

Publication in the Official Journal Yes / No

File Number: T 299/89 - 3.3.3
Application No.: 80 303 591.4
Publication No.: 0 027 375
Title of invention: Modified elastomer and laminate thereof

Classification: C08F 255/00

D E C I S I O N
of 31 January 1991

Applicant:

Proprietor of the patent: TOA NENRYO KOGYO KABUSHIKI KAISHA

Opponent: 01 BASF
02 DSM

Headword:

EPC Articles 54, 56, 107

Keyword: "Novelty (yes)"
"Inventive step (yes)"
"Right to appeal only to the extent of the original request"

Headnote



Case Number : T 299/89 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 31 January 1991

Appellant :
(Opponent 01)

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Respondent :
(Proprietor of the patent)

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Decision under appeal :

Decision of Opposition Division of the European
Patent Office dated 15 March 1989 rejecting the
oppositions filed against European patent
No. 0 027 375 pursuant to Article 102(2) EPC

Composition of the Board :

Chairman : F. Antony
Members : C. Gérardin
J. Stephens-Ofner

Summary of Facts and Submissions

- I. The mention of the grant of the patent No. 27 375 in respect of European patent application No. 80 303 591.4 filed on 10 October 1980 and claiming priority of 12 October 1979 of an earlier application in Japan, was published on 27 February 1985 on the basis of nine claims.

Claim 1 read as follows:

"A modified elastomer prepared by the reaction of:

- (a) 100 parts by weight of a mixture of (a1) at least 50 parts by weight of at least one elastomer selected from an ethylene/butene-1 copolymer having an ethylene content of 10-90% by weight of said copolymer and a Mooney viscosity at 100°C of 10-200, a styrene/butadiene copolymer having a styrene content of 5-70% by weight of said copolymer and a Mooney viscosity at 100°C of 10-200 and an ethylene/propylene copolymer having an ethylene content of 10-90% by weight of said copolymer, a Mooney viscosity at 100°C of 10-200 and a density of 0.85-0.90, and (a2) not more than 50 parts by weight of a crystalline polyolefin; with
- (b) 0.005-0.8 parts by weight of an unsaturated carboxylic acid or its anhydride, said reaction being effected by melting and kneading the mixture at 120°C to 300°C in the presence of the acid or anhydride."

II. On 17 October 1985, Opponent 01 filed a notice of opposition against the grant of the patent to the extent that component (a1) is an ethylene/propylene copolymer, on the grounds of lack of novelty, or, in any case, inventive step.

On 26 November 1985, Opponent 02 lodged an opposition to the granted patent and requested revocation thereof on the grounds of lack of novelty within the meaning of Article 54(3) EPC as well as inventive step.

These various objections, which were emphasised and elaborated in later submissions, were based essentially on the following documents:

- (1) DE-A-2 216 718 = (10) US-A-3 862 265
- (3) Chemical Abstracts, Volume 91, 1979, 92654
- (7) DE-A-2 316 614 = (11) US-A-3 868 433
- (8) DE-A-2 608 112
- (9a) EP-B-14 018.

When referring to the documents of the appeal proceedings, the same numbering will be used.

III. By decision of 15 March 1989 the Opposition Division rejected the oppositions. More specifically, it was stated in that decision that, although documents (1) and (9a) described modified elastomers prepared from compounds which were similar to a large extent to those used in the patent in suit, novelty could be acknowledged in both cases at least on the basis of the Mooney viscosity of component (a1). The claimed subject-matter was inventive as well, since the adhesives referred to in the other documents were not concerned with the specific properties of hot water resistance, salt water resistance and thermal

shock resistance aimed at in the patent in suit and, therefore, could not suggest the solution claimed therein.

- IV. The Appellant (Opponent 01) thereafter filed a notice of appeal on 29 April 1989 and paid the prescribed fee at the same time. The arguments presented in the Statement of Grounds of Appeal no longer referred to document (9a), i.e. the European patent specification, but to the corresponding European patent application, EP-A1-14 018, which will be called document (9b) hereinafter; these arguments can be summarised as follows:

Although the analysis of document (9b) in the decision under appeal was not disputed, the acknowledgement of novelty on the sole basis of the Mooney viscosity, a parameter which was not clearly defined in the patent in suit, could not be accepted. For the same reason, the teaching of document (10) was novelty destroying, since both the claimed compositional features and grafting reaction were known from that document. Further, all these features were individually disclosed in documents (3), (11) and (8) in the context of adhesive compositions, so that their combination as claimed in the patent in suit could not be regarded as inventive.

Additionally, the Appellant filed two new documents, DIN 53 523 (November 1976) and Kunststoff-Lexikon by K. Stoeckhert, Carl Hansen Verlag München Wien, 1981, 325.

- V. In the Counterstatement of Appeal filed on 14 December 1989 the Respondent first underlined that the problem underlying the patent in suit was not to provide a modified elastomer with just high adhesion to substrates, but one which additionally exhibited a good resistance to

hot water, good salt water resistance and good thermal shock resistance when laminated to such substrates. This required the Mooney viscosity of component (a1) to be within a specific range; this parameter, which the skilled man would have no difficulty to measure, was properly defined in the description of the patent in suit. The Appellant had not demonstrated that the elastomer mentioned in document (9b) had the required Mooney viscosity. The authors of the documents relied upon by the Appellant for the objection of lack of inventive step failed to recognise the advantages to be gained by operating in the specified proportional ranges both for the polymer components and the amount of acid or anhydride grafted to the mixture.

- VI. The Appellant requests that the decision under appeal be set aside and that the patent be revoked, or, by way of auxiliary request at the end of his Statement of Grounds, to exclude ethylene-propylene copolymers from the scope of Claim 1.

The Respondent requests that the appeal be dismissed. Additionally, the Respondent requests the correction of several editorial errors and typesetting mistakes in the description of the patent specification.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is, therefore, admissible.
2. The Board has considered the two late-filed documents in order to determine their relevance, i.e. their evidential weight compared with that of the documents filed in time,

and has found that neither of them is relevant in the above sense. It has, therefore, decided to disregard them pursuant to Article 114(2) EPC.

3. In his notice of opposition, the Appellant put forward only the limited request "das Patent in dem Umfang zu widerrufen, als es Ethylen-Propylen-Copolymermischungen betrifft" (emphasis added), i.e. to the extent that the component (a1) is the ethylene/propylene copolymer defined in Claim 1. Only to that extent, therefore, is the Appellant a party adversely affected by the decision under appeal within the meaning of Article 107 EPC. While the English language version of said Article, looked at in isolation, might possibly allow a different interpretation, it is quite clear from both the German and the French versions ("soweit sie durch die Entscheidung beschwert sind" and "pour autant qu'elle n'ait pas fait droit à ses prétentions"), that the above reflects the correct meaning of the Convention.

Accordingly, the Appellant had a right to appeal only to the extent of his above-quoted original request, or, in other words, of his auxiliary request received on 13 May 1990. Insofar as his main request exceeds the said auxiliary request, it is to be disregarded as irrelevant. Since Opponent 02 has not appealed the decision of the Opposition Division, the present decision will deal with the subject-matter of the patent in suit only to the extent of the Appellant's auxiliary request.

4. The patent in suit concerns a modified elastomer and laminate thereof. As acknowledged in the introductory section of the patent in suit, document (10) describes a process for modifying polymers not only in terms of their rheology, e.g. molecular weight and flow characteristics, but simultaneously in terms of their chemical composition. That process involves the formation and use of a special

reaction zone within an extruder, wherein intensive mixing is achieved by carefully controlling three essential parameters, namely shear, pressure and temperature (column 2, lines 3 to 25). It is applicable to all polymers capable of being processed by an extruder, i.e. olefin copolymers and elastomers as well as mixtures thereof, and encompasses their subsequent modification by grafting monomers having a functional group, especially a carboxylic group (column 4, lines 12 to 48; column 7, lines 4 to 6; column 8, lines 12 to 27). These monomers are said to be used in amounts of 0.01 to 100 weight percent of the base polymer (column 16, lines 42 to 46). Specific reference is made to blends of acrylic acid grafted propylene and EPR (column 23, lines 2 to 6). Emphasis is put on the enhanced adhesion to almost any substrate of the resulting grafted polymers and their suitability as film laminates to other polymers (column 7, lines 60 to 68; column 9, line 67 to column 10, line 22). However, these properties are not entirely satisfactory for specific applications. First, they are detrimentally affected upon contact with electrolyte-containing water or with hot liquids; further, the adhesion strength is still not sufficient in the case of co-extrusion and blow moulding applications.

In the light of this prior art, the technical problem underlying the patent in suit can thus be seen in improving the hot water resistance, salt water resistance and thermal shock resistance of the modified polymers.

According to the patent in suit, this problem is solved schematically by grafting very small amounts of an unsaturated carboxylic acid or its anhydride on a mixture of an elastomer having a specific Mooney viscosity and selected from an ethylene-propylene copolymer, an ethylene-butene-1 copolymer and a styrene-butadiene copolymer, as major component, and a crystalline

polyolefin as minor component. Although the patent specification does not indicate any lower limit for the amount of the minor component in that mixture, this would not be regarded as ambiguous at all by the skilled man, who would implicitly understand that a quantity of crystalline polyolefin sufficient to achieve the desired technical effect is to be present.

In view of the properties mentioned in the examples and comparative examples, especially in Tables 1 to 3, in which the beneficial effects of the above combination of compositional features on hot water resistance, salt water resistance and thermal shock resistance are illustrated, the Board is satisfied that the above defined technical problem has been effectively solved. These advantages have not been disputed by the Appellant.

5. The Appellant has argued that the solution claimed in the patent in suit has already been disclosed both in documents (9b) and (10).

5.1 Document (9b) (date of priority: 23 January 1979; date of filing: 23 January 1980; designated Contracting States: all those in the patent in suit), which is thus prior art within the meaning of Article 54(3) EPC, describes a process for the preparation of a thermoplastic elastomer having improved processability properties and superior mechanical properties (page 2, lines 25 to 28). According to a preferred embodiment, a mixture of 50 to 90 parts by weight of a rubbery ethylene copolymer and 10 to 50 parts by weight of a crystalline polyolefin is reacted with 0.1 to 10 weight percent of an unsaturated carboxylic acid (page 3, lines 15 to 24; page 6, lines 29 to 32). The rubbery ethylene copolymer is defined as a copolymer of ethylene and an α -alkene with 3 to 6 carbon atoms, preferably propylene (page 4, lines 4 to 6). With the exception of the Mooney viscosity, this teaching

corresponds to the third alternative in Claim 1 of the patent in suit, which raises the question of the meaning and weight of this parameter in the claim.

In reply to the formal and substantive issues raised by the Appellant having regard to the Mooney viscosity, the Respondent put forward (Counterstatement of Appeal, points 5.1 to 5.5) first, that no units are ever quoted for this parameter and that the values given are simply the measurements as recorded on a standard piece of apparatus, secondly, that the skilled man would have no difficulty whatsoever in measuring the Mooney viscosity of a rubber, and, thirdly, that it is specified in the patent in suit on page 2, lines 12 to 14, that the Mooney viscosity of ethylene-butene-1 copolymer rubber is measured according to ASTM D927-57T and that the same method is also used for the other elastomers. None of these points has been rebutted by the Appellant. From a more substantive standpoint, the Appellant, who has the onus of proof, failed to provide convincing evidence that the elastomers referred to in document (9b) have an actual Mooney viscosity falling within the ranges defined in Claim 1 of the patent in suit, or that the elastomers of the said prior art, when modified accordingly, would exhibit the same properties in terms of hot water resistance, salt water resistance and thermal shock resistance as the claimed polymer compositions. Consequently, the Board regards this parameter as a distinguishing feature over the teaching of document (9b).

- 5.2 The foregoing considerations and conclusions apply equally to the compositions mentioned in document (10), where again no Mooney viscosity is specified, either as a range for suitable elastomers in general or as specific values for the elastomers explicitly exemplified, such as ethylene-propylene elastomers (column 4, lines 38 to 46).

Further, although the various ingredients of the modified compositions according to the patent in suit are known from that document, their specific combination together with the required proportions are not to be found therein. In particular, there is no disclosure of the claimed relative amounts of olefin polymer and elastomer, nor of the degree of grafting in the acrylic acid grafted blends of polypropylene and EPR (column 23, lines 2 to 6) referred to above. No such conclusion can be drawn either from the other passage dealing with blends (column 10, lines 5 to 12), where it is specified that the addition of 10 to 70 weight percent elastomer improves adhesion and strength of tapes made of acrylic acid grafted polypropylene. Apart from the fact that the nature of the elastomer is not even disclosed, there is no indication as to whether the said elastomer content is based on the blend or on the designated acrylic acid polypropylene; moreover, there is no indication of the acrylic acid content of the grafted polypropylene, nor any indication that the elastomer component is itself grafted with the acrylic acid.

Nor can the Board accept the Appellant's point concerning a possible overlap between the definitions of the components (a1) and (a2) in Claim 1 of the patent in suit. According to the Statement of Grounds of Appeal (see page 4, paragraph 1), ethylene-propylene elastomers (a1) with an ethylene content higher than 70% by weight would still exhibit some crystalline properties in spite of their general elastomer properties; likewise, crystalline propylene-ethylene copolymers (a2) with a low degree of crystallinity might display an elastomer behaviour, so that the two definitions would not necessarily correspond to different components. In reality, as argued by the Respondent in the Counterstatement of Appeal (point 7),

the skilled man would have no difficulty in distinguishing between a rubbery elastomer and a crystalline polyolefin. The presence of the latter in combination with a specific elastomer can thus be regarded as a further novel feature over the broad teaching of document (10), which refers indiscriminately to both plastic and elastomeric polyolefins (column 11, lines 23 to 32).

5.3 In view of the foregoing, the solution claimed in the patent in suit is novel within the meaning of Article 54(1) and (3) EPC.

6. It still remains to be examined whether the claimed subject-matter involves an inventive step with regard to the cited documents.

6.1 As noted in point 4 above, the process described in document (10) aims at the modification of polymers not only in terms of their rheology, but also in terms of their composition and/or structure, for instance by grafting reactions (column 2, lines 19 to 25). It comprises the formation and use of a special reaction zone within an extruder, where the reaction conditions, especially the shear, pressure and temperature, are chosen and controlled in order to effect thorough and intensive mixing over a very short interval of time (column 2, lines 3 to 15 and 42 to 59). This is achieved by first utilising a high shear-thin film zone under high pressure conditions, then, toward the end of the extrusion run, by reducing the pressure in one or more decompression zones; this ensures a homogeneous distribution of the reactants, in particular of the grafting monomer in the case of a grafting reaction, over the total surface area of the molten polymer (column 2, line 65 to column 3, line 45). The essence of this process, whereby the rheological properties of polymers are improved by simultaneously

narrowing the molecular weight distribution and reducing the molecular weight thereof, while at the same time achieving a degree of grafting over a wide range (column 5, lines 26 to 68 and column 10, lines 50 to 53), resides thus in the choice and the control of specific operative features. This contrasts with the broad definition of the polymers suitable for this process, which encompasses thermoplastics, polyolefins and elastomers of all classes as well as combinations thereof, i.e. all polymers capable of being processed by an extruder (column 4, lines 12 to 52). After grafting, these modified polymers, in particular those of acrylic acid grafted polypropylene and those containing 10 to 70 weight percent elastomer, exhibit good bonding and fastening properties which make them valuable for many applications and uses where adhesion and strength are important, such as substrates to be printed and decorated, tapes, coatings and film laminates to other polymers (column 9, line 67 to column 10, line 22).

In contradistinction to this teaching, the solution claimed in the patent in suit does not involve the control of such operative conditions within the extruder, but requires particular compositional features in order to improve the adhesion properties under specific conditions which are not considered at all in the prior art. In view of this totally different approach, the skilled man has no reason to consider single features of the process disclosed in document (10) as relevant for the solution of the problem underlying the patent in suit.

- 6.2 The other documents relied upon by the Appellant provide evidence that the various compositional features of the modified elastomers according to the patent in suit are individually well known in the field of hot melt adhesives and laminated products.

Document (3) discloses certain laminate structures in which one of the layers is a modified polyolefin mixture of 70 to 98 weight percent of a crystalline polyolefin and 30 to 2 weight percent of an ethylene copolymer of low crystallinity. This polymer mixture is modified by melt blending with 0.01 to 0.05 phr unsaturated carboxylic acid (or anhydride) in the presence of an organic peroxide. This abstract teaches thus the use of unsaturated carboxylic acid as grafting compound in amounts comparable to those specified in the patent in suit.

Document (11), is closely related to document (10) as far as the composition features (Claim 1) as well as the operative features (column 7, lines 51 to 67) are concerned. Although various embodiments are encompassed within this broad teaching, especially the grafting of a blend comprising a polyolefin plastic component and an elastomer component (column 9, lines 20 to 29; column 10, lines 20 to 23), they all have in common the use of 0.1 to 50 weight percent of a grafting monomer, such as an unsaturated carboxylic acid; although such amount is much higher than in the solution claimed by the Respondent, it can be said that this document teaches in general terms the sort of compositions which are the subject-matter of the patent in suit.

Further, the use in adhesive compositions of elastomers having a Mooney viscosity falling within the range according to Claim 1 of the patent in suit is known from document (8), which deals with laminates exhibiting simultaneously good oil resistance, gas barrier properties and high mechanical strength (page 1, paragraph 1). This desirable combination of properties is achieved by laminating a polyamide, a polyester or a hydrolysed ethylene-vinyl acetate copolymer with a modified

polyolefin composition comprising a mixture of 60 to 97 weight percent of a polyolefin modified with an unsaturated carboxylic acid and 40 to 3 weight percent of a rubber component with a Mooney viscosity of 40 to 150 (Claim 1).

- 6.3 In view of the foregoing, the issue of inventive step boils down to the question whether for the skilled person starting from document (10) and looking for a solution to the above-defined technical problem, it would have been obvious to combine the teaching of that citation with the grafting of a mixture of a polyolefin and an elastomer as mentioned in documents (3) and (11), the low amount of unsaturated carboxylic acid as taught in document (3), and the Mooney viscosity of the elastomer component as specified in document (8).

In this respect, it is essential to appreciate that none of these three documents is concerned with the problem underlying the patent in suit, i.e. hot water resistance, salt water resistance and thermal shock resistance. As noted above, the laminates described in document (8) aim at good oil resistance and gas barrier properties, whilst the hot melt adhesives referred to in document (11) aim at improved flexibility and bond strength, especially to non-porous metallic surfaces (column 1, lines 37 to 48). The skilled man has thus no reason to consider individual features from these documents and, therefore, no incentive to combine these compositional features in the manner claimed by the Respondent. It follows that the subject-matter of the patent in suit was not obvious.

As demonstrated in the patent in suit, the claimed combination of features is essential to achieve the improvements put forward by the Respondent (Reference

Examples 1 to 5, Table 1). More specifically, Comparative Examples 1 to 3 (Table 1) and 4 to 7 (Table 2) show that if the elastomer (a1) alone or the crystalline polyolefin (a2) alone is used, the adhesion strength measured by the 90° peel strength of a three-layer laminate structure as well as the adhesion strength durability measured by tests for hot water resistance, salt water resistance and thermal shock resistance (patent in suit, page 4, line 56 to page 5, line 20) are not satisfactory; the same conclusion arises from Comparative Examples 8 to 11, wherein the polymer components (a1) and (a2) are not both modified by the unsaturated carboxylic acid. These results, which, as noted above, have not been disputed by the Appellant, support the inventiveness of the modified elastomers.

- 6.4 In conclusion, for these various reasons the subject-matter of Claim 1 of the patent in suit, especially the alternative comprising the use of ethylene-propylene copolymers, involves an inventive step.
7. Claim 1 being allowable, the same applies to the dependent compositions Claims 2 to 6, which are directed to preferred modified elastomers, as well as to Claims 7 to 9, which concern laminates comprising at least one layer of a modified elastomer according to Claim 1 and whose patentability is supported by that of the main claim.
8. The various amendments to the description of the patent specification requested by the Respondent (Counterstatement of Appeal, point 1) cannot be accepted for the following reasons.

The amendments A) (correction of the spelling of "having" on page 4, line 42) and B) (correction of figures in Table 1, page 6) correspond to misprints which were not

present in the text on which the decision to grant was based. As specified in the Legal Advice for the European Patent Office No. 17/90 published in OJ EPO 1990, 260, which is in line with the prevailing practice of the Boards of Appeal, only the text on which the decision to grant is based gives the authentic content of a European patent. By contrast, the text of the patent specification has no binding character; its function is confined to facilitating public access to the content of the granted patent, particularly the nature and scope of the industrial property right (points 4 and 5). It follows that there is no need to make these two amendments.

Regarding the amendment C) in Table 3, the Board notes that the discrepancy with respect to the application as originally filed was introduced during examination procedure and that the Respondent had several opportunities to request the appropriate correction at that stage, as apparent from the various replies following the Advance Notice of 22 March 1984 (Rule 51(4) and (5) EPC).

More generally, errors of the above types are not a ground of opposition under Article 100 EPC and cannot, therefore, be considered during opposition procedure. In this respect, reference is made to the published Decisions T 127/85 Blasting compositions/IRECO, OJ EPO 1989, 271 (points 7.1 and 7.2), T 295/87 Polyetherketones/ICI, OJ EPO 1990, 470 (point 3), and T 406/86 Trichloroethylene/WACKER, OJ EPO 1989, 302 (point 3), which all underline that amendments, such as those requested by the Respondent, cannot be considered as appropriate or necessary in the sense of Rules 57(1) and 58(2) EPC and are, therefore, not admissible.

Order

For these reasons, it is decided that:

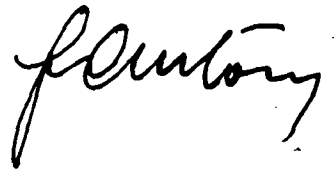
The appeal is dismissed.

The Registrar:



E. Gorgmaier

The Chairman:



F. Antony