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Datasheet for the decision of 18 May 2022

Case Number: T 0222/19 - 3.3.03

Application Number: 13765911.6

Publication Number: 2895547

IPC: C08L23/04

Language of the proceedings: EN

Title of invention:
ETHYLENE-BASED POLYMER COMPOSITIONS, AND ARTICLES PREPARED FROM THE SAME

Patent Proprietor:
Dow Global Technologies LLC

Opponents:
Borealis AG
Basell Polyolefine GmbH

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - non-obvious alternative

Decisions cited:
T 0939/92

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Case Number: T 0222/19 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 18 May 2022

Other party: (Opponent 1)	Borealis AG Trabrennstrasse 6-8 1020 Vienna (AT)
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Respondent: (Patent Proprietor)	Dow Global Technologies LLC 2040 Dow Center Midland, MI 48674 (US)
Representative:	Boult Wade Tennant LLP Salisbury Square House 8 Salisbury Square London EC4Y 8AP (GB)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 23 November 2018 concerning maintenance of the European Patent No. 2895547 in amended form.**

Composition of the Board:

Chairman	D. Semino
Members:	F. Rousseau
	W. Ungler

Summary of Facts and Submissions

I. The appeal lies from the interlocutory decision of the opposition division according to which European patent No. 2 895 547 as amended according to the main request (claims 1 to 12) submitted with letter of 23 January 2018 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:

D2: US 2011/0034635 A1.

III. According to the reasons for the contested decision which are pertinent in the appeal proceedings, the claims of the main request met the requirements of Articles 123(2), 123(3) and 84 EPC. The requirements of sufficiency of disclosure and novelty were also met. An inventive step was acknowledged when starting from any of the compositions described in examples 1, 8 and 10 of D2 as the closest prior art.

IV. An appeal was lodged by opponent 2 (appellant). In response to the statement of grounds of the appellant, the patent proprietor (respondent) filed a reply, as well as four sets of claims as auxiliary requests 1 to 4. Their wording is not relevant for the present decision.

V. A second appeal filed by opponent 1 was withdrawn. Opponent 1 is accordingly party as of right to the appeal proceedings pursuant to Article 107, second sentence, EPC.

VI. Oral proceedings before the Board were held on 18 Mai 2022.

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

VIII. The respondent requested that the appeal be dismissed (main request), or in the alternative that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of any of auxiliary requests 1 to 4 filed with the reply to the statement of grounds of appeal.

IX. Claim 1 of the main request reads as follows:

"1. A composition consisting of a first composition, wherein the first composition comprises a first ethylene-based polymer and a second ethylene-based polymer, and wherein the first composition has a high load melt index (I_{21}) less than 17, a density greater than, or equal to, 0.952 g/cm^3, a molecular weight distribution MWD (conv), defined as the ratio of the weight average molecular weight to the number average molecular weight (Mw (conv)/Mn (conv)), greater than, or equal to, 11, and a viscosity ratio, $\eta(0.01\ s^{-1})/\eta(100\ s^{-1})$ at 190°C, greater than, or equal to, 60, an extrudate swell (t300 measured at 300 s^{-1} shear rate and 190°C) greater than, or equal to, 18 seconds, and an extrudate swell (t1000 measured at 1000 s^{-1} shear rate and 190°C) greater than, or equal to, 6 seconds, and an I_{21}/I_5 ratio less than, or equal to, 25.0."

Dependent claims 2-11 define preferred embodiments of the composition of claim 1. Claim 12 defines an article

comprising at least one component formed from the composition of any of the preceding claims.

X. The appellant's submissions, in so far as they are pertinent, may be derived from the reasons for the decision below. They are essentially as follows:

(a) The subject-matter of claims 1 to 12 of the main request lacks an inventive step over either example 8 or example 10 of D2 as the closest prior art.

XI. The respondent's submissions, in so far as they are pertinent, may be derived from the reasons for the decision below. They are essentially as follows:

(a) The subject-matter of claim 1 of the main request involves an inventive step starting from any of examples 8 and 10 of D2 as the closest prior art.

XII. The party as of right did not make any submissions.

Reasons for the Decision

1. The sole issue in dispute is inventive step.

Closest prior art and distinguishing feature(s)

2. The patent in suit aims at providing compositions suitable for use in extrusion blow molded articles (paragraph [0001]). According to paragraph [0002] there remained a need for new compositions that provided improved processability, as well as excellent mechanical properties.

In line with the contested decision, the appellant is of the opinion that each of the compositions described with examples 8 and 10 of D2 represents a suitable starting point for assessing inventive step of the subject-matter of claim 1. As noted by the appellant, D2 describes in paragraphs [0379] that the compositions of examples 8 to 10 are especially suitable for blow molding applications. In the light of paragraphs [0064] and [0159] of the patent in suit, it can be understood that improved processability meant among others higher extrudate swell. The same applies for D2 (paragraphs [0399] to [0401]), the extrudate swell values measured for examples 8 and 10 of that document being almost identical. In fact, the extrudate swell is marginally higher for example 8 than for example 10 at a shear rate of 300 s^{-1}, but the converse is true at a shear rate of 1000 s^{-1} (table 11B of D2).

Although the respondent argued in writing that it would be only with the benefit of hindsight that one would also take example 10 as a starting place, since it is the composition of example 8 and not that of example 10 which exhibits the highest extrudate swell, it was no longer disputed at the oral proceedings that each of the compositions described in these two examples would represent a suitable starting point for analysing inventive step.

In view of the above, the Board is satisfied that either example 8 or example 10 of D2 represents a suitable starting point for assessing inventive step.

3. To the exception of a viscosity ratio $\eta(0.01\ s^{-1})/\eta(100\ s^{-1})$ at 190°C greater than, or equal to, 60 for which the parties disagree whether it represents a

distinguishing feature of the composition of operative claim 1 over the compositions of examples 8 and 10 of D2, it is undisputed based on the parametric results shown in tables 8A-C, 9A-C and 11A-C of D2 that all other features of operative claim 1, apart from the I_{21}/I_5 ratio, are met by the compositions of examples 8 and 10 of D2. Whereas the compositions of present claim 1 must have a I_{21}/I_5 ratio being less than, or equal to, 25.0, the compositions of examples 8 and 10 of D2 exhibit a I_{21}/I_5 ratio of 31 and 26, respectively (table 9B).

Having regard to the reasons provided below, the conclusion regarding the presence of an inventive step is independent of whether a viscosity ratio $\eta(0.01\ s^{-1})/\eta(100\ s^{-1})$ at 190°C greater than, or equal to, 60 represents a further distinguishing feature of the present claim 1 over the closest prior art. That question can therefore be left unanswered.

Problem successfully solved

4. According to the respondent, the problem solved over the closest prior art would be the provision of a bimodal ethylene-based resin for blow moulded articles exhibiting an improved balance of mechanical properties with respect to flexural modulus and environmental stress crack resistance (ESCR), while maintaining good extrudate swell properties (rejoinder, paragraph bridging pages 4 and 5).

By reference to page 14 of the opposition division's decision, in particular the last paragraph of the contested decision, the respondent relies on a comparison made between the experimental results shown with examples 1 to 3 of the patent in suit, which are

all in accordance with the teaching of operative claim 1. It is is submitted that the effect of a lower I_{21}/I_5 ratio can be seen by comparing examples 1 and 2 of the patent. In addition, the respondent compares the flexural modulus values obtained with examples 1 to 3 of the patent in suit with those obtained with examples 8 and 10 of D2. The respondent, however, does not rely on any comparative examples, in particular the comparative tests A to E of the patent in suit which are undisputedly more remote than examples 8 and 10 of D2.

5. It is established case law that if a claimed invention is based on a given technical effect, the latter should, in principle, be achievable over the whole area claimed (Case Law of the Boards of Appeal of the EPO, 9th edition 2019, I.D.4.3), reference being in particular made to landmark decision T 939/92 (OJ EPO 1996, 309, see point 2.5.4 of the reasons) according to which a purported technical effect can only form the basis for the assessment of inventive step if it could be fairly assumed that this technical effect occurs across the whole breadth of the claim. Therefore, the question arises in the present case whether or not the alleged improved balance of mechanical properties with respect to flexural modulus and ESCR, while maintaining good extrudate swell properties, is likely to occur over the whole breadth of the claim.

5.1 Having regard to the limited number of examples relied upon by the respondent (examples 1 to 3 of the patent in suit), the breadth of operative claim 1 and the absence of technical explanation as to why the flexural modulus values obtained with examples 1 to 3 of the patent in suit, i.e. 231,593, 211,228 and 224,558 psi, respectively, are necessarily representative of the

flexural modulus which are generally obtained with the compositions in accordance with operative claim 1, the Board has no reason to assume that the claimed compositions exhibit an improved flexural modulus in comparison to the composition of the closest prior art with values of about 202,000 psi.

As regards ESCR values, example 1 of the patent in suit (table 6, page 14) exhibits with 453 hours a level below that obtained with examples 8 and 10 of D2 (table 9B, page 33).

5.2 As to probative value of any comparison made between examples 1 to 3 of the patent in suit, in particular a comparison between examples 1 and 2, it must be stressed that the compositions of examples 1 to 3 are almost exclusively defined in terms of parameters, the parameters used being as in operative claim 1 the melt index I_{21}, the density, the molecular weight distribution MWD, the dynamic viscosity ratio $\eta(0.01\ s^{-1})/\eta(100\ s^{-1})$, the extrudate swells t300 and t100 and the I_{21}/I_5 ratio and in addition the melt index I_5, the viscosity values $\eta(0.01\ s^{-1})$ and $\eta(100\ s^{-1})$ used to compute the viscosity ratio, as well as M_n and M_w used to calculate the molecular weight distribution MWD(conv).

It has to be borne in mind that contrary to compositions which can be defined in an exhaustive manner using solely structural features and for which the existence of a causal link between an alleged technical effect and a structural feature can be easily assessed by modifying only that structural feature, establishing in the present case the existence of a causal relationship between the I_{21}/I_5 ratio of the claimed composition and the flexural modulus is a

different matter. This is due not only to the very limited number of experiments considered, but also to the fact that (i) the parameters used to describe the exemplified compositions are interrelated, (ii) their relationship is not fully explained on the basis of the parties' submissions, (iii) their degree of interdependence is not established and (iv) these parameters used for characterising the exemplified polymers have not been shown to provide a full description of the polymers under consideration.

On that basis, any comparison made between examples 1 to 3 of the patent in suit cannot be conclusive as to establishing a causal link between a I_{21}/I_5 ratio of less than, or equal to, 25.0, possibly in combination with a viscosity ratio $\eta(0.01\ s^{-1})/\eta(100\ s^{-1})$ at 190°C greater than, or equal to, 60, should it represent a further distinguishing feature of the claimed compositions over the closest prior art, and the alleged technical benefits achieved over the closest prior art, i.e. an improved balance of mechanical properties with respect to flexural modulus and environmental stress crack resistance (ESCR), while maintaining good extrudate swell properties.

5.3 Consequently, it follows from the above analysis that the respondent has not presented any corroborating evidence or explanations rendering it credible that the purported technical effect of providing a bimodal ethylene-based resin for blow moulded articles exhibiting in comparison to those obtained in the closest prior art an improved balance of mechanical properties with respect to flexural modulus and ESCR, while maintaining good extrudate swell properties is successfully achieved over the whole breadth of claim 1. Accordingly, any such advantage of the claimed

compositions over the closest prior art cannot be taken into account for the purpose of assessing inventive step and the problem underlying the claimed invention can only be seen as the provision of a further bimodal ethylene-based resin suitable for blow moulded articles.

Obviousness of the solution

6. It remains to be decided wether the skilled person desiring to solve the above problem would, in view of the disclosure of D2, possibly in combination with other prior art documents or with common general knowledge, have modified the compositions of example 8 or 10 of D2 in such a way as to arrive at the composition of operative claim 1.

6.1 The appellant submits that selecting an upper limit for the I_{21}/I_5 ratio of 25 would be arbitrary and therefore obvious for the skilled person. However, the question to be answered is not only whether the skilled person would have been inclined to provide a composition having a I_{21}/I_5 ratio which is within the limit defined in operative claim 1, but also whether the preparation of such composition was obvious, e.g. whether the composition of the closest prior art could be modified not only as to meet the I_{21}/I_5 ratio requirement of operative claim 1, but also as to achieve simultaneously the additional requirements of said claim based of the information provided in the available prior art, the common general knowledge and a reasonable amount of experimental work.

6.2 As already pointed above in relation to the parameters used for describing the compositions exemplified in the patent in suit, which are essentially the same as those

defined in operative claim 1, these parameters are interrelated and their relationship is not fully explained or known, let alone their degree of interdependence. The appellant's arguments that the I_{21}/I_5 ratio is related to the MW distribution and that the skilled person could decrease the I_{21}/I_5 ratio of the bimodal composition by adapting the proportion of high molecular weight component (split) which is below 50 wt% for the compositions of the closest prior art is undisputed. The appellant, however, failed to demonstrate that the sole modification of the split would be sufficient to obtain compositions falling within the ambit of claim 1. The appellant did not indicate either if additional measures would need to be applied by the skilled person to obtain a composition meeting all requirements of operative claim 1, should the modification of the split be insufficient to prepare such composition.

Even if it can be accepted, as submitted by the appellant during the oral proceedings, that a modification of the split by increasing the proportion of the low molecular weight component in the case of examples 8 and 10 of D2 would be expected by the skilled person to increase the molecular weight distribution MWD of the overall composition and consequently its I_{21}/I_5 ratio, as well as to increase the density, because shorter polymeric chains are less prone to entanglement and therefore more incline to crystallize, this would demonstrate that a modification of the split by increasing the proportion of the low molecular weight component, which would also lead to an increase of the load melt index (I_{21}), is likely to result in a composition exhibiting a I_{21} of at least 17, i.e. above the limit of less than 17 defined in operative claim 1, since the compositions of examples 8

and 10 of D2 already exhibit I_{21} values of 15.2 and 16.5, respectively.

Conversely, a modification of the split by decreasing the proportion of the low molecular weight component would be expected by the skilled person to decrease the molecular weight distribution MWD and consequently the I_{21}/I_5 ratio of the overall composition, as sought to be achieved by the skilled person, however, at the expense of a reduced density, when density values of 0.953 and 0.952 g/cm^3 for the compositions of examples 8 and 10 of D2, respectively, are already close to the lower limit of 0.952 g/cm^3 defined in operative claim 1.

On that basis, it cannot be concluded that a mere modification of the split of the compositions of examples 8 and 10 of D2 for obtaining a I_{21}/I_5 ratio of less than, or equal to, 25.0 would necessarily allow the skilled person to obtain compositions being also within the boundaries defined in operative claim 1 for both the melt index I_{21} and the density.

Moreover, the Board is also left with no submissions of the appellant, let alone corroborating evidence concerning the achievement of a viscosity ratio $\eta(0.01\ s^{-1})/\eta(100\ s^{-1})$ at 190°C, an extrudate swell (t300 measured at 300 s^{-1} shear rate and 190°C) and an extrudate swell (t1000 measured at 1000 s^{-1} shear rate and 190°C) as defined in operative claim 1.

Accordingly, even if to the benefit of the appellant it were accepted that the skilled person using a reasonable amount of experimental work would be able to modify the split of the compositions of examples 8 and 10 of D2 to obtain compositions being within the

boundaries defined in operative claim 1 for the I_{21}/I_5 ratio, the melt index I_{21} and the density, one would not be in the position to conclude that such modification of the split would be sufficient to meet also said three additional parametric requirements. In that respect, the mere fact that the compositions of the closest prior art meet the extrudate swell values t300 and tl000 defined in operative claim 1 is not sufficient to conclude that the modification of the closest prior art by changing the split would necessary result in such parametric requirements being still met.

6.3 According to the boards' established case law, each of the parties to the proceedings bears the burden of proof for the facts it alleges. If a party, whose arguments rest on these alleged facts, does not discharge its burden of proof, this is to the detriment of that party, who may not shift the onus of proof onto the other party (Case Law, supra, III.G.5.1.1 and III.G.5.2.1). In the present case, the appellant did not present sufficient submissions, let alone corroborating evidence, showing that the skilled in the light of the prior art, including common general knowledge and applying a reasonable amount of experimental work would be able to modify the teaching of the closest prior art so as to arrive at the composition of operative claim 1.

6.4 For these reasons, the composition of claim 1 has not been shown to be obvious having regard to the state of the art. The same holds true for dependent claims 2 to 11 which define preferred embodiments of claim 1 and claim 12 which uses the composition of any of the preceding claims.

7. Since the sole objection raised against the main request does not succeed, the appeal must be dismissed and it is not necessary to consider any of the auxiliary requests.

Order

For these reasons it is decided that:

1. The appeal is dismissed.

The Registrar: The Chairman:

B. ter Heijden D. Semino

Decision electronically authenticated