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D E C I S I O N
of 24 February 2005

Case Number: T 0353/01 - 3.3.9

Application Number: 93925089.0

Publication Number: 0666890

IPC: C09J 123/08

Language of the proceedings: EN

Title of invention:

Blends of ethylene copolymers for hot melt adhesives

Patentee:

ExxonMobil Chemical Patents Inc.

Opponent:

THE DOW CHEMICAL COMPANY

Headword:

-

Relevant legal provisions:

EPC Art. 54, 56, 123(2), (3)

Keyword:

"Main request - novelty (no)"

"First auxiliary request - novelty (yes) - inventive step
(yes)"

Decisions cited:

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Catchword:

-



Case Number: T 0353/01 - 3.3.9

D E C I S I O N
of the Technical Board of Appeal 3.3.9
of 24 February 2005

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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted
26 January 2001 concerning maintenance of
European patent No. 0666890 in amended form.

Composition of the Board:

Chairman: P. Kitzmantel
Members: A.-T. Liu
M.-B. Tardo-Dino

Summary of Facts and Submissions

I. Opposition was filed against European patent No. 0 666 890 relating to "Blends of ethylene copolymers for hot melt adhesives".

II. The opposition was supported, *inter alia*, by the following documents:

D1: EP-A-0 319 043,

D2: Handbook of adhesives, 2nd edition, Ed. I. Skeist, pages 495 to 506 (1977),

D3: EP-A-0 115 434, and

D7: WO-A-92/12212.

III. Claim 1 of the patent in suit read as follows:

"A hot melt adhesive composition comprising a blend of at least a first and a second ethylene/alpha-olefin copolymer and a tackifier, said first ethylene/alpha-olefin copolymer comprising from 3 to 17 mole percent of a C₃ to C₂₀, preferably C₃ to C₈ alpha-olefin, and a weight average molecular weight from 20,000 to 39,500, and said second ethylene/alpha-olefin copolymer comprising from 3 to 17 mole percent of a C₃ to C₂₀, preferably C₃ to C₈ alpha-olefin, and a weight average molecular weight of from 40,000 to 100,000."

- IV. During the opposition proceedings, the Patentee requested that the patent be maintained with the claims as granted or as amended according to one of three auxiliary requests. By its interlocutory decision announced on 10 January 2001, the Opposition Division held that the patent as amended according to the third auxiliary request met the requirements of the EPC.
- V. Appeals were lodged by both the Patentee and the Opponent against the interlocutory decision.
- VI. By letter dated 18 December 2001, the Appellant - Opponent (hereinafter "Opponent") filed test data (Curves A, B and C) performed on a sample of Affinity SM1300.
- VII. By letter dated 23 December 2004, the Appellant - Patentee (hereinafter "Patentee") filed *inter alia* three sets of claims as bases for new auxiliary requests. The claims according to the first auxiliary request were later replaced by a new set of Claims 1 to 8 submitted with a letter dated 21 February 2005.
- VIII. Claim 1 according to the first auxiliary request on file differed from Claim 1 as granted in that it comprised the additional feature:
- "... wherein said first ethylene/alpha-olefin copolymer is present in said blend in 40 to 95 weight percent, based upon the weight of the total copolymer blend, and said second ethylene/alpha-olefin copolymer is present in said blend in 5 to 60 weight percent, based upon the weight of the total copolymer blend."

IX. The arguments of the Patentee can be summarised as follows:

- The prior art documents only disclosed compositions containing a single ethylene/alpha-olefin copolymer but not blends of at least two such copolymers.
- In the assessment of novelty, the term "blend" should be construed as a product-by-process feature.
- D7 was to be considered as comprising the closest prior art teaching.
- With respect to D7, the technical problem to be solved was the provision of a hot melt adhesive (HMA) composition having a low viscosity in combination with appropriate adhesive properties.
- This technical problem was solved by the provision of a HMA comprising a blend of copolymers according to Claim 1 of the first auxiliary request.
- In the only other documents also relating to HMA compositions based on ethylene/alpha-olefin copolymers, the same technical problem was solved either by adding a viscosity adjuster (D1) or by lowering the molecular weight of the single copolymer (D3).
- The skilled person would not have consulted D2 for solving the present technical problem because he had no reason to expect that the teaching relating to HMA

compositions based on ethylene/vinyl acetate copolymers was applicable to HMA compositions based on ethylene/alpha-olefin copolymers.

X. The arguments of the Opponent can be summarised as follows:

- The compositions according to Claim 1 of the main request comprised a blend of copolymers having the same monomer composition as the copolymers disclosed in D7. Given the absence of any weight ratio for the copolymers in the blend and the closeness of their respective weight average molecular weight ranges, the claimed blend was in essence not distinguishable from the single copolymers disclosed in D7. The subject-matter of Claim 1 therefore lacked novelty with regard to D7.
- The above reasoning of lack of novelty was confirmed by the test data of Affinity SM1300.
- As far as it related to the provision of HMA compositions exhibiting a lower viscosity, the Patentee's formulation of the technical problem to be solved with respect to D7 did not have a basis in the application as filed.
- Even if the technical problem was accepted to be as stated, the claimed subject-matter would lack an inventive step.
- D7 already suggested HMA compositions comprising more than one copolymer. In addition, D1 suggested lowering the viscosity of the HMA compositions by

adding a lower MW polyethylene. The subject-matter of Claim 1 therefore resulted from an obvious combination of these two teachings.

- The replacement of a single ethylene copolymer with a blend employing both high and low melt index ethylene copolymers was explicitly recommended in D2. The subject-matter of Claim 1 was therefore also obvious in view of D7 in combination with D2.

- D3 disclosed HMA compositions comprising blends of ethylene/alpha-olefin copolymers and other polymers. The skilled person would have considered incorporating an appropriate ethylene/alpha-olefin copolymer as one of the "other polymers" into the composition of D7. By doing so, he would have arrived at the composition of Claim 1.

XI. At the end of the oral proceedings on 24 February 2005, the Parties' requests were as follows:

The Patentee requested that the decision under appeal be set aside and that the patent be maintained as granted (main request) or alternatively according to Claims 1 to 8 of the first auxiliary request filed with the letter dated 21 February 2005, or according to the second or third auxiliary request, submitted with the letter of 23 December 2004.

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

Reasons for the Decision

Main request

1. *Novelty*

- 1.1 The subject-matter of Claim 1 is a HMA composition comprising a blend of two copolymers and a tackifier. Both copolymers involve identical monomers in the same ratio, namely ethylene and 3 to 17 mole percent of a C₃ to C₂₀ alpha-olefin comonomer. They are only distinguished by their respective weight average molecular weight (Mw), which ranges from 20,000 to 39,500 and from 40,000 to 100,000 (see item III above).
- 1.2 It is common ground that none of the documents on file explicitly discloses a HMA composition including a tackifier and a blend of copolymers as defined in Claim 1. The question is whether such a composition is inherently disclosed in any of the citations, in particular in D7 (see also contested decision, item 2.1).
- 1.3 D7 is directed to hot melt adhesive compositions comprising an ethylene/C₃ to C₂₀ alpha-olefin copolymer of comonomer content 6 to 30 weight percent and a tackifier. The Mw of the copolymers, which are prepared in the presence of a metallocene catalyst system, generally ranges from 20,000 to 100,000 (Abstract; description, page 4, lines 6 to 17). More specifically, the Mw of the "single" ethylene/butene-1 copolymer of formulation 99-9 is 50,000 (Tab. III in combination with description page 15, lines 2 to 5 and page 13, lines 10 to 13).

- 1.3.1 It is undisputed that the monomer composition of the copolymer used in formulation 99-9 of D7 meets the respective definitions of the first and second copolymers according to present Claim 1.
- 1.3.2 One has to keep in mind that each of the "single" copolymers disclosed in D7 with a characteristic Mw, including the copolymer of formulation 99-9, is in fact a "mixture" of copolymer molecules of different individual molecular weights.

To illustrate this fact, the Opponent has submitted test data obtained with a sample of Affinity SM1300, an ethylene/1-octene copolymer also prepared in the presence of a metallocene catalyst system. The molecular weight distribution (MWD) of this copolymer is represented in Curve C. This plotting of the weight fractions as a function of their molecular weights shows that the major part of the curve covers a molecular weight range of from 10,000 (log 4.0) to above 100,000 (log 5.0); the Mw of Affinity SM1300 is 40,000 and its ratio Mw/Mn (Mn being the number average molecular weight) is 2.05.

The copolymer of formulation 99-9 of D7, with a broader ratio Mw/Mn of 2.50, inevitably has a broader MWD (see D7, page 13, lines 10 to 13). Given the fact that its Mw of 50,000 is fairly close to the Mw limits of 39,500 and 40,000 separating the low Mw fractions from the high Mw fractions of the blend according to Claim 1, it is beyond reasonable doubt that the MWD of this "mixture" of copolymers molecules will comprise at least a small portion of weight fractions extending

into the molecular weight area below 39,500. In this case, the "single" copolymer of formulation 99-9 of D7 having a Mw of 50,000 can be considered as comprising a molecular weight fraction having a Mw below 39,500.

- 1.3.3 The Board does not concur with the Patentee in that the term "blend" should be considered as a differentiating feature.

It is common ground that, in the present case, the different molecular weight fractions in the "blend" cannot be distinguished by their monomer compositions (see item 1.3.1 supra). Furthermore, according to the general common knowledge of the person skilled in the art, mechanical blending (including melt blending), is not causative of any process-typical characteristic of the product.

The Patentee's reliance on allegedly different properties between "single" polymers and "blends" of polymers with identical monomer compositions and overlapping Mw is at variance with the general common knowledge of the person skilled in the art. In support of its contrary assertion, the Patentee has contended that the "blending of copolymers" would be shown to have an impact on the properties of the resulting composition by comparing Example 7 of the patent in suit to Example 4 (which is identical to formulation 99-9 of D7). The composition of Example 7, however, includes a copolymer ("Copolymer C") which is absent from the composition of Example 4. A variation in the properties of these two compositions thus cannot be exclusively attributed to the different methods of their preparation. A fair comparison would require that

the compositions to be compared differ only by the method of their preparation, here involving mechanical blending as compared to direct copolymerisation. The term "blend" used in Claim 1 therefore cannot be accepted as a distinguishing feature.

- 1.4 As a consequence, the Board finds that the subject-matter of Claim 1 is anticipated by the formulation 99-9 of D7.

First auxiliary request

2. *Amendments*

Claim 1 of this request differs from Claim 1 of the main request in that it specifies the relative amounts of the copolymer components in the blend (see item VIII). This additional feature is fairly based on the original description (page 7, last paragraph). Its incorporation into Claim 1 restricts the scope of the claim as compared to the main request.

Claims 2 to 8 correspond to Claims 2 to 8 as granted and as filed. The amendments therefore comply with the requirements of Article 123(2) and (3) EPC.

3. *Novelty*

Although the Opponent submitted that the subject-matter of Claim 1 was not novel, he did not advance any argument, let alone proof, to substantiate this objection.

Claim 1 is now directed to a composition comprising a blend of two distinct copolymers in amounts between 40

and 95 % by weight and 5 to 60 % by weight. As already indicated earlier, such a blend is not explicitly disclosed in any of the available prior art documents (see item 1.2 above). Furthermore, it is not clearly and unequivocally established that the formulation 99-9 of D7 comprises at least 40 % by weight of a fraction of an ethylene/1-butene copolymer with a Mw within the range of from 20,000 to 39,500. Thus, the novelty of the claimed subject-matter over D7 can also be recognised.

4. *Inventive step*

4.1 The Board concurs with the Parties that D7 should be considered as comprising the closest prior art (see item 1.3 above).

4.2 The Patentee has made a case that, with regard to D7, the technical problem to be solved is the provision of an alternative HMA composition having a lower viscosity but still acceptable adhesive properties, especially vis-à-vis non-polar surfaces (page 4, first paragraph of the application as filed).

The Opponent has contested this formulation of the technical problem with the argument that neither the application documents as filed nor the patent in suit gives any support for such formulation.

The Board notes that the explicit aim given in the original description (page 3, last paragraph) and in the patent in suit (page 2, lines 39 to 42) is to provide blends of copolymers having greater adhesion to certain substrates. However, it is undisputed that the

need for low viscosity HMA is well known in the art and explicitly stated in D7 (page 3, lines 23 to 30), which is already acknowledged in the application as filed (page 3, lines 19 to 26). The relevance of the viscosity of a HMA composition can also be judged by the fact that all the formulations exemplified in D7 and in the patent in suit have been tested for their viscosity. Under these circumstances, the Board holds that the aspect of the technical problem which relates to the viscosity of HMA compositions can be derived from the description of the claimed invention. The Board therefore accepts the reformulation of the technical problem according to the Patentee's submission.

- 4.3 In order to solve the above indicated technical problem, the patent in suit proposes a HMA composition characterised by a "blend" of copolymers, in the proportions as defined in Claim 1.
- 4.4 The Opponent has not contested the validity of the test data shown in the patent in suit. It is also undisputed that the HMA compositions according to Claim 1 have a consistently lower viscosity than the comparative examples. The Board therefore accepts that the indicated technical problem is effectively solved by the claimed compositions. This has not been refuted by the Opponent.
- 4.5 The Board is also of the view that the subject-matter of Claim 1 involves an inventive step with regard to the available prior art for the reasons set out below.

4.5.1 Whilst the Board concurs with the Opponent, in that D7 discloses that "these hot melt adhesive formulations comprise at least one (emphasis added) of the specified copolymers" (page 4, lines 35 to 37), it is conspicuous that D7 does not give any further details as to a polymer composition comprising more than one ethylene/alpha-olefin copolymer. Thus, the cited statement cannot be construed as suggesting a HMA formulation comprising a "blend" of defined copolymers.

On the other hand, D7 teaches that "a reduction in viscosity of the hot melt can be accomplished by further including an isobutylene based, e.g. isobutylene/butene-1, liquid copolymer, especially the formulation Parapol 950" (page 4, line 37 to page 5, line 5 and page 5, lines 26 to 31). In the Board's view, D7 explicitly proposes replacing part of the tackifier with an isobutylene based liquid copolymer in order to reduce the viscosity of a HMA composition based on an ethylene/alpha-olefin copolymer. To solve the present technical problem, D7 thus points toward an entirely different solution than the provision of a blend of copolymers as stipulated in Claim 1.

4.5.2 With reference to page 4, lines 1 to 8 of D1, the Opponent has alleged that this document, which also relates to HMA compositions comprising ethylene/alpha-olefin copolymers, suggests adjusting the viscosity of the HMA composition by adding a lower molecular weight polyethylene. The skilled person would therefore consider adding a lower Mw copolymer as disclosed in D1 to the composition of formulation 99-9 of D7 in order to decrease its viscosity. The subject-matter of

Claim 1 would therefore be an obvious combination of the teaching according to D1 with that of D7.

The Board notes that, in the relevant passage of the description, D1 mentions that "an optional, but desirable additive, to the copolymer/tackifier composition is a viscosity adjuster". "Examples of compounds which are suitable as viscosity adjusters are ... synthetic waxes such as polyethylene wax and polyethylene glycols...". Since these ethylene containing substances are constitutionally different from ethylene/alpha-olefin copolymers, this statement cannot suggest a lowering of the viscosity of the HMA compositions according to D7 by providing a blend of lower and higher molecular weight ethylene/alpha-olefin copolymers.

- 4.5.3 The Opponent has pointed out that D2, taken from a Handbook of Adhesives, should be regarded as comprising the general common knowledge in the field of Adhesives. It teaches that "polymer blends employing both high and low melt index EVA (i.e. ethylene vinyl acetate, remark added by the Board) resins often yield better properties than can be obtained through the use of a single intermediate melt index resin" (page 498, left hand column, first full paragraph). The proposed solution according to Claim 1 therefore would be obvious in view of D7 in combination with the teaching according to D2.

The Board recognises that D2 refers to HMA compositions based on polyethylene, polyamides and ethylene copolymers (page 495, right hand column, last paragraph to page 496, left hand column, first three paragraphs).

However, under the heading of "Ethylene Copolymers", the document focuses the discussion on HMA compositions based on EVA (page 496, right hand column, last paragraph). D2 does not make any reference to HMA compositions based on ethylene/alpha-olefin copolymers.

On the other hand, D7 is specifically directed to HMAs for use with non-polar substrates, for which HMAs based on EVA are explicitly described as being ineffective (page 1, line 26 to page 3, line 7). Therefore, the Board fails to be convinced that, when seeking a solution to the present technical problem with respect to D7 relative to HMA compositions based on ethylene/alpha-olefin copolymers, the skilled person would have consulted D2.

- 4.5.4 The Opponent has lastly asserted that D3, also directed to HMA compositions comprising ethylene/alpha-olefin copolymers teaches that "proper control of melt viscosity is an important requirement for forming strong adhesive bonds" (page 6, last paragraph). Furthermore, D3 discloses ethylene/alpha-olefin copolymers "as an adhesive, in part or in whole", and suggests that, for particular applications, the compositions may contain other polymers (page 3, lines 7 to 12 and page 9, lines 5 to 9). When taken together, these statements implicitly suggest the use of more than one polymer, selected with the aim of adapting the melt viscosity. The skilled person would therefore be led to replace the copolymer of D7 with a blend of copolymers and thus arrive at the subject-matter of Claim 1 in an obvious way.

In the Board's judgment, this conclusion is misconceived for various reasons. Firstly, the mention of the copolymer being "an adhesive, in part or in whole" is to indicate that the adhesive may consist of the copolymer only or may comprise "optionally a tackifier resin and/or wax, and/or other ingredients" (page 3, lines 13 to 18). Secondly, the reference to "polymers" as additional ingredients for particular compositions can, in the absence of any more specific information, be interpreted merely as a reference to "components common in HMA formulation", similarly to the other components also cited as common in the art, "for example ... antioxidants, plasticizers, fillers and flow improvers" (page 9, lines 5 to 9). Finally, when addressing the necessity of proper control of the melt viscosity as an important requirement for forming strong adhesive bonds, D3 in fact recommends "decreasing the molecular weight of the copolymer" (page 6, lines 28 to 33). This information, suggesting regulation of the viscosity by choosing a copolymer with an appropriate Mw, falls short of suggesting blends of copolymers with different Mw values.

4.5.5 The Opponent has not provided any other prior art document directed to a HMA composition containing a blend of polymers, let alone one suggesting a particular blend of copolymers for reducing the viscosity of a HMA composition. The Board therefore concludes that the Opponent has failed to demonstrate that the subject-matter of Claim 1 is an obvious combination of prior art teachings.

4.6 The dependent Claims 2 to 8 relate to preferred embodiments of the HMA composition according to Claim 1;

their subject-matter is therefore also new and involves an inventive step.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent on the basis of Claims 1 to 8 of the first auxiliary request, filed with letter of 21 February 2005, after any necessary consequential adaptation of the description.

The Registrar:

The Chairman:

G. Röhn

P. Kitzmantel