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Datasheet for the decision of 8 November 2012

Case Number: T 2113/09 - 3.3.03

Application Number: 98911096.0

Publication Number: 0972796

IPC: C08L 9/00

Language of the proceedings: EN

Title of invention:
Conjugated Diene Polymer Composition and Rubber-Reinforced Styrene Resin

Patent Proprietor:
Asahi Kasei Kabushiki Kaisha

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 2113/09 - 3.3.03

D E C I S I O N
of the Technical Board of Appeal 3.3.03
of 8 November 2012

Appellant: (Patent Proprietor)
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Decision under appeal:
Decision of the opposition division of the European Patent Office posted 28 August 2009 revoking the patent 0972796.

Composition of the Board:

Chairman: B. ter Laan
Members: D. Marquis
C.-P. Brandt

Summary of Facts and Submissions

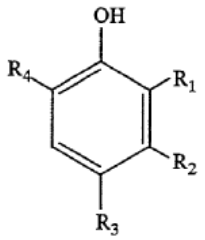
I. The appeal by the patent proprietor lies from the decision of the opposition division dated 28 August 2009 to revoke the European patent N° 0 972 796 based on application number 98 911 096.0, originating from international application PCT/JP98/01437, having an international filing date of 30 March 1998 and published as WO98/44034.

II. The patent was granted with a set of six claims, among which claims 1 and 4 were independent claims and read as follows:

"1. A conjugated diene polymer composition comprising:

(a) 100 parts by weight of a non-coupling conjugated diene polymer consisting of at least one conjugated diene or a non-coupling random copolymer consisting of a conjugated diene and at least one monovinyl aromatic compound,

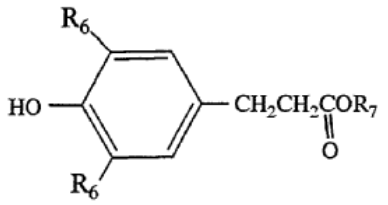
(b) 0.03 to 0.2 parts by weight of a sulfur—containing antioxidant represented by the following general formula (I):



(I)

wherein R_1 and R_3 are $—CH_2—S—R_5$ in which each R_5 represents independently an alkyl group having 2 to 18 carbon atoms; R_2 represents hydrogen or a methyl group; and R_4 represents an alkyl group having 1 to 8 carbon atoms, and

(c) 0.03 to 0.2 parts by weight of a phenol type antioxidant represented by the following general formula (II):



(II)

wherein R_6 represents a tert—butyl group; and R_7 represents an alkyl group having 2 to 22 carbon atoms."

"4. A rubber-reinforced styrene resin in which the conjugated diene polymer composition according to Claim 1 is contained as a toughening agent."

The remaining claims were dependent claims directed to embodiments of claim 1 (claims 2 and 3) and 4 (claims 5 and 6).

III. A notice of opposition against the patent was filed on 22 September 2006. The opponent requested the revocation of the patent in its entirety based on grounds according to Article 100(a), 100(b) and 100(c) EPC, because the claimed subject matter was neither novel nor inventive.

IV. The decision of the opposition division was based, inter alia, on the following documents:

D4: English translation of JP 3059499 B2

D7: Gächter/Müller; Plastic Additives Handbook, 3rd ed. 1990, pp 31-33

In its decision, the opposition division held that the claimed subject matter of the patent lacked an inventive step over D4.

V. On 22 October 2009, the patent proprietor lodged an appeal and the prescribed appeal fee was paid on the same day. The statement setting out the grounds of appeal was filed on 07 January 2010. The appellant requested that the patent be maintained as granted or on the basis of any one of the auxiliary requests 1 to 8, 8b, 9 and 10 as filed therewith.

VI. By letter of 15 September 2010, the respondent (opponent) filed comments on the statement of grounds of appeal and requested the dismissal of the appeal.

VII. On 24 August 2012, the Board issued a summons to attend oral proceedings on 08 November 2012. In a communication the Board set out its preliminary opinion on the inventive step of the claimed subject matter and brought to attention that D4, chosen by the opposition division as the closest prior art, was an English translation of a Japanese B2 patent publication published after the filing date of the patent in suit and was therefore as such not a prior art document according to Article 54(2) EPC.

VIII. By letter dated 01 October 2012, the respondent submitted D4a, an English translation of the Japanese application JP 4252243 A, corresponding to the Japanese patent JP 3059499 B2 and published before the priority date of the patent in suit.

IX. By letter of 05 October 2012, the appellant submitted further arguments in favour of an inventive step of the claims. New auxiliary requests 1, 2, 5, 5a, 6, 6a, 7, 7a, 8b, 8c, 9, 10, 10a, 11 and 12 were filed.

X. Oral proceedings were held on 08 November 2012 in the presence of both parties. During the oral proceedings, after discussion of the main request, the appellant withdrew all auxiliary requests.

XI. The appellant's arguments may be summarised as follows:

a) The overall teaching of D4a was considered to represent the closest prior art rather than comparative example 9.

b) The problem solved in the patent in suit was to provide a conjugated diene polymer composition which was excellent in heat stability, colour tone and resistance to discoloration and which could be used as a toughening agent for styrene resins. Comparative Example 10 of the patent in suit, which corresponded to Example 3 of D4a, showed that the compositions of the closest prior art were inferior to those claimed in the patent in suit.

c) The patent in suit disclosed non-coupled diene polymers whereas D4a described coupled diene polymers. As both types of polymers displayed a different processability, D4a taught away from the subject matter now claimed.

D4a taught that a phosphorus stabilizer was equally effective as a phenol stabilizer to prevent discoloration and did not point to the use of the specific phenol type antioxidant used in the patent in suit.

Neither D4a nor D7 suggested to replace 2,6-di-*tert*-butyl-4-methylphenol (BHT) disclosed in D4a by the phenol antioxidants (c) of general formula (II) disclosed in the present claims. Even if D7 explained why the decomposition product of BHT was more coloured than that of another phenolic antioxidant, that could not be used to evaluate the degree of discoloration of polymeric compositions containing BHT.

XII. The respondent's arguments may be summarised as follows:

a) The claims of the patent as granted lacked an inventive step.

b) Starting from D4a as the closest prior art and in particular from its comparative example 9, the technical problem solved in the patent was to provide a stabilizing polybutadiene composition which was based on a non-coupled polybutadiene.

c) The question to be answered was which of the stabilizer combinations was the most efficient rather than which of the polymer types, coupled or non-coupled, was preferred in D4a.

The patent proprietor had acknowledged in his letter of 07 January 2010 (page 7, point 3.2) that coupled and non-coupled polybutadiene had similar stabilization properties. Also, the skilled person would know that the stabilization of coupled polybutadiene was more difficult than that of non-coupled polybutadiene.

In D4a, the skilled person would find an incentive to replace BHT by another phenolic antioxidant since it was taught that BHT was not the stabilizer of choice when it came to long term stability of polymer compositions, processability, high temperature applications and discoloration of the diene rubber compositions.

D7 showed on page 31 that decomposition products of BHT were strong chromophores that led to increased discoloration of the polymer composition. Furthermore, D7 and D4a both disclosed that BHT had to be used in high concentrations in polymer compositions because it was volatile even at 60°C. D7 therefore suggested the replacement of BHT by another phenolic antioxidant that could be used in lower concentrations and was less prone to discoloration.
Therefore, the choice of a phenolic antioxidant of the general formula (II) was obvious. The other

requirements of the claimed composition, such as the amounts disclosed in the patent in suit were the result of routine experimentation of the skilled person and were not shown to bring a surprising effect.

XIII. The appellant requested that the decision under appeal be set aside and that the European patent N° 0 972 796 be maintained as granted.

The respondent requested the dismissal of the appeal.

Reasons for the Decision

1. The appeal is admissible.

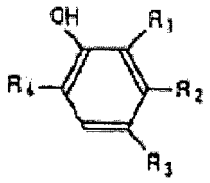
Main request

2. Inventive step

2.1 The opposed patent concerns a conjugated diene polymer composition which has an excellent stability and a good colour tone, as well as rubber-reinforced styrene resins in which the above polymer composition is used and that have an improved colour tone and impact strength (paragraphs [0001], [0005] and [0006]).

2.1.1 D4a (claim 1) discloses a conjugated diene rubber composition comprising: 100 parts by weight of a conjugated diene rubber which has a Mooney viscosity (ML_{1-4}, 100°C) of 20 to 180 or a weight average molecular weight of 200000 to 1000000, as measured by gel permeation chromatography in terms of the weight

average molecular weight of polystyrene, and comprises at least one conjugated diene or a conjugated diene and at least one monovinyl aromatic compound, and is coupled by a multifunctional coupling agent; 0.1 to 2.0 parts by weight of at least one stabilizer selected from phenol stabilizers and a phosphorus stabilizer; and 0.01 to 0.20 parts by weight of at least one sulfur-containing phenol compound represented by the following general formula 1:
[Formula 1]



(wherein R_1 and R_3 each represent $-CH_2-S-R_5$, wherein R_5 represents an alkyl group having 20 or less carbon atoms, and R_2 and R_4 each represent a hydrogen atom or an alkyl group having 15 or less carbon atoms).

2.2 D4a was considered as the closest prior art document by the parties as well as the opposition division. As D4a addresses the issues of discoloration and stability of coupled conjugated diene rubber compositions, the Board sees no reason to depart from that position. However, the respondent and the opposition division started from comparative example 9 of D4a for assessing inventive step and the Board does not agree with that point of view.

The composition described in comparative example 9 of D4a is based on 100 parts by weight of a non-coupled butadiene/styrene rubber with 0,1 parts by weight of 2,6-di-tert-butyl-4-methylphenol and 0,20 parts by weight 2,4-bis(n-octylthiomethyl)-6-methylphenol. This

composition is therefore based on a **non-coupled** conjugated diene rubber which is explicitly excluded from the claimed compositions of D4a (Claim 1 and paragraphs [0001], [0006] and [0009]). Although, in terms of technical features, comparative example 9 of D4a could be seen as the closest example to the presently claimed compositions, the skilled person would not restrict the teaching of D4a to a comparative example, which by its nature is not representative of the solutions proposed in the document. It is therefore not comparative example 9 of D4a which represents the closest prior art but rather the general teaching of D4a as a whole.

2.3 The respondent formulated the problem to be solved as to provide a stabilizing polybutadiene composition based on a **non-coupled** polybutadiene. However, the closest prior art D4a teaches the use of **coupled** conjugated diene polymer compositions (paragraphs [0001], [0006], [0009] and [0011]), and not that of non-coupled conjugated diene polymers. The use of non-coupled conjugated diene polymers is an element of the solution provided in the patent in suit; it cannot be a part of the technical problem to be solved.

The patent in suit does not contain comparative examples in respect of D4a. According to the appellant, a comparison of Example 3 of the patent in suit with Comparative example 10, which allegedly represented D4a, showed improved heat stability properties. However, the composition of comparative example 10 is based on a **non-coupled** conjugated diene polymer and not on a **coupled** conjugated diene polymer as taught in D4a. Comparative example 10 of the patent in suit does not

truly represent the compositions of D4a so that it is not suitable to demonstrate an improvement in the compositions of the patent in suit over those of D4a.

As the patent in suit does not contain comparative examples to the compositions of D4a, the technical problem posed in view of D4a can only be seen in providing further conjugated diene polymer compositions suitable as resin modifiers.

2.4 The solution to the posed problem is the conjugated diene polymer composition of claim 1 comprising 100 parts by weight of non-coupled conjugated diene polymer, 0.03 to 0.2 parts by weight of a sulfur containing antioxidant of formula (I) in combination with 0.03 to 0.2 parts by weight of a phenol type antioxidant of formula (II).

The colour tone, dry and wet discoloration resistance under heating as well as gel time values (dynamic and static stability) of the claimed non-coupled conjugated diene polymer compositions are disclosed in tables 1 and 2 of the patent in suit. Table 3 shows that the non-coupled conjugated diene polymer compositions of the patent in suit are suitable as toughenerers in styrene resins resulting in good colour tone and impact strength. Therefore, the problem defined above is effectively solved by the claimed subject-matter.

2.5 It remains to be decided whether the solution to the technical problem defined above is obvious in view of the prior art. Starting from the closest prior art D4a, the question to be answered is whether the skilled person would have used a **non-coupled** conjugated diene

polymer based composition instead of a **coupled** conjugated diene polymer composition as disclosed in D4a, and whether he would have used such compositions as resin modifiers.

D4a teaches how to reduce discoloration arising in **coupled** conjugated diene polymer compositions as a consequence of their branched structure, high molecular weight and the presence of residues resulting from coupling (paragraphs [0002] and [0004]). According to D4a, it is necessary that the **coupled** conjugated diene polymer rubber contains at least 20% by weight of a branched component caused by the coupling in order to prevent the deterioration of the processability and the mechanical strength of the resultant conjugated diene rubber composition (paragraph [0010]). In comparative examples 8 and 9, it is shown that vulcanized articles produced from **non-coupled** conjugated diene polymer compositions display poor tensile strength and impact resilience (paragraph [0043]). Therefore, D4a teaches away from using **non-coupled** conjugated diene polymer compositions.

The respondent's argument that coupled and non-coupled conjugated diene polymers would be interchangeable and that that would also be supported by the passage on page 7, lines 10 to 26 of the letter of the appellant dated 07 January 2010, cannot be followed. In that passage, it is therein merely stated that the discoloration properties of the non-coupled conjugated diene polymers according to the patent in suit are expected to be closer to those of the coupled conjugated diene polymers of D4a than to those of any other polymer. This passage does not suggest that

coupled and non-coupled conjugated diene polymers are generally interchangeable.

2.6 D7 discloses the use of antioxidants in polymer compositions in order to improve their color stability. D7 does not mention the use of coupled and non-coupled conjugated diene polymers and therefore cannot lead to the solution proposed in the patent in suit.

2.7 In view of the above, the skilled person would therefore not consider the replacement of the **coupled** conjugated diene polymer of D4a by a **non-coupled** conjugated diene polymer in order to provide further conjugated diene polymer compositions suitable as tougheners in styrene resins.

Therefore, the subject-matter of claim 1 is inventive so that Article 56 EPC is complied with.

2.8 Since claims 2 to 3 are directed to preferred embodiments of the composition of claim 1 and claims 4 to 6 to styrene resins in which the composition according to 1 is contained as a toughening agent, those claims, too, comply with Article 56 EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is maintained as granted.

The Registrar The Chairman

E. Görgmaier B. ter Laan