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**Datasheet for the decision
of 4 September 2024**

Case Number: T 1760/22 - 3.3.03

Application Number: 15179458.3

Publication Number: 3127951

IPC: C08K3/34, C08L23/12, B32B27/32,
C08J9/14

Language of the proceedings: EN

Title of invention:

POLYPROPYLENE COMPOSITION SUITABLE FOR FOAMED SHEETS AND
ARTICLES

Patent Proprietor:

Borealis AG

Opponents:

SABIC Global Technologies B.V. /
SABIC Petrochemicals B.V.

Relevant legal provisions:

RPBA 2020 Art. 13(1)
EPC Art. 54, 56

Keyword:

Amendment to appeal case - amendment detrimental to procedural economy (no)

Novelty - (yes)

Inventive step - (yes)

Decisions cited:

T 0035/85, T 2759/17



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Case Number: T 1760/22 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 4 September 2024

Appellants: SABIC Global Technologies B.V. /
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted on
17 May 2022 concerning maintenance of the
European Patent No. 3127951 in amended form.

Composition of the Board:

Chairman D. Semino
Members: F. Rousseau
L. Basterreix

Summary of Facts and Submissions

I. The appeal of the opponents lies from the interlocutory decision of the opposition division according to which European patent No. 3 127 951 as amended according to the claims of auxiliary request 2 submitted as auxiliary request 7 with letter of 3 February 2022 and a description adapted thereto met the requirements of the EPC.

II. The following documentary evidence was *inter alia* submitted before the opposition division:

D1: WO 2015/024018 A1

D4: Sangjin Lee *et al*, "The effect of strain-hardening on the morphology and mechanical and dielectric properties of multi-layered PP foam/PP film", *Polymer*, 70, (2015), 173-182

D10: DaployTM HMS Polypropylene for Foam Extrusion, technical brochure, Borealis Borouge 2010,

D11: N. Reichelt *et al*, "PP-blends with Tailored Foamability and Mechanical Properties", *Cellular Polymers*, Vol. 22, No. 5, 2003, 315-327

D15: Declaration by N. Reichelt dated 27 January 2022 and experimental report

III. According to the reasons for the contested decision which are pertinent for the appeal proceedings, i.e. those concerning the claim request which was found to meet the requirements of the EPC:

(a) Document D15 was admitted into the proceedings.

(b) Novelty over D4 was acknowledged, since that document did not disclose a foamed sheet having a thickness of 1.5 mm or less and/or a density of 150 to 250 kg/m³.

(c) Taking into account the experimental data of D15, the claimed multi-layered sheet was considered to involve an inventive step over D1 representing the closest prior art, examples 5 and 9 being considered as relevant starting points, whereas D4 did not represent a realistic starting point for the present invention.

- IV. An appeal was filed by the co-opponents (appellants).
- V. With their reply to the statement of grounds of appeal, the patent proprietor (respondent) filed auxiliary requests 1 to 10.
- VI. Additional submissions were filed by the appellants with their letter of 2 November 2023 to which the respondent replied with letter of 18 December 2023.
- VII. In preparation of the oral proceedings, a communication pursuant to Article 15(1) RPBA conveying the Board's provisional opinion was issued.
- VIII. In response to the provisional opinion of the Board, the appellants made further submissions with letter dated 14 August 2024.
- IX. Oral proceedings before the Board were held in person on 4 September 2024 with the participation of both parties.

X. The final requests of the parties were as follows:

The appellants requested that the contested decision be set aside and the patent be revoked.

The respondent requested that the appeal be dismissed, or alternatively that the contested decision be set aside and that the patent be maintained on the basis of any of the claims of auxiliary requests 1 to 10, all filed with the reply to the statement of grounds of appeal.

XI. The sole claim which is relevant to the present decision is claim 1 of the main request, submitted as auxiliary request 7 with letter of 3 February 2022 and renumbered as auxiliary request 2 at the oral proceedings before the opposition division. It reads as follows:

"1. A multi-layered sheet comprising a foamed sheet and a cover layer (CL), the cover layer (CL) having a density of at least 0.85 g/cm^3 , wherein the foamed sheet has a thickness of 1.5 mm or less and/or a density of 150 to 250 kg/m^3 , wherein the foamed sheet comprises a polypropylene composition (PC) comprising

- (a) 95.0 to 99.70 parts by weight of a high melt strength polypropylene (HMS-PP); and
- (b) 0.30 to 5.0 parts by weight of a nucleating agent (NA) having a particle size d_{50} within the range of $1 \mu\text{m}$ to $30 \mu\text{m}$ determined as described herein;
- (c) 1 to 5 parts by weight, of a further high melt strength polypropylene (HMS-PP')

whereby the total amount of the high melt strength polypropylene (HMS-PP), the nucleating agent (NA) and the further high melt strength polypropylene (HMS-PP')

is at least 95 wt.% based on the polypropylene composition (PC)."

- XII. The parties' submissions, in so far as they are pertinent to the present decision, may be derived from the reasons for the decision below. The contentious points essentially concerned novelty of the claimed subject-matter over D4 and whether it involved an inventive step over each of D1 and D4.

Reasons for the Decision

Novelty over D4

Introduction

1. Cork is a natural foam that has a layered closed-cell foam/film structure comprising alternating small cells and firm film layers (D4, page 173, last paragraph). The alternating foam/film morphology of cork is reported in D4 to have been successfully mimicked with a continuous microlayer co-extrusion technology developed by Ranade *et al.* (D4, sentence bridging pages 173 and 174). The purpose of the work reported in D4, which is based on that of Ranade *et al.*, is to assess the influence of the degree of long-chain branching of polypropylene (PP) on the morphology of the multilayered foam/films obtained by a similar process (page 174, left-hand column, first and third full paragraphs; abstract).

The appellants' objection of lack of novelty of the subject-matter of claim 1 of the main request is based on two samples described in the experimental part of D4, which are identified in that document and hereafter

as 16BPP2 and 32BPP2. They are held by the appellants to correspond to the embodiment of operative claim 1, according to which the foamed sheet has a thickness of 1.5 mm or less.

Admittance of the objection for lack of novelty over sample 32BPP2 of D4

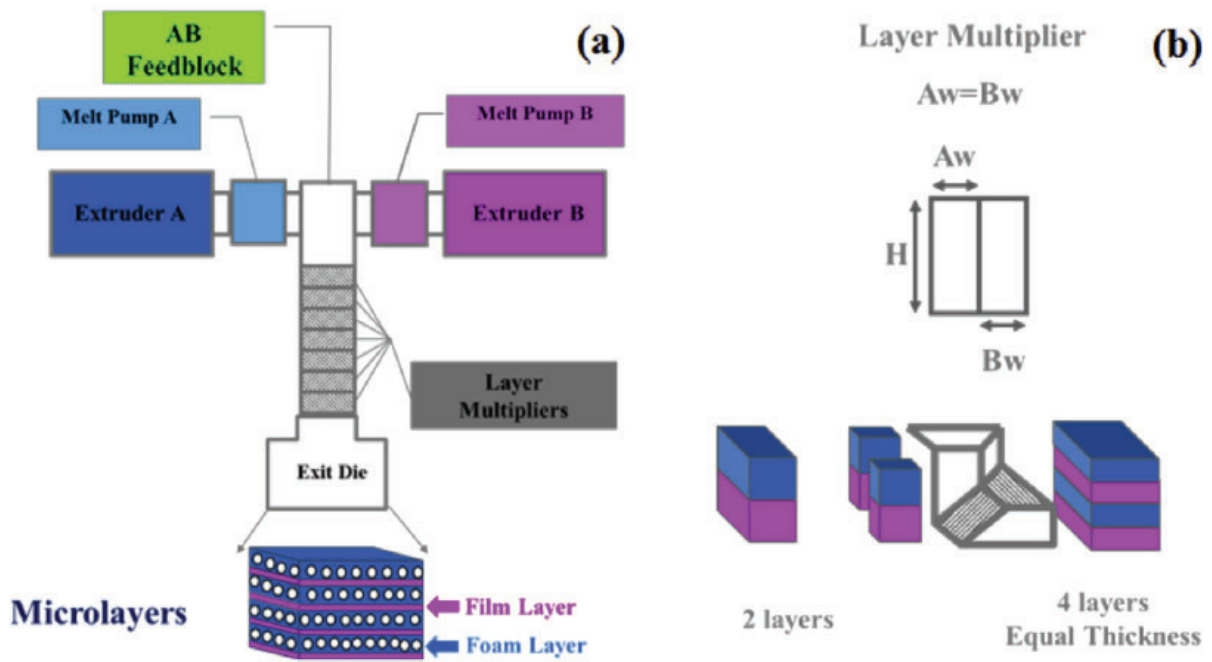
2. The objection for lack of novelty over sample 32BPP2 was not raised prior to the appellants' letter of 2 November 2023. It represents an amendment to the appellants' case within the meaning of Article 13(1) RPBA, whose admittance, contested by the respondent, is subject to the discretion of the Board. The non exhaustive list of criteria on which the Board shall exercise its discretion pursuant to Article 13(1) RPBA includes the current state of the proceedings and whether the amendment is detrimental to procedural economy.

It is undisputed in view of the parties' submissions that samples 16BPP2 and 32BPP2 of D4 are produced according to the same principle, resulting in a similar structure shown in Figures 7(b) and 7(c) of that document, respectively, which are each a Scanning Electron Microscope (SEM) image of these samples. The essence of the appellants' objection is for each of these samples essentially the same, the two images being analysed side by side using the same approach (letter of 2 November 2023, items 103, 108-123, 140-145 and 147). The respondent's arguments brought forward for samples 16BPP2 and 32BPP2 are also substantially the same (rejoinder, items 21, 23-30, 34, 35, 39 and letter of 18 December 2023, items 62 to 69 and 72 to 79).

It results from the above that the additional objection by the appellants of lack of novelty of the subject-matter of claim 1 in view of sample 32BPP2 of D4, which was raised sufficiently in advance to the oral proceedings, was not detrimental to procedural economy. Accordingly, the Board exercised its discretion under Article 13(1) RPBA by admitting this additional objection into the proceedings.

Preparation of samples 16BPP2 and 32BPP2

3. The preparation of these samples is schematically represented in Figures 1(a) and 1(b) of D4, reproduced below. In such a process, two different materials, intended to form the film layer and the foamed layer, are separately processed in two extruders leading to the formation of an initial two layered polymer melt, i.e. consisting of a layer of the material for the film layers and a of layer of the material for the foam layers. The initial two layered polymer melt is then split vertically into two parts, which are spread and stacked, the same operation being repeated with additional multipliers. The number of layers is in this way doubled after each multiplier (D4, section 2.6).



The numbers 16 and 32 in designations 16BPP2 and 32BPP2 are indicative of the number of layers targetted (abstract; page 178, legend of Figure 7). Accordingly, while 16 layers are sought to be obtained for 16BPP2, 32 layers are aimed at for 32BPP2, using the same process and the same material, but an additional multiplier. One crucial difference between the work of D4 and that reported by Ranade *et al* is that the system used in D4 allows for a large expansion of the layered extrudates (D4, page 175, last paragraph of section 2.6) (rejoinder, items 22 and 26).

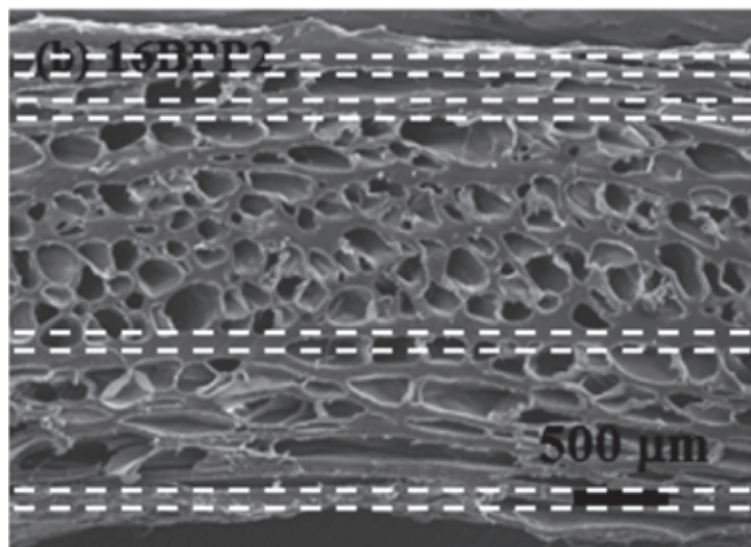
The material used for the film layers is identified in D4 as BPP2. It consists of the commercial product WB140HMS from Borealis (D4, section 2.6, sentence bridging the two columns and section 2.1, right hand-column, lines 5-7). It is undisputedly a HMS-PP (D10, page 11).

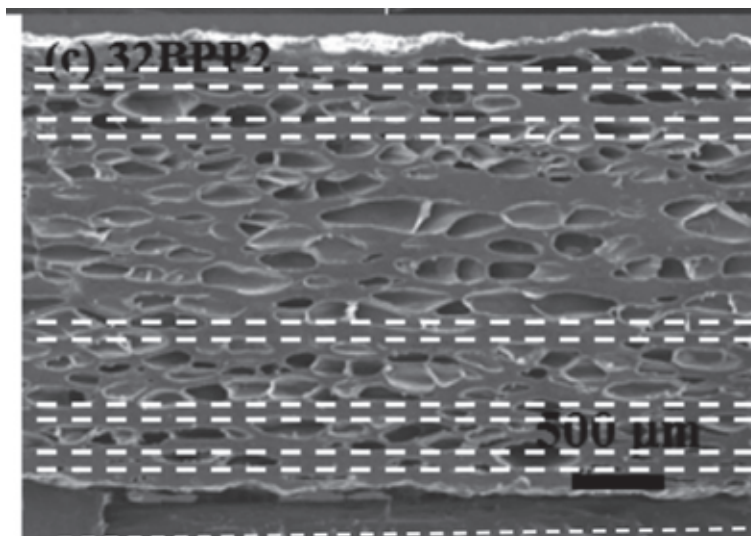
The material used for the foam layers, consists of the same material HMS-PP (BPP2) to which is added 1 wt% of talc with an average size of 2 μm , as nucleating agent, as well as a chemical blowing agent decomposing at around 200°C in order to generate gas bubbles (D4, section 2.6, first paragraph, lines 8-10; page 174, right hand-column, lines 11-12; page 178, legend of Figure 7; page 179, section 3.5).

There is also agreement that the material used in D4 to obtain a foamed layer corresponds to the polypropylene composition (PC) comprising components (a) to (c) defined in operative claim 1.

Presence of a foamed sheet

4. The only disputed issue concerning novelty of the subject-matter of operative claim 1 over each of 16BPP2 and 32BPP2 is whether those samples comprise or not a foamed sheet having a thickness of 1.5 mm or less. The appellants' argumentation in that respect is based for each of these samples 16BPP2 and 32BPP2 on a SEM image of their cross-sectional surface, shown in Figures 7(b) and 7(c) of D4, respectively. Those are reproduced below:





Meaning of the term "sheet"

5. It is useful at this juncture to recall the meaning of the term sheet. In this regard, as correctly noted by the appellants, it is a well-established principle laid down by the boards' case law that a non-specific definition in a claim should be given its broadest technically sensible meaning (letter of 2 November 2023, item 97).

In the Board opinion, according to its usual meaning, the term sheet implies certain relative dimensions. It refers to a wide flat artefact (compared to its thickness), i.e. that is relatively thin in comparison to its length and width. It also implies that its two surfaces are substantially parallel.

Samples 16BPP2 and 32BPP2 in the light of Figure 1 and section 4. "Conclusions"

6. Having regard to Figure 1 of D4 and to the sentence "*On the other hand, the stronger strain-hardening of BPP2 gave rise to a stable foam/film layered structure for*

16BPP2 and 32BPP2 with ellipsoidal shaped closed cells due to the strong layer confinement effect" in the conclusions of that document (page 181, section 4, right-hand column, lines 13-16), the appellants submit that 16BPP2 and 32BPP2 must be considered to describe a structure having alternate foam and films layers (letter of 2 November 2023, sections 101 to 104). This is not convincing.

6.1 It is established case law that a prior art document anticipates the novelty of claimed subject-matter if the latter is directly and unambiguously derivable from that document, including any features implicit to a person skilled in the art (Case Law of the Boards of Appeal of the EPO, 10th edition 2022, here after Case Law, I.C.4.3). Moreover, a disclosure destroys novelty only if the teaching it contains is enabling (Case Law, I.C.4.11), i.e. when it can be carried out by the skilled person. On that basis, the schematic disclosure in Figure 1 of D4 of a stacking of regular alternate parallel horizontal foam layers and film layers which is useful to understand the intended structure for 16BPP2 and 32BPP2 is not as such a disclosure of the structure indeed achieved for those samples for which a cross-section is shown in Figures 7(b) and 7(c).

6.2 Furthermore, the sentence of the conclusion of D4 cited by the appellant is to be put in perspective when read in the context of the whole document, in particular when examining Figures 7(b) and 7(c) showing the samples actually obtained.

While the passage of the conclusion cited by the appellants could give the impression, when read in isolation, that BPP2 gives a stable structure, it is added in the sentence immediately following that

passage that "*32BPP2 has more stable layer and ellipsoidal cell structure than 16BPP2 because of layer confinement effect*". Therefore, the conclusions of D4 are not that the sole use of BPP2 leads to a stable structure, but rather that it contributes to improve the foam/film layered structure.

- 6.3 Moreover, according to the abstract of D4 (5th and 6th lines from the bottom), stable cell layers (emphasis added by the Board) are obtained with BPP2 near the surface of the sample, i.e. stable cell layers are not described to be generally obtained throughout the samples prepared. More importantly, the indication of a stable structure near the surface is not a description of discernable horizontal cell/film layers across the whole portion of the sample represented in Figures 7(b) and 7(c), even near the surface.

If one attempts to visually detect in Figures 7(b) or 7(c) horizontal film layers (without foams cells) and foam layers, it is apparent that said film layers would not have a continuous thickness and/or the same inclination, putative portions of some of those being partially fused or having bifurcations. In the absence of two clearly observable horizontal film layers (free of foam cells) across the whole images represented in Figures 7(b) or 7(c) which would represent unambiguous demarcations of one horizontal foamed zone contiguous to said horizontal film layers, one cannot discern within the structure shown in Figure 7(b) or 7(c) a portion of 16BPP2 or 32BPP2 corresponding to the definition of a (foamed) sheet, let alone with a thickness of not more than 1.5 mm.

- 6.4 The absence of a structure shown in Figure 7(b) or Figure 7(c) allowing to clearly discern a foamed sheet

having a thickness of 1.5 mm or less is also in agreement with the detailed analysis of the samples made by the authors of D4.

According to the section of D4 in which the film/foams cell morphology is addressed, it is pointed out that "*the 16BPP2 film/foam shows more (but not completely) distinct alternating layers and ellipsoidal bubble cells*" (emphasis added by the Board), that comparison referring to an additional sample designated as 32BPP1 which exhibits little or no evidence of film/foam structure, as a result of using a polypropylene BPP1 having a lower degree of long chain branching (page 179, section 3.5, lines 7-8 and 10-12; page 174, section 2.1 and page 181, conclusion). According to the same section 3.5 on page 179, last three lines "*This indicates that the film layers can partially suppress cell growth due to the higher melt strength of BPP2*" (emphasis added by the Board).

This is also consistent with the indication of "*the better layered structures in 16BPP2 and 32BPP2*" in the first paragraph of section 3.6 of D4 and the passage bridging pages 179 and 180 according to which "*In the case of 16BPP2 and 32BPP2, the layered structures are more obvious in the outer layers due to the fast cooling that stabilizes the morphology; in the bulk area, cooling is much slower and the layered cell structure is less apparent*".

Moreover, the last sentence of section 3.6 describes that "*the 32BPP2 system shows the better foam/film structure by layer confinement effect*".

6.5 Accordingly, D4 does not describe that the theoretical structure depicted in Figure 1 was obtained with 16BPP2

or 32BPP2. This conclusion, based on the analysis made by the authors of D4, is consistent with the expectation that the crucial difference between the system used in D4 and in the work reported by Ranade *et al.* would result in a reduction of the homogeneity of the film/foam structure (point 3 above, second paragraph, last sentence). This is in agreement with the goal of D4 which was not to provide the structural arrangement of layers depicted in Figure 1, but to demonstrate that the use of a certain type of long chain branched polypropylene (BPP2) was more suitable than another (BPP1) towards achieving that goal (point 1 above).

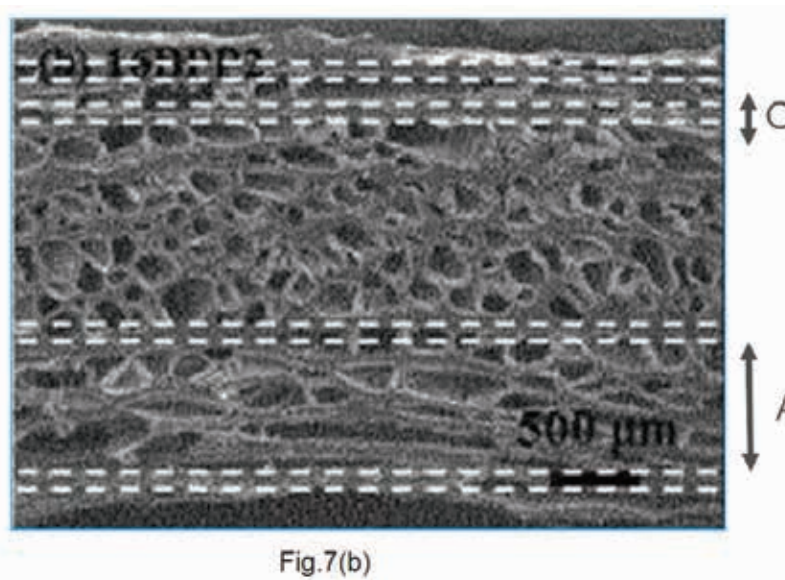
6.6 It can be also agreed with the appellants that it would not be decisive whether a sheet having the thickness required by operative claim 1 would be the result from the fusion of several layers in samples 16BPP2 and 32BPP2. Decisive is whether such fused layers would appear on the SEM image shown in Figure 7(b) or Figure 7(c) as corresponding to a foam portion having two substantially parallel surfaces not more than 1.5 mm apart which run across the whole portion of the sample represented in said Figure.

In this respect, the whole sample represented in either Figure 7(b) or Figure 7(c), if seen as a foamed article, would have a thickness of more than 1.5 mm (about 2.6 mm), as can be seen from the scale bar represented at the bottom of these figures.

However, as already indicated in point 6.3 above, one cannot discern within the structure shown in Figure 7(b) or 7(c) two film layers which would provide a demarcation for a foam sheet having a thickness of at most 1.5 mm.

Meaning of the dashed white lines

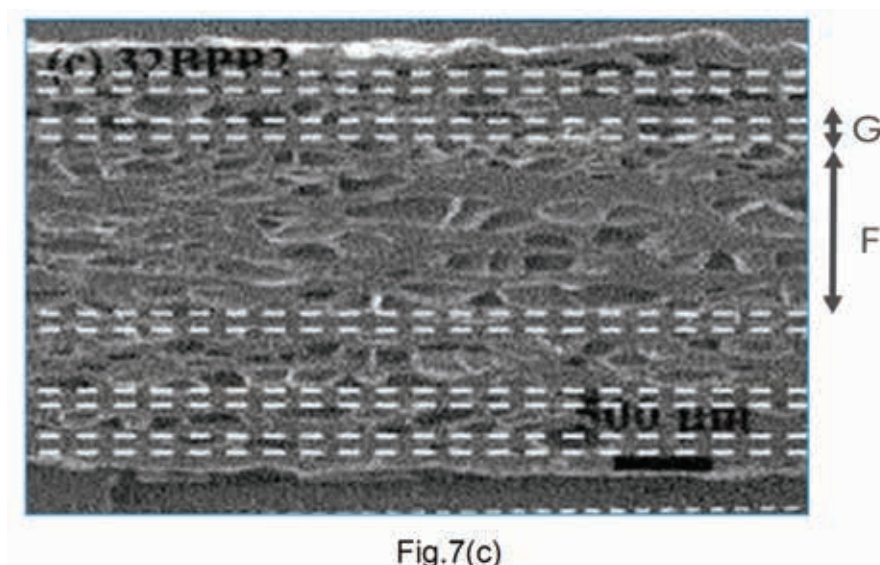
6.7 The appellants submitted in addition that the parallel dashed white lines forming narrow bands represented in Figure 7(b) would have been inserted by the authors of D4 in order to mark films layers, while the broad bands between such two film layers would have been meant by the authors of D4 to indicate foam layers (statement of grounds of appeal, page 7, item 9; letter of 2 November 2023, page 10, item 116). The same would be valid for the parallel dashed white lines forming narrow bands represented in Figure 7(c) (letter of 2 November 2023, page 11, item 117). The zones alleged by the appellants to have been indicated by the authors of D4 to represent film and foam layers were marked by the appellants with insertions of double arrows C and A in Figure 7(b), respectively (letter of 2 November 2023, pages 10 and 11, item 116). A reproduction of modified Figure 7(b) marked by the appellants is shown below:



Based on the scale bar at the bottom of Figure 7(b) the foamed zone A would have a thickness of 9 mm (statement of grounds of appeal, page 6, section 6). The film

layer zone C would be "generally free of pore/voids" (letter of 2 November 2023, sections 111 and 116).

Similarly, the zones alleged by the appellants to represent film and foam layers in Figure 7(c) have been marked by the appellants with insertions of double arrows G and F (letter of 2 November 2023, page 11, sections 117 and 118). Figure 7(c) marked by the appellant is reproduced below.



6.8 The appellants' argument attributing to the dashed white line a representation by the authors of D4 of the film and foam layers identified in samples 16BPP2 and 32BPP2, which is disputed by the respondent (rejoinder, page 9, section 34), is not convincing.

It is uncontested that those white dashed lines are merely shown in Figures 7(b) and 7(c) and that no reference is made to them in the whole text of D4, including the legend of these figures. This already casts doubt on their implicit signification alleged by the appellants. Considering that the purpose of D4 is to study the influence the long chain branching of PP

towards the goal of achieving a better separation between film and foam layers, it should rather be expected that any symbol added by the authors of D4 in Figure 7(b) and Figure 7(c) in order to symbolize satisfying separations between foamed and film zones would be explained by the authors of D4.

6.9 Such an implicit meaning of the dashed white lines also does not stand up to closer scrutiny of the samples.

In agreement with the indication by the appellants that these narrow bands are "generally free of pore/voids" (letter of 2 November 2023, page 9, section 111 and page 17, sections 143), it can be seen that all the narrow bands alleged to indicate a film layer in Figures 7(b) and 7(c) cross some cells. This is in particular the case for the narrow band situated in Figure 7(b) at the top of arrow A, in agreement with the remark in D4 (point 6.4 above, third paragraph), according to which the layered structures are more obvious in the outer layers than in the bulk area.

Moreover, having regard to the scale bar indicated at the bottom of Figures 7(b) and 7(c) it is apparent that both samples have the same thickness, which is in agreement with a process using splitting, spreading and stacking steps, as depicted in Figure 1 of D4. This implies that sample 32BPP2 having the double amount of film and foamed layers should have film layers which have half the thickness of those of sample 16BPP2. This would imply that the narrow bands alleged to represent the film layers in both figures should have a different thickness, which is not the case.

In addition, as noted by the respondent a single dashed white line is represented below the cross-section of

the sample on Figure 7(c), which implies that dashed lines in general are not necessarily meant to describe structural details of the samples.

Hence, in view of the above and contrary to the appellants' opinion, a technical sensible review of Figures 7(b) and 7(c) by a mind willing to understand would not attribute to the dashed white lines represented in said figures the meaning alleged by the appellants, namely the localisation of film separation layers.

On that basis, the appellants' submissions based on the alleged meaning of those dashed white lines cannot demonstrate that those were implicitly meant to indicate the presence of a foamed area between two film separation layers.

- 6.10 In view of the above, none of the appellants' submissions allow the conclusion that sample BPP16 or sample BPP32 would provide a direct and unambiguous description of a foam sheet whose thickness is at most 1.5 mm. For this reason, the appellants' objection that novelty of claim 1 of the main request would be taken away by those samples cannot succeed. Novelty of the subject-matter of claim 1 of the main request is therefore acknowledged.

Inventive step over D1

7. The patent in suit aims at providing a multi-layered sheet suitable for the fabrication of container articles such as cups with low wall thickness while maintaining mechanical properties, which can be advantageously recycled, and have improved thermal insulation properties and printability without

requiring an additional layer for printing in the final article fabrication (patent in suit, paragraphs [0001] to [0003]; [0100-0106]; [0147-0148]).

7.1 Example 5 of D1 (paragraphs [00290] to [00294]) describes by reference to example 3 of that document (last line of page 56 and page 57) the preparation of a cup, comprising a foamed sheet and a cover layer, reference being also made in paragraph [00294] to Example 1 for the definition of the foamed sheet (paragraphs [00224] to [00226]).

7.2 According to paragraph [00262] of D1, the formulation used for preparing the foamed sheet comprises

81.4% of the HMS-PP WB140 HMS from Borealis

15% of the secondary resin Braskem F020HC (homopolymer PP)

0.1% of a chemical blowing agent

and 0.5% of a nucleating agent (Heritage Plastics HT4HP Talc)

It is undisputed that the secondary resin is not a HMS resin, but a linear PP.

7.3 In agreement with the contested decision, the parties agree that the preparation of the cup as described in example 5 of D1 represents a suitable starting point for assessing inventive step. The Board having no reason to differ from that opinion takes the disclosure of that example as the closest prior art.

Distinguishing features

8. The parties are also in agreement that the subject-matter of operative claim 1 differs from the closest prior art in that

(i) the total amount of the high melt strength polypropylene (HMS-PP/HMS-PP') and the nucleating agent is higher, i.e. at least 95 wt.%, based on the polypropylene composition comprised in the foamed sheet, whereby the amounts of HMS-PP, nucleating agent and HMS-PP' are as defined in operative claim 1,

(ii) the nucleating agent used for the preparation of the foamed sheet is specified to have a particle size d_{50} within the range of 1 μm to 30 μm .

Problem successfully solved

9. Whereas having regard to the comparison shown in D15 and the examples of the patent in suit, the opposition division found that the problem successfully solved over the closest prior art could be seen as the provision of a multi-layered sheet, wherein the foamed sheet has a lower surface roughness and thus better printability, the appellants submit that the objective technical problem should be formulated as an aggregation of the problems separately solved by each of the above mentioned distinguishing features (statement of grounds of appeal, page 18, section 57). In other words, these two distinguishing features are not held by the appellants to be functionally interdependent. This is not disputed. The following analysis is therefore made on that basis.

9.1 Starting with the partial problem solved by the first distinguishing feature (i), the appellants submit that the opposition did not correctly analyse experimental evidence D15, as they would have failed to see that an amount of 60 wt.% for the HMS PP resins used in the comparative composition of D1 is much lower than in the closest prior art. In this regard, it was considered in the Board's preliminary opinion that the erroneous reference to the secondary resin in the submissions of the appellants in their statement of grounds, page 19, section 62, was obviously to be understood as a reference to the HMS PP. This was not contested.

In other words, the appellants consider that comparative example of D15 would not be representative of the example of D1 taken as the closest prior art, since it would comprise 35 wt.% of linear PP instead of 15 wt.%. For this reason D15 would not have any probative value.

9.2 The fact that the comparative example of D15 is not a repetition of example 5 of D1 using the composition of example 1 or example 3 of D1 does not as such necessarily invalidate the comparative tests offered by the patent proprietor, since the possibility of using a comparison made with a variant of the closest prior art has been recognized by the Boards of Appeal as early as in T 35/85. According to point 4 of the Reasons for said decision the patentee may discharge his onus of proof by voluntarily submitting comparative tests with newly prepared variants of the closest state of the art making identical the features common with the invention in order to have a variant lying closer to the invention, so that the advantageous effect attributable to the distinguishing features of the invention is thereby more clearly demonstrated.

This is here the case, as the comparison made in D15 has been made by merely varying the proportion of HMS-PP and linear PP, i.e. this comparison is suitable to establish a causal link between the alleged technical effect of a decreased surface roughness and an increased proportion of HMS-PP component in the polypropylene composition comprised in the foamed sheet. This comparison is in particular made so as to result in the same foam density and foam thickness. It is also credible that a decrease in surface roughness results in an improved printability, which was not disputed.

- 9.3 The appellants' argument that foaming is influenced to a large extent by the presence of linear PP, as would be known from D10 and D11, which in their opinion would support their submission that comparative test D15 would not be suitable to demonstrate any technical effect with respect to the closest prior art (statement of grounds of appeal, sections 65 to 67) fails to convince.

This argument rather supports the respondent's position that the foaming step performed in the presence of a different proportion of linear PP and therefore a different amount of HMS-PP has an effect on the foamed product obtained.

The fact that the amount of linear PP is higher in the closest prior art than in the comparative example of D15 might have the consequence that the extent of the effect expected to be obtained for the multi-layered sheet of operative claim 1 vis-à-vis the closest prior art might be lower than in experimental test of D15. It is, however, not sufficient to cast doubt on such a

technical effect resulting from the use of a lower proportion of linear PP or conversely higher proportion of HMS PP.

9.4 In the absence of additional arguments by the appellants and in agreement with the opposition division, the Board is therefore satisfied on that basis that the partial problem of providing a multi-layered sheet, wherein the foamed sheet has a lower surface roughness and thus improved printability is indeed solved by the first distinguishing feature (i) identified in point 8 above.

9.5 As shown below, the question as to which partial problem would be solved by the second distinguishing feature (ii) is not decisive for the present decision and therefore can be left unanswered.

Obviousness of the solution

10. It remains to be decided whether the skilled person desiring to solve the first partial problem so defined, would, in view of the disclosure of D1, possibly in combination with other prior art documents or with common general knowledge, have modified the multi-layered sheet of the closest prior art in accordance with the first distinguishing feature.

10.1 The sole arguments of the appellants regarding obviousness of the first distinguishing feature do not concern the achievement of an improved surface roughness of the foamed sheet of the multi-layered sheet, but the mere provision of a further polypropylene composition (statement of grounds of appeal, page 21, sections 68 to 72). Moreover, the sole document cited by the appellants in respect of

obviousness of that modification, i.e. D10 (statement of grounds of appeal, page 21, section 70) does not address surface roughness of the foamed sheet, let alone as a result of varying the amount of HMS polypropylene. Arguments by the appellants in this respect were not submitted.

- 10.2 Consequently, the appellants' submissions based on example 5 of D1 as the closest prior art do not establish the obviousness of the modification (i) identified in point 8 above and therefore the lack of inventive step of the multi-layered sheet in accordance with operative claim 1 which comprises that feature, i.e. irrespective of whether or not the additional modification of the closest prior art consisting in the selection of a specific particle size for the nucleating agent (ii) involves an inventive step.
11. The appellants' objection starting from example 5 of D1 as the closest prior art therefore does not succeed.

Inventive step over D4

12. The appellants submitted in addition that the multi-layered sheet of operative claim 1 lacked an inventive step starting from the disclosure of D4. It is, however, disputed by the respondent that D4 would constitute a valid starting point for assessing inventive step (rejoinder, items 74 to 83).
- 12.1 According to the case law, ideally the closest prior art should be a document that mentions the purpose or objective indicated in the patent in suit as a goal worth achieving and having the most relevant technical features in common, i.e. requiring the minimum of structural modifications (Case Law, I.D.3.1). The aim

of the problem-solution approach is to assess in an objective manner whether the invention for which protection is sought can be seen, from the perspective of the notional skilled person, as a contribution to the art which could justify the extent of the monopoly conferred by the patent. For these reasons, the assessment process should start from a situation as close as possible in reality to that encountered by that notional skilled person. This necessitates in a first step to select a realistic starting point from the perspective of the skilled person as is reminded in decision T 2759/17 (point 5.3.2 of the Reasons).

12.2 The patent in suit aims at providing a multi-layered sheet suitable for the fabrication of container articles such as cups with low wall thickness while maintaining mechanical properties, which can be advantageously recycled, and have improved thermal insulation properties and printability without requiring an additional layer for printing in the final article fabrication (patent in suit, paragraphs [0001] to [0003]; [0100-0106]; [0147-0148]). These are also the purposes underlying the embodiments described in the examples of the patent in suit, at least insofar suitability for the fabrication of a container article and printability are concerned (paragraph [0164]).

12.3 While in order to achieve an objective assessment of inventive step an artificial and technically unrealistic approach should be avoided when formulating the problem solved over the closest prior art, the same is valid for the selection of the latter. Whereas such an artificial and unrealistic approach cannot be recognized when selecting example 5 of D1 as a starting point for the claimed invention, since it also relates like the examples of the patent in suit to the

preparation of a cup using a foamed sheet based laminate, D4 does not concern the preparation of a thermal insulative container, let alone one which is printable. It is a research article which concerns the preparation of a material meant to mimic the structure of cork, and more specifically the influence of the degree of long-chain branching of PP on the morphology of the multilayered foams/films sought to be obtained. The mere general indication in the introduction of D4 that thermoplastic foams are widely used in the automotive, construction, and packaging industries because of their wide range of properties such as mechanical, thermal, acoustic, and electrical insulation properties does not imply that the products prepared in D4, i.e. samples 16BPP2 and 32BPP2, for which possible practical uses are not disclosed in D4, would be suitable for the fabrication of printable thermal insulative containers. On that basis D4 is completely unrelated to the scope and purpose of the patent.

Under these circumstances the disclosure of D4, the selection of which as the closest prior art is exclusively based on the alleged similarity of the structural features disclosed therein with operative claim 1, does not represent a realistic starting point for the present invention.

On this basis, the appellants' objection starting from the disclosure of D4 lacks the necessary objectivity and is therefore unfounded.

13. In light of the foregoing, none of the appellants' objections can succeed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



D. Hampe

D. Semino

Decision electronically authenticated