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**Datasheet for the decision
of 10 November 2023**

Case Number: T 0573/21 - 3.3.03

Application Number: 15806765.2

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C08F212/10, C08F265/04

Language of the proceedings: EN

Title of invention:
THERMOPLASTIC RESIN COMPOSITION AND MOLDED PRODUCT THEREOF

Patent Proprietor:
Techno-UMG Co., Ltd.

Opponent:
INEOS Styrolution Group GmbH

Relevant legal provisions:
RPBA 2020 Art. 13(1), 13(2)
EPC Art. 54, 56

Keyword:

Documentary evidence submitted after summons - exceptional
circumstances (no)

Experimental data submitted after summons - exceptional
circumstances (no)

Novelty (yes)

Inventive step (no) alleged improvement over the closest prior
art not demonstrated - obvious modification

Decisions cited:

G 0002/12, T 0939/92, T 0815/93, T 0179/03



Beschwerdekammern

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Case Number: T 0573/21 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 10 November 2023

Appellant: INEOS Styrolution Group GmbH
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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
2 March 2021 concerning maintenance of the
European Patent No. 3156452 in amended form.**

Composition of the Board:

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

Summary of Facts and Submissions

I. The appeal lies from the interlocutory decision of the opposition division according to which European patent No. 3 156 452 as amended according to the claims of auxiliary request 3 submitted during the oral proceedings on 14 January 2021 and a description adapted thereto met the requirements of the EPC.

II. The decision was taken having regard to the following documentary evidence amongst others:

E1: DE 41 21 975 A1

E2: Experimental report concerning E1

E3: EP 0 131 202 B1

E6: EP 0 062 901 A2

E7: DE 24 27 960 B1

E10: Ullmann's Encyclopedia of Industrial Chemistry, Wiley-VCH, 7th Edition, Volume 29, pages 59-91 and 475-522.

III. According to the reasons for the contested decision concerning claim 1 of auxiliary request 3 which are pertinent for the appeal proceedings:

(a) Novelty over the compositions of examples 22 and 23 of E3 was acknowledged, in particular since PBT, which was an ingredient of those compositions, could not be seen as an additive within the meaning of operative claim 1.

(b) Concerning inventive step, the closest prior art was represented by E1, reference being made to its claim 1 and page 7, as it also concerned impact

resistant compositions comprising a polycarbonate and a graft copolymer.

The claimed thermoplastic composition differed from the closest prior art at least in that it comprised a graft copolymer (B). Having regard to examples 3 and 5-11 and comparative examples 3-12 of the patent in suit, in which a graft polymer (B) according to claim 1 was compared with a graft polymer having a particle size distribution outside the range in claim 1, it was credible that the presence of a graft polymer (B) according to operative claim 1 brought about an improved impact resistance at 23°C.

Even if example 2 of E6 disclosed a graft copolymer (B) according to operative claim 1, E6 also concerned grafted copolymers which were outside its scope. Furthermore E6 did not teach that the graft copolymer of example 2 could be advantageous to improve the impact resistance at 23°C of molding compositions. An inventive step was therefore acknowledged.

- IV. An appeal against that decision was lodged by the opponent (appellant). With the statement setting out the grounds of appeal, the following document among others was submitted:

E16: IUPAC Compendium of Chemical Terminology, 2nd Ed., "The Gold Book" (7. Oktober 2008), entry "Additive", <https://goldbook.iupac.org/terms/view/A00134>.

- V. With their rejoinder (letter of 16 November 2021) the patent proprietor (respondent) submitted nineteen sets of amended claims designated as auxiliary requests 1,

2, 3, 3A, 3B, 4, 4A, 4B, 5, 5A, 5B, 6, 6A, 6B, 7, 8, 8A, 8B and 8C, as well as the following document:

E17: Römpp Chemie Lexikon, Band 1, page 50, entry for "Additives".

- VI. In reply to the rejoinder, the appellant made additional submissions with letter of 25 April 2022.
- VII. The respondent made further submissions with letter of 8 December 2022 to which seven additional sets of claims, labelled as auxiliary requests 7D, 8D, 9, 9A, 9B, 9C and 9D were attached.
- VIII. Additional submissions by the appellant were filed with letter of 17 February 2023.
- IX. In preparation of the oral proceedings, a communication pursuant to Article 15(1) RPBA 2020 conveying the Board's provisional opinion was issued.
- X. Following the Board's communication, the respondent with letter of 29 September 2023 referred to additional experimental data incorporated within that letter on pages 3 and 4 thereof and submitted in addition the following documents:
- E18: Excerpt from the Hawley's Condensed Chemical Dictionary, twelfth edition, Van Nostrand Reinhold Company, 1993, page 22
- E19: Excerpt from the Encyclopedia of Polymer Science and Engineering, John Wiley & Sons, Volume 1, 1985, pages 472-475.
- XI. Oral proceedings before the Board were held on 10 November 2023.

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

- The appellant requested that the decision under appeal be set aside and that the patent be revoked.

- The respondent requested that the appeal be dismissed or, alternatively, that the patent be maintained on the basis of any of auxiliary requests 1, 2, 3, 3A, 3B, 4, 4A, 4B, 5, 5A, 5B, 6, 6A, 6B, 7, 7D, 8, 8A, 8B, 8C, 8D, 9, 9A, 9B, 9C and 9D in this order, all filed with the reply to the statement of grounds of appeal, with the exception of auxiliary requests 7D, 8D and 9 to 9D filed with letter of 8 December 2022.

XIII. The claims relevant to the present decision are as follows:

Main request (auxiliary request 3 filed during the oral proceedings on 14 January 2021)

"1. A thermoplastic resin composition consisting of 30 to 70 parts by weight of a polycarbonate resin (A), 10 to 60 parts by weight of a graft copolymer (B), and 0 to 40 parts by weight of a copolymer (C) wherein the total is 100 parts by weight, and optionally additives; the graft copolymer (B) being a graft copolymer obtained by graft polymerizing 20 to 90 parts by weight of at least one monomer including at least an aromatic vinyl monomer and/or a vinyl cyanide monomer to 10 to 80 parts by weight of a rubbery polymer having a weight average particle size of 150 to 450 nm and having a particle size for a cumulative weight fraction of 10 wt% of 50 to 250 nm and a particle size for a cumulative weight fraction of 90 wt% of 450 to 650 nm

(wherein the total of the rubbery polymer and the monomer(s) is 100 parts by weight); and

the copolymer (C) being a copolymer obtained by copolymerizing at least two monomers selected from the group consisting of an aromatic vinyl monomer, a vinyl cyanide monomer and another vinyl monomer copolymerizable with these monomers."

Auxiliary request 1

Claim 1 of auxiliary request 1 corresponds to claim 1 of the main request in which the optional additives are defined to be

"selected from hindered amine light stabilizers, antioxidants, thermal stabilizers, UV absorbers, lubricants, plasticizers, flame retardants and flame retardant auxiliaries, odor masking agents, pigments, dyes, reinforcing agents and fillers"

Auxiliary request 2

Claim 1 of auxiliary request 2 corresponds to claim 1 of the main request in which the optional additives are more specifically defined to be

"selected from hindered amine light stabilizers; antioxidants selected from those based on hindered phenols, sulfur-containing organic compounds and phosphorus-containing organic compounds; thermal stabilizers selected from those based on phenols and acrylates; UV absorbers selected from those based on benzoates, benzotriazoles, benzophenones and salicylates; lubricants selected from those based on organic nickels and higher fatty acid amides; plasticizers selected from phosphate esters; flame

retardants and flame retardant auxiliaries selected from halogen-containing compounds, for example, polybromophenyl ether, tetrabromobisphenol-A, brominated epoxy oligomer and brominated polycarbonate oligomer, phosphorus compounds and antimony trioxide, odor masking agents; pigments selected from carbon black and titanium oxide; dyes; reinforcing agents and fillers including talc, calcium carbonate, aluminum hydroxide, glass fibers, glass flakes, glass beads, carbon fibers and metal fibers"

Auxiliary requests 3, 3A and 3B

Claim 1 of auxiliary requests 3, 3A and 3B corresponds to claim 1 of the main request, auxiliary request 1 and auxiliary request 2, respectively, in which copolymer (C) is defined to be

"a copolymer obtained by copolymerizing a monomer mixture including 60 to 95 wt% of an aromatic vinyl monomer, 5 to 40 wt% of a vinyl cyanide monomer, and 0 to 40 wt% of an additional monomer copolymerizable with these monomers, and the weight average molecular weight (Mw) of the copolymer (C) is in the range of 50000 to 200000".

Auxiliary requests 4, 4A and 4B

Compared to claim 1 of auxiliary requests 3, 3A and 3B, claim 1 of auxiliary requests 4, 4A and 4B, respectively, defines that the rubbery polymer in the graft copolymer (B)

"is at least one selected from the group consisting of alkyl (meth)acrylate rubber, diene/alkyl (meth)acrylate

composite rubber and polyorganosiloxane/alkyl (meth)acrylate composite rubber".

Auxiliary requests 5, 5A and 5B

Compared to claim 1 of auxiliary requests 4, 4A and 4B, claim 1 of auxiliary requests 5, 5A and 5B, respectively, includes a restriction of the amount of monomers and rubbery polymer used to prepare the graft copolymer (B) (deletions indicated in ~~striketrough~~ and additions in **bold**), i.e.

"by graft polymerizing ~~2040~~ to ~~9060~~ parts by weight of at least one monomer including at least an aromatic vinyl monomer and/or a vinyl cyanide monomer to ~~1040~~ to ~~8060~~ parts by weight of a rubbery polymer"

Auxiliary requests 6, 6A and 6B

Compared to claim 1 of auxiliary requests 5, 5A and 5B, claim 1 of auxiliary requests 6, 6A and 6B, respectively, defines the rubber used for preparing the graft copolymer (B) to be

"an alkyl (meth)acrylate rubber".

Auxiliary request 7

Claim 1 of auxiliary request 7 corresponds to claim 1 of auxiliary request 6 in which the list of optional additives is limited to a lubricant.

Auxiliary request 7D

Claim 1 of auxiliary request 7D corresponds to claim 1 of auxiliary request 7 in which the composition comprises a lubricant.

Auxiliary requests 8, 8A, 8B, 8C and 8D

Claim 1 of auxiliary requests 8, 8A, 8B, 8C and 8D corresponds to claim 1 of auxiliary requests 6, 6A, 6B, 7 and 7D, respectively, in which the graft copolymer (B) is further defined to be

"recovered from a graft copolymer latex resulting from emulsion graft polymerization by a wet process in which the graft copolymer latex is added to a solution of a coagulant in hot water to cause the copolymer to be flocculated as a slurry, with the coagulant being an inorganic acid".

Auxiliary requests 9, 9A, 9B, 9C and 9D

Claim 1 of auxiliary requests 9, 9A, 9B, 9C and 9D corresponds to claim 1 of auxiliary requests 8, 8A, 8B, 8C and 8D, respectively, in which the graft copolymer (B) is defined to have

"the graft ratio of 5 to 150% and the reduced viscosity of 0.2 to 2.0 dL/g".

XIV. 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 point essentially concerned the question whether the claimed composition was novel and involved an inventive step over the disclosure of E1.

Reasons for the Decision

Admittance of documents E16 to E19

1. It is undisputed that document E16 filed with the statement of grounds of appeal is to be regarded as an amendment to the appellant's appeal case within the meaning of Article 12(4) RPBA 2020, whose admittance is at the discretion of the Board. It is also undisputed that the same holds true for document E17 submitted with the reply to the statement of grounds of appeal. The need to address the meaning of the term "additives" was triggered by the filing during the oral proceedings of a new auxiliary request 3, corresponding to the present main request in which the additives were not any more defined by their function, and by the argument in the reasons for the contested decision concerning the meaning to be attributed to that term. The submission of E16 with the statement of grounds of appeal represents therefore a legitimate and timely reaction to the new point which arose during the oral proceedings concerning the meaning to be attributed to the term "additives". The Board has therefore no ground to use its discretion conferred by Article 12 (4) RPBA 2020 and not to admit E16 to the appeal proceedings. The same is valid for E17 which was submitted by the respondent in reply to the filing of E16.

The admittance of documents E18 and E19 submitted by the respondent with their letter of 29 September 2023, i.e. after issuance of the summons to oral proceedings is regulated by the provisions of Article 13(2) RPBA 2020. In the exercise of its discretion under Article 13(2) RPBA 2020 the Board may also rely on the criteria set out in Article 13(1) RPBA.

These documents have been submitted in support of the respondent's interpretation of the term "additives" within the meaning of claim 1 of the main request, which issue, in the contested decision, was relevant for assessing novelty over examples 22 and 23 of E3, i.e. for determining whether PBT which was contained in an amount of 55 wt% in the composition of those examples could be seen as an additive.

The respondent argued that the filing of E18 and E19 was necessary and had been filed in direct reply to the Board's preliminary opinion in which it was indicated that the term "additives" had to be given its broadest technical sensible meaning in the context in which it appeared, the meaning of the term "additives" in E16 being given by the Board more weight than that indicated in E17. Arguing that the present technical context was that of polymers, the respondent submitted that it had become necessary to file E18 and E19.

This is not convincing, since the respondent was well aware of the technical context of the present invention and had themselves already pointed out in writing that it was clear from E17 that different technical fields required different additives. Accordingly, the respondent did not demonstrate the presence of exceptional circumstances which would justify the filing of E18 and E19 at this stage of the procedure.

Accordingly, the Board sees no reason to take E18 and E19 into account in the exercise of its discretion pursuant to Articles 13(1) and 13(2) RPBA 2020.

Main request

Novelty over E1

2. The appellant submits that the subject-matter of operative claim 1 lacks novelty over the compositions of examples 1 to 9 and comparative example 1 of document E1 (page 5, line 60 to page 7, line 27). The thermoplastic moulding compositions of examples 1 to 9 comprise a polycarbonate component A, a mixture of two different core-shell graft copolymers B1 and B2 in a 1:1 weight ratio, a copolymer of styrene and acrylonitrile in a weight ratio of 80:20 with a viscosity number of 83 ml/g as component C, a polyolefin D in accordance with claim 1 of document E1 (an ethylene/acrylic acid copolymer D1 containing 8 wt% of acrylic acid for examples 1 to 3, a polyethylene D2 or D3 for examples 4 to 9) and a high molecular weight multicomponent ester (Loxiol® G 70 S from Henkel). The composition of comparative example 1 comprises the same components, but not the polyolefin component D.

2.1 The 1:1 mixture of core-shell graft copolymers B1 and B2 is obtained by first preparing B1 and B2 separately.

The median weight average particle size d_{50} of the latex particles used for preparing B1, i.e. the latex particles building the core of B1, is indicated to be 76 nm, with a narrow particle size distribution $Q = (d_{90}-d_{10})/d_{50}$ of 0.29 (page 6, lines 16-26).

The median weight average particle size d_{50} of the latex particles used for preparing B2 is 430 nm, with a narrow particle size distribution $Q = (d_{90}-d_{10})/d_{50}$ of 0.1 (page 6, lines 33-40).

2.2 It is undisputed that neither the latex used for preparing B1, nor the latex used for preparing B2, has the weight size distribution of the rubbery polymer defined in operative claim 1 for the synthesis of component (B). Hence, neither of those separately prepared core-shell graft copolymers is a component (B) within the meaning of operative claim 1.

2.3 The appellant's objection, however, rests on the argument that a 1:1 weight mixture of the respective rubber core particles used for preparing the core-shell graft copolymers B1 and B2 has a particle size distribution corresponding to that of the rubbery core of the graft copolymer of present claim 1. This would be shown in experimental report E2, reference being made to point 5 thereof.

However, the shell of copolymer B1 is obtained by grafting a single layer of a mixture of styrene and acrylonitrile (page 6, lines 27-32), and the shell of copolymer B2 has a two layer structure obtained by grafting for the inner layer styrene and for the outer layer of a mixture of styrene and acrylonitrile (page 6, lines 41-44). On that basis, copolymers B1 and B2 which present a different shell structure cannot be obtained by grafting in the same manner a mixture of the polymers used as core for the preparation of copolymers B1 and B2.

On that basis, the mixture of graft copolymers B1 and B2 used in comparative example 1 and examples 1 to 9 of E1 is not obtainable by the process of grafting monomers to a single rubbery polymer, as implicitly required by the wording of operative claim 1.

- 2.4 Novelty of the subject-matter of claim 1 over E1 is therefore acknowledged.

Inventive step over E1

Closest state of the art

3. The parties agreed that the compositions of examples 1 to 9 of E1 described in the table on page 7 of that document (see points 2, 2.1 and 2.3 above) constitute a suitable starting point for assessing inventive step of the subject-matter of claim 1. These thermoplastic compositions correspond to preferred embodiments of E1, for which favourable impact resistance and fluidity values have been obtained, in line with the purpose of the present invention defined in paragraph [0007] of the patent in suit, namely to provide a thermoplastic resin composition having an excellent balance of properties such as impact resistance, fluidity and heat resistance.

As submitted by the appellant and acknowledged by the respondent during the oral proceedings, the subject-matter of operative claim 1 differs from the compositions of examples 1 to 9 of E1 solely in that it contains a graft copolymer (B) as defined in claim 1 instead of 1:1 mixture of graft-copolymers B1 and B2.

Problem successfully solved

4. Relying on the experimental results described in the patent in suit, the respondent argues that the technical problem solved by the subject-matter of claim 1 with respect to the closest prior art is the provision of a thermoplastic resin composition with improved impact resistance at 23 °C while maintaining

favourable levels of other properties, like impact resistance at -30 °C, fluidity and flexural elastic modulus.

- 4.1 However, as pointed out by the appellant, none of the comparative examples of the patent in suit uses a graft copolymer corresponding to one of those described in examples 1 to 9 of E1, which is uncontested. It was not even submitted that the compositions of the comparative examples of the patent in suit could be seen as a fair representation of one the examples 1 to 9 of E1, as far as the grafted copolymers are concerned. The Board has no reason to consider that this would be the case.

Therefore, in the absence of any appropriate evidence or technical explanation proposed in order to demonstrate the credibility of the respondent's contention with respect to an improvement of the impact resistance at 23 °C without a decrease of the other properties, like impact resistance at -30 °C, fluidity and flexural elastic modulus, resulting from the replacement of the mixture of core-shell graft copolymers B1 and B2 used in E1 by the graft copolymer (B) of operative claim 1, the respondent's assertion remains speculative and cannot be taken into consideration in determining the problem successfully solved over the closest prior art (Case Law of the Boards of Appeal of the EPO, 10th edition 2022, I.D.4.3.1).

- 4.2 Based on the respondent's submission during the oral proceedings that the numerous examples in the specification illustrative of the claimed invention demonstrated at least that the thermoplastic composition of operative claim 1 exhibited a good balance of properties, which must be understood to

refer to impact resistance at 23 °C, impact resistance at -30 °C, fluidity and flexural elastic modulus, it is accepted to the benefit of the respondent and in view of these examples that the problem successfully solved over the closest prior art cannot be formulated as the mere provision of a further thermoplastic composition, but as the provision of a further thermoplastic composition exhibiting such favorable balance of properties.

Obviousness of the solution

5. It remains to be decided whether, in view of the disclosure of E1, and possibly in combination with other prior art documents or common general knowledge, the skilled person desiring to solve the above problem would have modified the composition of E1 in such a way as to arrive at the composition of operative claim 1. In this respect, it is the appellant's submission that the skilled person would have found obvious to replace the impact modifier of the closest prior art with the impact modifier used in example 2 of E6.
- 5.1 Concerning the compositions of the closest prior art, the impact modifier used is a combination of graft copolymers B1 and B2 which have each a polyacrylate rubber core with a shell made of polymerised styrene and acrylonitrile, particles B2 having in addition an inner layer made of styrene (E1, page 6, lines 19-42) (see point 2.3 above). Those grafts copolymers B1 and B2 are mixed with copolymers of styrene and acrylonitrile, as component C. In other words, the compositions of the closest prior art all of which comprise polycarbonate (PC), said core-shell impact modifiers B1 and B2 and a copolymer of styrene and

acrylonitrile are compositions of the PC - ASA type (see explanation in the next page).

As regards the graft copolymer of example 2 of E6 (page 11, line 1 to page 12, line 14), it has a core of a butadiene/acrylic ester rubber and a shell made of polymerised styrene and acrylonitrile. It is undisputed that the graft rubber described in example 2 of E6 corresponds to component (B) of operative claim 1. Said core-shell impact modifier is mixed with a copolymer of styrene and acrylonitrile, the resulting mixture being an ABS type material (E6, page 1, lines 3-6 and page 3, line 5).

It is useful at this juncture to remember that the term ABS designates particles of butadiene or copolymer of butadiene rubber grafted with styrene-acrylonitrile copolymer chains, which grafted rubber particles are embedded in a styrene-acrylonitrile matrix. Similarly ASA defines acrylate rubber particles also grafted with styrene-acrylonitrile copolymer chains and embedded in a styrene-acrylonitrile matrix. Reference is made in this respect to E10 (page 74, right-hand column, section "ABS", first paragraph; page 495, left-hand column, last paragraph and Figure 13; page 500, left-hand column, first paragraph in respect of ABS; and page 514, item 5.12 in respect of ASA).

- 5.2 Turning then to the teaching of E6 invoked by the appellant, this document is not only concerned with ABS type materials, but also ASA type materials, which are mentioned alongside of ABS in the same passages on page 1, lines 3-6 and page 3, line 5.

Both ABS and ASA materials are disclosed on page 3, lines 5-7 and page 8, lines 1 to 4 of E6 to exhibit a

balanced combination of properties, including impact strength, even at low temperatures, and flowability, as pointed out by the appellant.

Furthermore, concerning the use of ABS in PC compositions, it was common general knowledge, as demonstrated by the excerpts of the encyclopedia E10 cited by the appellant, that mixtures of PC and ABS provide an excellent balance of impact strength, processability and heat resistance (page 75, left-hand column, first full paragraph; page 78, right-hand column, last full paragraph; page 490, right-hand column, second full paragraph). The appellant also pointed out that E10 also teaches on page 517 (right-hand column, lines 4-7) that the blending of PC with ABS improves heat resistance, processing behaviour and low-temperature toughness.

5.3 Consequently, starting from the thermoplastic compositions exemplified in E1 and faced with the problem identified in point 4.2 above, the skilled person would have found it obvious to replace the ASA type component comprised in these compositions by an ABS type component such as that described in example 2 of E6, or taking into account that both components contain a copolymer of styrene and acrylonitrile in addition to the impact modifier, to replace the graft copolymer impact modifier used in the examples of E1 by the graft component described in example 2 of E6, arriving thereby in an obvious way at a thermoplastic composition falling within the ambit of claim 1 of the main request.

5.4 The respondent submitted that all compositions in accordance with the teaching of E1 would comprise a mixture of two grafted copolymers B1 and B2 and that

the skilled person would find no motivation to replace both grafted copolymers B1 and B2 with a single one. This, is not convincing. While the skilled person might also find obvious to replace one of the grafted copolymers B1 and B2, which constitute in admixture the impact modifier used in E1, it would be above all obvious to replace the component of E1 having the impact modifying effect, i.e. the mixture of B1 and B2, by another component having the same function, i.e. the graft copolymer of example 2 of E6.

- 5.5 Relying upon E7 whose examples 2 and 3 concern the same graft-copolymers disclosed in examples 2 and 3 of E6, the respondent also submitted during the oral proceedings that the skilled person would not be guided to use the graft copolymer impact modifier of example 2 of E6/E7, but that of example 3 of E6/E7, as the latter brings about a higher notched impact strength (tables 2 and 3 in columns 9 and 10). By doing so, the skilled person would not arrive at the compositions of operative claim 1, since the graft copolymer of example 3 of E6/E7 is not based on a rubbery polymer having the weight average particle size distribution defined in operative claim 1.

This is also not convincing.

Both inventions defined in E6 and E7 aim at providing ABS compositions exhibiting a balanced combination of properties, including impact strength, even at low temperatures, and flowability (E6, passages referred to in point 5.2 above; E7, column 3, lines 8-11 and column 5, lines 25-29). This means that both compositions in accordance with examples 2 and 3 of E6/E7 are considered by the skilled person to provide an adequate balance of the properties mentioned above.

Given the established principle that the answer to the question as to what a person skilled in the art would have done depends on the result s/he wished to obtain (T 939/92, point 2.5.3 of the Reasons), in the present case, the skilled person, seeking to provide a further thermoplastic composition having a favorable balance of impact resistance at 23 °C, impact resistance at -30 °C, fluidity and flexural elastic modulus, would have considered each of these graft copolymers described with examples 2 and 3 of E6/E7 as suitable, and for this reason would have had no reason to disregard the graft copolymer of example 2 of E6/E7, especially when a comparison of the other properties addressed in E6/E7 is not given for these examples 2 and 3.

Conclusion

6. The subject-matter of claim 1 of the main request therefore does not involve an inventive step within the meaning of Article 56 EPC with the consequence that the main request is not allowable.

Auxiliary requests 1 and 2

7. With respect to auxiliary requests 1 and 2, the respondent declared during the oral proceedings that they had no further arguments in addition to those submitted in regard of the main request. This had also been stated in the written submissions of the respondent, according to which the comments on patentability of the main request also applied to auxiliary requests 1 and 2. Under these conditions, the Board has no reason to consider that the amendments introduced in claim 1 of auxiliary requests 1 and 2 have been shown to overcome the finding in respect of

the main request that the subject-matter of its claim 1 does not involve an inventive step. Auxiliary requests 1 and 2 are therefore not allowable either.

Auxiliary request 3

8. Claim 1 of auxiliary request 3 corresponds to claim 1 of the main request in which copolymer (C) has been specified to be a copolymer obtained by polymerizing a monomer mixture including 60 to 95 wt% of an aromatic vinyl monomer, 5 to 40 wt% of a vinyl cyanide monomer, and 0 to 40 wt% of an additional monomer copolymerizable with these monomers, whereby the weight average molecular weight (Mw) of the copolymer (C) is specified to be in the range of 50 000 to 200 000.

Having regard to the disclosure of the closest prior art, according to which copolymer (C) consists of styrene and acrylonitrile in a weight ratio of 80:20 and has a viscosity number of 83 ml/g, the only additional feature of operative claim 1 potentially distinguishing the composition of operative claim 1 from those of the closest prior art is the Mw of copolymer (C).

- 8.1 While it is indicated on page 4, lines 50-53 of E1 that viscosity numbers in the range from 40 to 160 correspond to a Mw range of 40 000 to 2 000 000, it was not shown by the appellant that a viscosity number of 83 ml/g necessarily corresponds to a Mw within the range of 50 000 to 200 000 for copolymer (C). A Mw within this range therefore constitutes a further distinguishing feature over the closest prior art. In this respect the respondent submitted that, in view of the much broader upper limit of the range in E1, the

specific viscosity value could well correspond to a Mw above 200 000.

The respondent submitted during the oral proceedings that the selection of such a molecular weight for copolymer (C) within the broader range defined in E1 resulted in the technical effects described in paragraph [0068] of the specification and that no prior art suggested such modification.

According to paragraph [0068] of the specification, a weight average molecular weight below the range defined in operative claim 1 would lead to moulded articles with a poor impact resistance, while the workability during moulding would be decreased if the weight average molecular weight of the copolymer were above that range. However, the respondent's argument concerning the uncertainty about the weight average molecular weight of component (C) used in the closest prior composition was not whether such weight average molecular weight was below the range now specified in operative claim 1, but whether it was above its upper value of 200 000. Accordingly, the only effect to be possibly taken into account is the workability during moulding, i.e. the processability of the resin. This aspect should therefore be added to the formulation of the technical problem.

In this respect, the appellant referred during the oral proceedings to the common general knowledge about ABS provided in E10, attention being drawn to the section on page 496 dealing with the properties of the resin matrix, i.e. styrene acrylonitrile copolymers. It can indeed be gathered from the first paragraph of this section that the resin matrix of ABS polymers is mainly responsible for properties such as processability,

which depends predominantly on molecular weight and molecular weight distribution. The weight-average molecular weight of the styrene acrylonitrile matrix is specified in the last paragraph of that page to be within the range of ca. 50 000 to 180 000, the usual acrylonitrile content being also indicated to be of ca. 20 - 35 wt%, corresponding to the content of 20 wt% used for component (C) of the closest prior art composition.

On that basis, the skilled person wishing to obtain a resin having suitable processability would be prompted in view of the common general knowledge to select for copolymer (C) of the closest prior art a weight average molecular weight within the range specified in operative claim 1.

In view of the above, it is concluded that the subject-matter of claim 1 of auxiliary request 3 does not involve an inventive step. Auxiliary request 3 is therefore not allowable.

Auxiliary requests 3A and 3B

9. During the oral proceedings, the respondent did not contest that the conclusion in respect of claim 1 of auxiliary requests 1, 2 and 3 would also apply to auxiliary requests 3A and 3B. On that basis, it is concluded that the subject-matter of claim 1 of auxiliary requests 3A and 3B does not involve an inventive step either and that these requests consequently are not allowable.

Auxiliary requests 4, 4A, 4B, 5, 5A, 5B, 6, 6A, 6B, 7 and 7D

10. The parties had no further arguments regarding auxiliary requests 4, 4A, 4B, 5, 5A, 5B, 6, 6A, 6B, 7 and 7D in addition to those submitted regarding the requests of higher ranking. The respondent acknowledged during the oral proceedings that the amendments introduced into these auxiliary requests did not result in a further distinguishing feature over the closest prior art and that the conclusion reached on the requests of higher ranking equally applied to these auxiliary requests of lower ranking. In view of this, it is concluded that the requirements of inventive step have not been shown to be met by any of auxiliary requests 4, 4A, 4B, 5, 5A, 5B, 6, 6A, 6B, 7 and 7D with the consequence that these auxiliary requests are not allowable either.

Auxiliary request 8

11. Claim 1 of auxiliary request 8 corresponds to claim 1 of auxiliary request 6 in which the graft copolymer (B) is further defined by process steps for its preparation, namely that it is "to be recovered from a graft copolymer latex resulting from emulsion graft polymerization by a wet process in which the graft copolymer latex is added to a solution of a coagulant in hot water to cause the copolymer to be flocculated as a slurry, with the coagulant being an inorganic acid". The respondent contended that the use of an inorganic acid as coagulant in the step of recovering the graft copolymer latex would result in a graft copolymer which is different from that obtained in E1 or E6 where it is coagulated with a solution of calcium chloride. Such difference would be expressed by an

improved residential thermal stability resulting from the use of an inorganic acid.

11.1 Pursuant to the established case law of the Boards of Appeal a process feature can only contribute to the novelty of a product claimed insofar as it gives rise to a distinct and identifiable characteristic of the product (see e.g. decision T 0815/93, Reasons, points 4.3 and 4.3.1 and decision T 0179/03, Reasons, points 3.7 to 3.9). The specific process needed to obtain the claimed product should make it possible to distinguish the inevitable product of the product-by-process claim over the prior art (see decision G 2/12, Reasons, point IV.(5)). Applied to the present case, this means that the process feature defined in claim 1 of auxiliary request 8 can only be taken into account for the evaluation of inventive step of operative product claim 1, if such process feature gives rise to a distinct and identifiable characteristic of component (B).

11.2 In this respect the respondent relied upon experimental results presented on pages 3 and 4 of their letter of 29 September 2023, i.e. upon submissions filed after issuance of the summons to oral proceedings, whose admittance disputed by the appellant is therefore to be decided on the basis of Article 13(2) RPBA 2020. These experiments concern a repetition of example 5 of the patent in suit with the exception that in the production of the graft copolymer (B) a calcium acetate or calcium chloride coagulant was used instead of sulfuric acid.

11.2.1 Article 13(2) RPBA stipulates that any amendment to a party's case after notification of a summons to oral proceedings shall in principle not be taken into account unless there are exceptional circumstances,

which have been justified with cogent reasons by the party concerned. The respondent did not submit that such exceptional circumstances were given and the Board has no reason to take a different view, the filing of these new experimental data not being caused by an unforeseeable procedural development.

11.2.2 As a consequence, the board decided in the exercise of its discretion under Article 13(2) RPBA 2020 not to admit the experimental results presented on pages 3 and 4 of the respondent's letter of 29 September 2023 into the appeal proceedings.

11.3 The respondent also relied on two comparisons between examples of the patent in suit, namely (i) between example 9 using a graft copolymer B-6 coagulated with sulfuric acid and example 8 using a graft copolymer B-5 coagulated with calcium acetate, already indicated in point 11.2.1 above and (ii) between example 5 using a graft copolymer B-2 coagulated with sulfuric acid and example 8 using a graft copolymer B-1 coagulated with calcium acetate.

However, as submitted by the appellant in the last paragraph of page 10 of their submissions of 17 February 2023, an experimental comparison meant to demonstrate that the use of a different coagulant is causative for a technical effect should be made with coagulated particles whose size distribution has not been varied. This, however, is not the case, since the particle size distribution, which is indicated in table 4 of the specification, has been varied both between graft copolymers B-1 and B-2 (different weight average particle size and different d_{90} value) and between graft copolymers B-5 and B-6 (different weight average particle size and different d_{10} and d_{90} values). On

that ground, it is already doubtful whether these comparisons are appropriate to demonstrate that the alleged improved residential thermal stability of the thermoplastic composition is attributable to the use of sulfuric acid, let alone to the use of a mineral acid in general. In addition, the comparisons offered does not concern the coagulant used in example 2 of E6, namely calcium chloride, but calcium acetate.

Moreover, the respondent did not explain how the use of a mineral acid for coagulating component (B) would necessarily lead to a distinct and identifiable characteristic of said component, let alone of the thermoplastic composition as such. The patent in suit does not provide any information in this respect. Finally, the burden of proof of showing that a process feature results in a distinct and identifiable characteristic of the resulting product is on the patent proprietor, here the respondent (see decision T 179/03, point 3.9 of the Reasons).

Under these conditions, it is concluded that the product-by-process feature contained in claim 1 of auxiliary request 8 has not been shown to result in a further distinguishing feature of the claimed composition over the closest prior art.

- 11.4 For these reasons, the conclusion drawn in respect of claim 1 of auxiliary request 6 equally applies to claim 1 of auxiliary request 8, since the latter corresponds to claim 1 of auxiliary request 6 in which the graft copolymer (B) is further defined by the above mentioned process feature. The subject-matter of claim 1 of auxiliary request 8 lacks therefore an inventive step. Auxiliary request 8 is for this reason not allowable.

Auxiliary requests 8A to 8D and 9 to 9D

12. The parties had no further arguments regarding auxiliary requests 8A to 8D and 9 to 9D and acknowledged that the conclusion to be drawn in respect of auxiliary request 8 would equally apply to these auxiliary requests. On that basis, it is concluded that the requirements of inventive step are not met by any of auxiliary requests 8A to 8D and 9 to 9D and these auxiliary requests are not allowable either.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:



D. Hampe

D. Semino

Decision electronically authenticated