior art.

- In particular, O1 did not disclose a moldable composite structure since the molded article of a three-layered material represented in figure 2 of O1 was no longer moldable into various articles. In particular, O1 disclosed that three separate layers of material were fed into a molding tool where they were compressed, joined and brought into the desired shape of the article. O1 did not disclose that the "mat" layer or the "film" layer of O1 was *per se* suitable for being molded into an article. Moreover, the mat layer of O1/figure 2 was no longer a web made up of "*open cell structures*" according to claim 1 at issue, since its initially open cells were impregnated with the underlying polyolefin material, to ensure the intended mechanical interlock.

- The claimed subject-matter involved an inventive step over the closest prior art O2, even when taken in combination with other cited documents.

- O13 was not highly relevant and should not have been admitted into the proceedings by the Opposition Division.

- The process specified in O1, even taking into account O13 mentioned therein, differed in fact substantially from the method claims at issue.

XIV. The **Respondent**'s arguments of relevance here can be summarised as follows:

Admittance of O13

- Document O13 had been admitted into the proceedings by the Opposition Division by correct application of its discretionary power.

MR - Inventive step

- O1 was a suitable starting point for the evaluation of inventive step since it concerned a moldable composite sheet material comprising a permeable core containing reinforcing fibers, which material showed increased impact, flexural and textile strength and was to be used in the same technical fields of the patent in suit. Moreover, the material of O1 displayed, like the materials according to the patent in suit, adequate reinforcement of the molded article and was suitable to replace at least in part reinforcing glass fibers, thereby providing inherently all the associated advantages indicated in the patent in suit.

- In particular, the most appropriate starting point for the evaluation of inventive step as regards product claim 1 of the MR was represented by the composite sheet material of figure 2 wherein the "mat" layer 18 represented a "*permeable core*" according to claim 1 at issue.

- The composite sheet material of document O1 was certainly moldable by application of sufficient heat and pressure and differed from that of claim 1 at issue only insofar as the density and void content of the permeable core 18 layer were not explicitly disclosed. However, the permeable core represented by the mat 18 had an "*open cell structure*" made up of natural fibers

and thus had a void content. In fact, the flow of molten polyolefin from the underlying substrate layer 16 into the mat 18, emphasised by the Appellant, occurred only superficially, in order to ensure the interlocking of the polyolefin "substrate" layer and the fibrous "mat" layer to be joined, and O1 expressly taught that the flow of molten polyolefin through the mat (filling the open cells) was to be avoided.

- The patent in suit did not, however, teach that the density and void content of the permeable core, as defined in terms of numerical ranges in claim 1 at issue, had any particular technical effect. Therefore, the technical problem posed in the light of the material according to O1/figure 2 consisted only in the provision of another composite sheet material having similar characteristics and a permeable core of chosen density and void content.

- Considering that according to O1 the mat 18 of figure 2 could be made of 75% thermoplastic material and only 20% reinforcing fibres, and that thermoplastic materials had generally a density of less than 1 gm/cc, a density of about 1 gm/cc for the permeable core being within the range of claim 1 at issue, the skilled person would arrive at a mat displaying a density value in this range by simply following the teaching of document O1, without inventive skills.

- The numerical "*void content*" range of claim 1 at issue was extremely broad and encompassed any value obtainable for a web made up of an open cell structure of reinforced fibers as in O1. In fact, according to the patent in suit, the void content values of fully consolidated webs (having less than 5% void content) were encompassed by the range of claim 1, fibre-

reinforced mats with values of less than 1% (lower limit of claim 1 at issue) not being obtainable technically. Considering more particularly that the mat 18 of O1/figure 2 contained 20 to 40% by weight of reinforcing fibers, it could not be consolidated to a void content below 5%. Furthermore, the upper limit of claim 1 (95% voids) concerned webs hardly subjected to any compression pressure during their preparation. The webs of O1 were, however, expressly consolidated by pressure.
Therefore, by simply following the teaching of document O1 and without inventive skills, the person skilled in the art would necessarily arrive at a void content value of the mat layer 18 lying within the range of claim 1 at issue.

- Hence, the skilled person, starting from the disclosure of O1/figure 2, would have obviously arrived at a composite sheet material with all the features of claim 1 at issue.

- The subject-matter of product claim 1 according to the main request thus lacked an inventive step.

AR1 to AR5 - Inventive step

- The additional features of the respective claims 1 according to AR1 to AR5 were all known from O1, and could not impart non-obviousness to the claimed subject-matter. Therefore the subject-matter of these claims also lacked inventiveness.

AR6 to AR11 - Non-admittance

- The Appellant did not present any reason justifying the late filing of AR6 to AR11 and did not present any argument concerning their patentability. Moreover, the Patent Proprietor had been already repeatedly allowed during opposition and also during oral proceedings at first instance to present new requests.

- Therefore, the Appellant/Patent Proprietor could and should have filed such requests already before the Opposition Division.

- These requests should thus not be admitted under Article 12(4) RPBA.

AR10 - Inventive step

- As regards the method claim 1 of AR10 O1 already suggested (taking into account the content of O13 incorporated by reference into O1) a process for preparing a porous, natural fiber-reinforced thermoplastic sheet of the same type as claimed. Additional process steps including the provision of a substrate layer like in the process of O1 were in fact not excluded by the wording of claim 1 at issue.

- In particular, the use of surfactants in the agitated aqueous suspension of reinforcing fibers and thermoplastic powder particles having a dimension of less than 1.5 mm was disclosed in O13. Furthermore, powders always had dimensions not greater than 1 mm, as e.g. indicated in O14.

- Moreover, the wording of claim 1 at issue did not exclude that some of the process steps identified in the claim and, in particular, the steps occurring after formation of the resin-bonded fibrous web, could also

occur simultaneously (as is the case of O1), rather than sequentially.

- The process disclosed in O1 thus differed from that of claim 1 at issue only insofar as it did not disclose the density and, at least not explicitly, the void content of the "*porous thermoplastic composite sheet*" (mat) prepared by "*pressing the web to a predetermined thickness*" (and corresponding to the permeable core of claim 1 of MR) before adhering thereto a skin layer (adherent layer of claim 1).

- Therefore, the subject-matter of claim 1 of AR10 lacked an inventive step for essentially the same reasons as the subject-matter of product claim 1 of MR.

Reasons for the Decision

Document O13 remains in the proceedings

1. Document O13, referred to in document O1, has been admitted into the proceedings by the Opposition Division despite its filing after the expiry of the opposition period.

1.1 In its communication, the Board indicated that it considered that O13 had been admitted by correct application of the Opposition Division's discretionary power under Article 114(2) EPC.

The Appellant did not take position again as regards this issue.

1.2 Therefore, the Board sees no reason possibly justifying an overruling of the discretionary decision of the

Opposition Division to admit this document into the proceedings. The Board thus took the relevant disclosure of O13 into consideration.

Main request and First to Fifth Auxiliary Requests - admittance into the proceedings

2. The amended sets of claims according to these requests were filed with the statement of grounds of appeal. However, the sets of claims according to the MR and ARs 1 to 5 had already been pending before the Opposition Division.

Main request - claim 1 - meaning of the terms

3. The parties disagreed as regards the ambit of claim 1 at issue and, hence, as regards the differences between the claimed subject-matter and the disclosure of O1 (see Appellant's statement of grounds, point 5; Respondent's reply thereto, point 2, as well as XIII and XIV, *supra*). The Board thus deems it necessary to point out its position concerning the meaning of some terms used in claim 1.

3.1 Claim 1 is directed to "*a composite sheet material* ***comprising:***
a permeable core formed from a web made up of open cell structures formed by random crossover of reinforcing fibers comprising discontinuous natural fibers held together by a thermoplastic resin material ...".

3.2 Claim 1 thus undisputedly encompasses composite sheet materials
- wherein the "*permeable core*" has an "*open cell structure*" and consists essentially of web "formed by *random crossover of reinforcing fibers*" which are "*held*

together by a thermoplastic resin material", and
- wherein said "*reinforcing fibres*" are "***comprising*** *discontinuous natural fibers*", i.e. may also comprise, in addition to such natural fibers, synthetic fiber materials such as glass fibers, carbon fibers and aramid fibers (as expressly claimed in dependent claim 7 at issue).

3.3 As regards the "***open cell*** *structure*" of the fibre-reinforced web, the following is indicated in the description of the patent in suit (column 4, lines 26 to 30; emphasis added by the Board):

"*A* ***fully consolidated*** *web means a web that is* ***fully compressed*** *and* ***substantially void free****. A fully consolidated web would have* ***less than 5% void content*** *and have* ***negligible open cell structure***".

Claim 1 expressly encompasses also webs with a void content as low as "*about* ***1%***", i.e. "*fully consolidated web[s]*" within the meaning of the patent in suit. Such a web, although having "*negligible open cell structure*" according to the description is still qualified as "*permeable*" (without a more specific explanation) in claim 1 at issue.

3.4 Claim 1 requires said "*permeable core*" *to have "a density from about 0.3 gm/cc to about 1.0 gm/cc, and a void content of about 1% to about 95%*".

The Board accepts the Appellant's position (statement of grounds, page 2, fifth paragraph)that the wording of claim 1 unambiguously expresses that the density and void content values indicated are based on the total (bulk) volume of said permeable core.

3.5 Moreover, considering the open formulation of claim 1 ("*composite sheet material* ***comprising...***"), the claimed material may comprise further layers, in addition to the "*permeable core including a surface region*" and "*adherent layer adjacent to said surface region*" specifically mentioned.

This possibility is even expressly illustrated in the patent in suit; see Figure 1 and column 3, lines 17 to 19, reading as follows: "*In alternate embodiments, skins* ***and****/or barrier* ***layers*** *are bonded to second surface 16* " (emphasis added by the Board).

3.6 The feature "*said composite sheet moldable into various articles*" of claim 1 does not imply any further particular characteristics of the sheet besides its suitability for being shaped by a known or conceivable molding process (as listed in e.g. paragraph [0019] of the patent).

Main request - lack of inventive step

4. The invention

4.1 The invention concerns a composite sheet which is moldable into various articles and comprises a web of resin-bonded reinforcing fibres and a surface layer adhered thereto.

4.2 With respect to the prior art and its disadvantages, the following is stated in the description of the patent in suit:

"*[0002] Porous fiber reinforced thermoplastic sheets ... are used in numerous and varied applications in the product manufacturing industry because of the*

ease of molding the fiber reinforced thermoplastic sheets into articles ..."

"*[0003] Porous fiber reinforced thermoplastic sheets are sometimes formed into decorative interior panels for use in the interior of automobiles, mass transit vehicles and buildings ... Incineration of these decorative panels upon the end of their useful life is made impractical because of the presence of glass fibrous reinforcements.*"

As regard the advantages of the products according to the invention, the following is stated in the description:

"*[0007] ... Natural fiber reinforcement provides environmental advantages over composite sheets having, for example, glass fiber reinforcement, such as, clean incineration at the end of useful life, and recycle possibilities. Natural fiber reinforcement also provides weight reduction in comparison to glass fibers.*"

"*[0019] The porous composite thermoplastic sheets containing natural fibers as reinforcement described above can be used in, but not limited to, building infrastructure, automotive headliners, door modules, side wall panels, ceiling panels, cargo liners, office partitions, and other such applications that are currently made with polyurethane foam, polyester fiber filled multi-layered composites, and thermoplastic sheets. The porous composite thermoplastic sheets containing natural fibers as reinforcement can be molded into various articles using methods known in the art, for example, pressure forming, thermal forming, thermal stamping, vacuum forming, compression forming,*

and autoclaving. Natural fiber reinforcement provides environmental advantages over composite sheets having, for example, glass fiber reinforcement, such as, clean incineration at the end of useful life, and recycle possibilities. Natural fiber reinforcement also provides weight reduction in comparison to glass fibers."

5. Closest prior art

5.1 In the decision under appeal, the Opposition Division held that document O1 qualified as the closest prior art. This was contested by the Appellant who considered that document O2 disclosed the closest prior art.

5.2 It is established jurisprudence of the Boards of Appeal of the EPO that the closest prior art is normally a prior art document disclosing subject-matter conceived for the same purpose or aiming at the same objective(s) as the claimed invention and having the most relevant technical features in common (see e.g. T 1634/06 of 04 March 2011, reasons, 2.2.1).

5.3 Document O1 - issues addressed and products disclosed

5.3.1 Indeed O1 concerns a composite material comprising a polyolefin substrate and a reinforcing mat formed from reinforcing fibres and a thermoplastic polymer powder. The composite material of O1 is supposed to overcome the drawbacks (see O1: column 1, lines 18 to 30) of fibreglass-reinforced known polyolefin composite materials widely used in the manufacture of molded articles, including high impact paneling, with "decorative attributes".

5.3.2 The material according to O1 (column 1, lines 34 to 46) is intended in particular to meet the need for a fibre-

reinforced composite material offering *inter alia* a "wider range of decorative possibilities" and showing "a number of important properties including surface energy, surface smoothness, and improvements in impact, flexural and tensile strengths".

5.3.3 The fibres forming the reinforcing mat of the composite sheet material according to O1 (column 1, lines 60 to 64) may be selected from *inter alia* synthetic fibres and natural fibers like kenaf fibers, hemp fibers and cellulosic fibers.

5.3.4 O1 thus relates to a composite materials of a type encompassed by claim 1 at issue and conceived for the same ultimate purposes as the materials according to the patent in suit, including a wide range of decorative applications (see paragraph [0019] quoted under 4.2, *supra*). The use of mats made at least in part from natural fibers instead of glass fibres, as also disclosed in O1, inherently provides the corresponding advantages identified in the patent in suit.

5.3.5 The Respondent was correct in suggesting that, more particularly, the composite material of figure 2 is the most suitable starting point for the evaluation of inventive step.

(i) This material and its method of preparation are described in column 4, line 64, to column 5, line 24, and column 5, line 41, to column 6, line 9 of O1.

(ii) The composite material shown in figure 2 of O1 comprises (column 4, line 64 to 65) a "substrate" 16, a "mat" 18 and a "film" 20, adjacent to one surface of the mat 18, i.e. three superposed sheet layers, joined

by applying heat and pressure (column 5, lines 26 to 45).

(iii) The "mat" 18 (column 5, lines 2 to 4 read in combination with column 4, lines 16 to 31 and column 5, line 54) is more particularly made of discontinuous reinforcing fibers selected from the group of glass fibers, carbon fibers, aramid fibers, **kenaf** fibers, **hemp** fibers, **cellulosic** fibers (the last three types being natural fibers) and mixtures thereof, and of a thermoplastic polymer powder.

Therefore, according to one alternative, the fibres are at least in part natural fibers from the group indicated in claim 1 at issue.

(iv) The reinforcing fibers in the mat generally have a diameter of about 10 to about 23 microns (column 5, lines 10 to 12) and are "*discontinuous*" within the meaning of claim 1 since they have a length of at most 1.5 inch (column 4, lines 59 to 60).

(v) The mat is obtained by wet-laying and may be densified by pressing and then dried (column 6, lines 4 to 8).

(vi) For the Board, the reinforced mat layer of O1 is *de facto* a web "*made up of open cell structures*" as required by claim 1 at issue since it is prepared in essentially the same manner as the "*permeable core*" according to the invention.

Moreover, as noted under 3.3, *supra*, the web of claim 1 at issue may even have a void content of about 1% and can thus have a minimal "*open cell structure*" as obtained by fully consolidating the reinforced web.

Therefore the reinforced mat layer of O1, prepared by pressing and drying, has certainly an "*open cell structure*" as required according to claim 1 at issue.

(vii) The "film" 20, adjacent to one surface of the mat 18, is made of polymeric material, (O1: column 5, lines 4 to 7), such as PVC, PVC/PVAc copolymer, PVC/PVDC copolymer, PVDC, ABS, acrylic, polyester or mixtures thereof, and thus qualifies as "*adherent layer adjacent to [a] surface region*" of the permeable core according to claim 1 at issue, "*comprising at least one of a thermoplastic film [or] elastomeric material*".

(viii) Since claim 1 at issue does not exclude the possible presence of additional layers (3.5, *supra*), the presence of the polyolefin substrate layer 16 in the material of O1/figure 2 on the other surface of the mat 18 does not represent a difference compared to the subject-matter of claim 1 at issue.

(ix) The Board holds that the three-layered material of O1/Figure 2, provided in sheet form, must also be inherently "*moldable*" within the meaning of claim 1 at issue, since the materials of O1 are intended to be used for molding articles (column 1, lines 40 to 43). The fact that O1 describes molding in connection with a specific embodiment wherein the three layers of the material are joined and molded at the same time under heat and pressure (column 6, lines 10 to 34), actually confirms that the three layered sheet material described must be moldable.

5.4 Based on the above analysis the Board concludes that, considering the similarities between the patent in suit and document O1 in terms of the technical issues/goals

addressed and the products (composite mouldable sheets) disclosed therein, document O1 qualifies as closest prior art for the assessment of inventive step according to the problem-solution approach, the embodiment of Figure 2 as disclosed in combination with column 5, lines 26 to 45, and column 5, line 52, to column 6, line 9, being the most appropriate suitable starting point.

5.5 Appellant's objections to document O1 being taken as the closest prior art

5.5.1 From the above analysis it is apparent that the argument of the Appellant that document O1 did not disclose "*composite sheet materials*" to be molded into articles is not correct.

The Board thus holds that the composite sheet material of O1/Figure 2 is moldable as intended according to the patent in suit.

5.5.2 The Appellant also argued that the reinforced mat layer of O1 was not a "*web made up of open cell structures*" according to claim 1 at issue, since the initially open cells of the mat would be penetrated by molten polyolefin material, to ensure the desired mechanical interlock between the layers.

For the Board, this argument is not convincing. In fact, it is clearly stated in O1 (column 1, lines 54 to 59, and column 6, lines 22 to 28) that the polymer of the polyolefin layer of the composite sheet of O1 is forced to "**partially** flow" into the mat layer in order to provide a topological mechanical interlock and that "polyolefin bleed" through the mat layer "is **prevented**".

Moreover, as set out in 3.3, *supra*, claim 1 even encompasses webs having a void content of about 1% and thus a minimal open cell structure as obtained by fully consolidating the reinforced web.

Therefore the reinforced mat layer of O1 has certainly an "open cell structure" as required in claim 1 at issue (see 5.3.5 (vi), *supra*).

5.5.3 Finally, even though O1 focuses on the more specific problem concerning (column 1, lines 31 to 33) "*a way to effectively provide surface enhancements and improved bondability to polyolefin and polyolefin composite materials*", i.e. the substrate layer" according to O1, i.e. a technical problem not addressed in the patent in suit, it remains that document O1 (see points 5.3.1 and 5.3.2, *supra*) concerns composite materials conceived for the same ultimate purpose as the one of the patent in suit (providing molded articles) and also having many technical features in common.

5.5.4 Therefore, document O1 is clearly a most appropriate starting point for the evaluation of inventive step.

5.6 However, even accepting (*arguendo)* that document O2 could be considered as an equally appropriate closest prior art as O1, inventive step would have to be assessed relative to each of these pieces of prior art (see e.g. T 308/09 of 09 February 2011, reasons, 1.4.1).

5.6.1 The claimed subject-matter could thus only be considered to comply with the inventive step requirements if it involves an inventive step taking

either of these two prior art documents as the closest prior art.

5.6.2 Since the claimed subject-matter is found to lack an inventive step taking O1 as the closest prior art (*infra*), the question of obviousness over O2 is not further addressed in this decision.

5.7 The technical problem solved

5.7.1 There is no indication in the patent in suit that the density or the void content of the permeable core layer confers some particular unexpected advantage to the material as claimed.

5.7.2 Hence, in the light of the composite sheet material of O1/Figure 2, the technical problem can merely be seen in the provision of a further mouldable composite material of the same type.

5.8 The solution

The solution to this technical problem proposed according to amended claim 1 at issue is a "*composite sheet*" which is characterised in particular in that the "*the permeable core*" of thermoplastic resin-bonded reinforcing fibres has "*a density of from about 0.3 gm/cc to about 1.0 gm/cc and a void content of about 1% to about 95%*".

5.9 Success of the claimed solution

It is technically plausible and not in dispute that the subject-matter claimed solves the technical problem posed.

6. Obviousness of the solution

6.1 Document O1 discloses (column 5, lines 18 to 22) the overall density of the composite sheet material represented in figure 2 to be between about 0.9 and about 1.9 gm/cc but it does not disclose explicitly the density and the void content of the reinforcing mat 18 layer.

6.2 It remains thus to evaluate whether it was obvious for the person skilled in the art, starting from the closest prior art (product of O1/Figure 2 as identified in 5.4, *supra*) and seeking to solve the technical problem posed, to reduce to practice the teaching of O1 in a manner leading to a product wherein the fibrous core layer has a density and a void content falling within the ranges prescribed by claim 1 at issue.

6.3 O1 discloses (column 5, lines 13 to 17) that the mat layer 18 consists of 20 to 40 % by weight of the reinforcing fibers and 40 to 75% by weight of thermoplastic polymer powder.

6.3.1 As plausibly argued by the Respondent during oral proceedings, the void content depends very much on the amount of fibers in the mat, and a mat 18 according to O1/figure 2, containing 20 to 40% by weight of reinforcing fibers, cannot be consolidated to a void content value of less than 5%, let alone of less than 1%, i.e. to a void content of a fully consolidated web (see 3.3, *supra*).

The upper limit of 95 % of the void content range corresponds to webs, which have hardly been subjected to pressure during their preparation. Considering that, quite to the contrary, the webs of O1 are consolidated

by pressure (column 5, lines 38 to 42), they must plausibly have a void content below 95%.

6.3.2 Hence, a consolidation of the fibrous web under a pressure which is not too extreme, will inevitably lead to a void content value in the inner region of the range indicated in claim 1 and, hence, to bulk densities of the permeable core within the indicated range for many conceivable fibre/polymer powder mixes.

6.3.3 Considering that no arguments to the contrary were presented and that there is no teaching in O1 that would keep the person skilled in the art from selecting natural fibers, thermoplastic polymer powders and densification degrees in this manner, the Board concludes that adopting this approach was one out of several conceivable, equally obvious ways of solving the technical problem without ingenuity.

6.3.4 Hence, in the light of document O1 it was obvious to the person skilled in the art seeking to solve the technical problem posed to reduce to practice the teaching of this document in a manner leading to a material falling within the ambit of claim 1.

6.3.5 In the Board's judgement, the subject-matter of claim 1 according to the main request does not, therefore, involve an inventive step (Articles 52(1) and 56 EPC).

6.4 The main request is thus not allowable.

First to fifth auxiliary requests - Lack of inventive step

7. Inventive step - Claim 1

7.1 The additional feature of claim 1 contained in AR1 to

AR5 (see XII, *supra*) and requiring that the natural fibers have an "*average length of about 5 mm to about 50 mm*" is also disclosed in O1 in connection with the embodiment of figure 2. The fibres to be used according to O1 generally have in fact lengths of from 0.25 to 1.5 inch, i.e from 6.35 mm to 38.1 mm (see column 5, lines 12 to 13).

7.2 Moreover, based on the understanding of claim 1 set out under 3.1 to 3.6, *supra*, the other additional feature of claim 1 according to AR2 to AR5, expressing that the "*permeable core has an open cell structure*" and a void content based on "*the total volume of the permeable core*", is *de facto* redundant.

7.3 The further additional feature of claim 1 according to AR 5, i.e. that the core includes *"about 20% to about 80% by weight*" natural fibres is (also) a feature of the closest prior art material of O1/Figure 2: The content of reinforcing fibres in the mat is generally in the range of from 20 to 40% by weight of the mat 18 (column 5, lines 13 to 15).

7.4 Therefore, the additional features of AR1 to AR5 do not limit further the claimed subject-matter with respect to the disclosure of O1.

7.5 The subject-matter of each claim 1 according to AR1 to AR5 thus also lacks an inventive step for the reasons exposed above with respect to the MR.

7.6 AR1 to AR5 are thus not allowable either.

Sixth to ninth auxiliary requests - Non-admittance

8. The sets of claims according to these requests had not

been pending before the Opposition Division.

8.1 The Appellant did not indicate reasons possibly justifying the filing of these requests for the first time with its statements of grounds, neither in said statement nor after the Board drew the parties' attention to this point in its communication.

Already for this reason, the Board had strong reservations as regards the admittance of these fresh requests into the proceedings.

8.2 Moreover, the Appellant did not submit any argument in writing concerning their patentability, in particular as regards obviousness over document O1, considered as the closest prior art in the contested decision.

8.2.1 In the absence of any Appellant's argument it would thus be up to the Board and/or the Respondent to speculate about the reason for the additional amendments and about the consequence that the amendments could possibly have on the assessment of inventive step.

This is, however, contrary to Article 12(2) RPBA which stipulates *inter alia* that the statement of grounds of appeal shall set out clearly and concisely the reasons why it is requested that the decision under appeal be amended and should specify expressly all the facts, arguments and evidence relied on (in this respect, see e.g. decision T 217/10 of 25 March 2015, Reasons, 5.3, second full paragraph, and 5.4).

8.3 Finally, as pointed out by the Respondent, the Patent Proprietor had been already repeatedly allowed during

the opposition proceedings, up to and including at oral proceedings, to present new amended claim requests.

8.4 Taking all the above aspects into account, the Board, in the exercise of its discretion under Article 12(4) RPBA, decided not to admit these requests into the proceedings.

Auxiliary request 10 - Admittance into the proceedings

9. AR10 is based on the process claims 7 to 11 of AR2a, filed during oral proceedings before the Opposition Division. These claims were also part of the subject-matter explicitly considered by the Opposition Division in its decision (see point 2.4 of the reasons), although only having regard to compliance with Article 123(2) EPC.

9.1 Therefore, this request does not introduce new issues but actually amounts to a limitation of the issues to be debated in appeal, which could have been expected by the Respondent.

9.2 Even though the Appellant did not indicate in the statement of grounds any reason justifying the filing of this request and did not submit any argument in writing concerning patentability the Board decided, in the Appellant's favour, to admit it into the proceedings pursuant to Article 12(4) RPBA.

Tenth Auxiliary Request - Lack of inventive step

10. The invention

10.1 Method claim 1 at issue concerns (full wording under XII, *supra*) a "*method of fabricating a porous, natural*

fiber-reinforced thermoplastic sheet".

10.1.1 According to the Appellant (statement of grounds, point 3, last sentence) the claimed process concerns a method of fabricating a composite sheet material of the same type as the product claimed according to the MR.

The "*porous thermoplastic composite sheet*", obtained according to the process of claim 1 at issue after "*pressing the web to a predetermined thickness*", thus corresponds to the "*permeable core*" referred to in product claim 1 as granted whilst the "*skin*" adhered to at least a portion of a surface of the "*porous thermoplastic composite sheet"* according to claim 1 at issue corresponds to the "*adherent layer*" of the product claims.

10.1.2 The Board holds that considering the wording of claim 1 at issue ("*said method* ***comprising*** *...*") the listed steps need not necessarily be carried out in the given sequence. For example, the steps mentioned after the step of "*evacuating the water to form a web*" do not need to be carried out in the given order but may also be carried out simultaneously. Moreover, additional process steps are not excluded.

10.2 Closest prior art

10.2.1 According to the Respondent document O1 represented the closest prior art. The Appellant did not submit in appeal any explicit argument with regard to the process claims. It merely indicated why it considered that the process of O2 was "very different from the claimed process" (statement of grounds page 15, top paragraph).

10.2.2 O1 clearly discloses the preparation of a composite

sheet material of the same type (comprising a "substrate" 16, a "mat" 18 and a "film" 20, adjacent to one surface of the mat 18) conceived for the same purpose as the composite sheet material according to the patent in suit (see 5.3.4, *supra*). Hence, document O1 can also be considered to represent the closest prior art in the evaluation of inventive step having regard to the method claimed.

More particularly, for the Board, the method of fabricating the composite sheet material of O1/figure 2 (described in column 5, line 26 to 45, and column 5, line 52 to column 6, line 9) is the most appropriate starting point for the evaluation of inventive step.

10.3 The technical problem

The technical problem posed in the light of O1 consists, as stated by the Respondent, in the provision of another method of fabrication of a natural fiber-reinforced thermoplastic sheet having similar overall comparable properties (moldability).

10.4 The solution

As the solution to the technical problem identified above the patent in suit proposes the method of claim 1, which is characterised in particular in that it includes (emphasis added by the Board)
- the step of "*adding natural fibres ... and thermoplastic resin powder particles* ***that are not coarser than 1.5 mm*** *to an agitated aqueous foam* ***containing a surfactant*** *to form a dispersed mixture*"
and
- the step of "*pressing the web to a predetermined thickness to form a porous thermoplastic composite*

sheet having a ***void content of about 1% to about 95% of the volume of the composite sheet and having a density from about 0.3 gm/cc to about 1.0 gm/cc***".

10.5 Success of the claimed solution

It is not in dispute that the subject-matter claimed solves the technical problem posed (10.3, *supra*).

10.6 Obviousness of the solution

10.6.1 Document O1 explicitly discloses that the preparation of the porous composite sheet material of figure 2 includes the step of "forming an aqueous suspension of fibers and thermoplastic polymer powder" (column 5, lines 52 to 56).

The natural fibers used

- have an average length of 0.25 to 1.5 inch (6.35 mm to 38.1 mm) (column 5, lines 12 to 13), i.e within the range of about 5 mm to about 50 mm of claim 1 at issue;
- have an average diameter of about 10 to about 23 microns (column 5, lines 11-12), a range almost completely encompassed by the range of about 7µm (microns) to about 22 µm of claim 1 at issue; and
- maybe kenaf fibers, hemp fibers or cellulosic fibers (column 5, lines 30-31), i.e. natural fibers encompassed by claim 1.

The thermoplastic polymer powder

- has a particle size which is necessarily not greater than 1.5 mm, as required in claim 1 at issue, considering that it is common general knowledge that a powder usually has a maximum particle dimension of less than 1000 microns (1 mm)

as shown by O14, an entry from a Dictionary, the admissibility of which was not contested.

As regards further details of this process step, O1 (column 6, lines 1 to 3) refers to document O13 disclosing, in the context of a comparable process step,

- the use of thermoplastic powder having a size of less than 1.5 mm (O13: column 3, lines 26 to 32), and
- the formation of a dispersed mixture by adding the natural fibers and thermoplastic powder to an agitated aqueous foam containing a surfactant and
- the step of wet-laying a suspension of reinforcing fibers and thermoplastic powder foamed using a surfactant (O13: column 1, lines 65 to 68, column 2, lines 12 to 15 and column 3, lines 10 to 14).

These steps of O13 can thus be also considered to be steps of the process disclosed in D1 wherein the aqueous suspensions of fibers and thermoplastic powders are indeed agitated in a mixing tank (O1: column 5, lines 56 to 57) and the dispersed mixture of fibers and thermoplastic resin particles is wet laid onto a wire mesh (O1: column 5, lines 57 to 65).

The process of D1 requires also that water is evacuated to form a web (O1; column 5, lines 65-67).

10.6.2 As stated in column 5, lines 38 to 43, the process of O1 includes "applying sufficient temperature and pressure for a sufficient time to consolidate the mat..." and, thus, necessarily implies heating the web above the glass transition temperature of the thermoplastic resin powder particles (see also O1, column 6, lines 21 and 22) and "adding a film 20

against the mat 18" (O1, column 5, line 43).

10.6.3 The only features of the claimed process not expressly addressed in document O1 are thus the properties of the "mat" layer of the composite sheets produced in this manner, as discussed under 6.1, *supra,* with regard to the product of claim 1 of the MR, i.e. the "*density*" and the "*void content*" of the mat 18 (i.e. of the "*porous thermoplastic ... composite sheet*" in the terminology of claim 1 at issue).

10.6.4 Hence, it remains to evaluate whether it was obvious to the skilled person, starting from the closest prior method of preparing a composite sheet as described in O1/figure 2, and seeking to solve the technical problem posed, to apply such heat and pressure to the three layers of material that the reinforced mat 18 in the product obtained has density and void content values falling within the ranges according to claim 1 at issue.

10.6.5 For similar reasons as given with respect to claim 1 of the main request (6.3.1 to 6.3.4, *supra*) the Board holds that to the person skilled in the art it was obvious to reduce to practice the readily available conceivable variants of the process described in O1, such that the reinforced mat 18 of the three layered product formed has density and void content values within the ranges indicated in claim 1 at issue. Hence, processes resulting in a "*porous, natural fibre-reinforced thermoplastic sheet*" comprising such a fibrous web and an adhering "*skin*" as defined in claim 1 would be obvious to the skilled person.

10.7 Therefore, the Board concludes that the subject-matter

of claim 1 of AR10 also lacks an inventive step (Articles 52(1) and 56 EPC).

10.8 AR 10 is thus not allowable.

Eleventh auxiliary request - Non-admittance

11. Compared to claim 8 as granted, method claim 1 according to AR11 (see XII, *supra*) additionally comprises features (taken from claim 10 as granted) limiting the relative amounts of natural fibers and thermoplastic resin incorporated into the thermoplastic composite sheet formed.

11.1 None of the requests filed in opposition comprises an independent method claim amended in this particular manner. In its statement of grounds, the Appellant did not, however, indicate reasons possibly justifying the filing of such a request at the appeal stage only. Neither did it submit arguments specifically in support of the patentability of such an amended method claim, let alone over the method disclosed in document O1.

11.2 The Board also took into account that the further amendment made to claim 1 is not, at first sight, suitable for overcoming the pending objections to the patentability of the method raised by the Respondent on the basis of document O1 (see e.g. Respondent's response to the Board's communication, point IX, last paragraph), considering that the additional feature also appears to be clearly disclosed in, or at least suggested by document O1. Indeed, O1 (column 5, lines 13 to 16) discloses a mat layer 18 comprising 20 to 40% by weight of reinforcing fibers and 40 to 75% by weight of thermoplastic polymer powder, these ranges being fully encompassed by the corresponding ranges indicated

in claim 1 at issue.

11.3 Although the Board drew the Appellant's attention to the fact that no justification had been submitted regarding the late filing of this request, and that inventive step was an issue potentially to be addressed at the oral proceedings, the Appellant did not submit any arguments in this respect.

11.4 In the exercise of its discretion under Article 12(4) RPBA, the Board thus decided not to admit AR11 into the proceedings.

Conclusion

12. None of the Appellant's claim requests admitted into the proceedings is allowable.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

D. Magliano B. Czech

Decision electronically authenticated