BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Publication in the Official Journal ~~Yes~~ / No

File Number: T 108/89 - 3.3.3

Application No.: 81 103 775.3

Publication No.: 0 040 419

Title of invention: Heterogeneous polymer latex of relatively hard and relatively soft interpolymers of a monovinylidene aromatic monomer and an aliphatic conjugated diene monomer and paper coating compositions containing said latexes.

Classification: C08L 25/10

D E C I S I O N
of 8 February 1991

Applicant:

Proprietor of the patent: The Dow Chemical Company

Opponent: 01 Hüls
02 BASF

Headword:

EPC Articles 54, 56

Keyword: "Novelty (yes) - whole content approach - parameter not implicitly disclosed"
"Inventive step (yes)"

Headnote

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number : T 108/89 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 8 February 1991

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Decision under appeal :
Decision of Opposition Division of the European Patent Office dated 7 December 1988 rejecting the opposition filed against European patent No. 0 040 419 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. 40 419 in respect of European patent application 81 103 775.3 filed on 17 May 1981 and claiming priority of 21 May 1980 from an earlier application in the United States, was published on 31 July 1985 on the basis of 10 claims.

Claim 1 reads as follows:

"An aqueous synthetic polymer latex, the dispersed polymer particles of which are heterogeneous and individually comprise per 100 parts by weight of the polymer particle:

(a) from 20 to 45 parts by weight of a relatively soft interpolymer domain having a glass transition temperature less than 25°C and comprising in polymerized form and based upon the total soft interpolymer:

(1) from 25 to 65 weight percent of a monovinylidene aromatic monomer; and
(2) from 35 to 75 weight percent of an open chain aliphatic conjugated diene monomer; and

(b) from 55 to 80 parts by weight of a relatively hard interpolymeric domain having a glass transition temperature greater than 25°C and comprising, in polymerized form and based upon the total hard interpolymer portion:

(1) from 70 to 90 weight percent of a monovinylidene aromatic monomer; and
(2) from 10 to 30 weight percent of an open chain aliphatic conjugated diene monomer."

Claims 2 to 8 are dependent product claims. Claims 9 and 10 relate to paper coating compositions comprising a pigment and a polymer latex in accordance with Claim 1.

II. Opponent 01 filed a notice of opposition on 25 April 1986 against the grant of the patent on the ground of lack of inventive step. He objected firstly that non-carboxylated polymer latexes, which were encompassed within the definition of the polymer particles according to Claim 1, were not stable enough for paper coating applications; secondly, he argued, on the basis of the results of a comparative test report, that the binding strength and the stiffness of paper samples coated with polymer latexes prepared according to Examples 1 to 3 of the patent in suit - thus within the scope of Claim 1 - and with a polymer latex prepared according to the Comparative Example of the patent in suit - thus outside the scope of Claim 1 - were not significantly different.

On 29 April 1986 Opponent 02 lodged an opposition to the granted patent and requested revocation thereof on the grounds of lack of novelty and inventive step. These objections, which were emphasised and elaborated in a later submission, were based essentially on the following documents:

(1) US-A-3 393 169
(2) DE-C-2 821 835.

III. The Opposition Division rejected the oppositions in a decision dated 7 December 1988. As to novelty, it was first stated in that decision that the latexes claimed in the patent in suit differed in their composition and their glass transition temperature from those described in document (1); further, the process features in that document, in particular the addition of the withheld

monomer in the second step, could not be equated with those defined in the product-by-process Claim 8 of the patent in suit. As to inventive step, there was no incentive to modify the compositions disclosed in document (2), regarded as the closest state of the art, in the manner claimed in the patent in suit. The experimental data in Table I of the patent specification had been misinterpreted by Opponent 01, since the technical problem underlying the patent in suit was not to improve specific properties of the homogeneous particles containing latexes referred to in the introduction of the description, but to improve those of the heterogeneous particles containing latexes illustrated in document (2). Regarding the insufficient stability of non-carboxylated latexes for paper coating applications, it was mentioned that the skilled man would self-evidently use stabilizers or surfactants, as suggested in the patent description.

IV. Opponent 01 (the Appellant), thereafter filed a notice of appeal against that decision on 8 February 1989 and paid the prescribed fee at the same time. The arguments presented in the statement of grounds of appeal filed on 3 March 1989 concentrated first on the alleged lack of relevance of the Comparative Example in the patent in suit, since these experimental data did not demonstrate any superiority of the claimed latexes over those disclosed in document (2) (now DE-A-2 821 835). It followed that the claimed subject-matter could, at most, be regarded as an alternative to that teaching, whose main feature, a higher amount of the hard interpolymer, was in fact suggested by Examples 5 to 7 of that citation. Furthermore, non-carboxylated polymer latexes would technically represent a retrograde step in view of their poor compatibility with pigments as well as the necessity to be stabilized. Finally, sample 4 of Example 1 of document (1), interpreted in the light of the whole

teaching of that disclosure, was novelty destroying for the subject-matter of the patent in suit.

V. In the counterstatement of appeal filed on 20 September 1989, the Respondent (Patentee) underlined the differences in terms of composition and process features between the latexes according to document (1) and the patent in suit. The relative amount of soft copolymer in the latex particles described there in sample 4 of Example 1 was 46.6 weight percent, thus lying outside the scope of the patent in suit (the figure of 43.2 actually mentioned is obviously erroneous, since it corresponds to the theoretical conversion rate of 65% considered by Opponent 02 in the statement of grounds of opposition, page 3, paragraph 2 to page 4, paragraph 1). Furthermore, the continuous addition of styrene according to all the samples of Example 1 in document (1) resulted in a continuously changing monomer composition, thus in a second stage polymer which was different from the specific hard domain (b) according to the patent in suit. Regarding inventive step, the absence of any open chain aliphatic conjugated diene monomer in the hard domain as well as the relatively low amount of that component in the latex particles described in document (2) were critical features which the skilled man had no reason to change. As to the Appellant's comparative tests, the rather aggressive drying conditions used by the Appellant in his experiments did not correspond to the coating speed at present commercially used in the paper industry and were thus inappropriate. Lastly, as far as the non-carboxylated latexes were concerned, the fact that these might require the addition of stabilizers to achieve the desired properties did not make these latexes retrogressive.

VI. There was no express request per se in the notice of appeal, let alone in the statement of grounds of appeal.

The Respondent requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64(a) EPC. While an express request is missing, the Board, in accordance with prevailing practice, interprets the notice of appeal as an expression of the Appellant's intention to have the decision under appeal set aside and the patent revoked (cf. Decision T 1/88 of 26 January 1989, section 1.1.2; unpublished). It follows that Rule 64(b) is deemed to have been complied with. The appeal is, therefore, admissible.

2. The patent in suit concerns a heterogeneous polymer latex of relatively hard and relatively soft interpolymers of a monovinylidene aromatic monomer and an aliphatic conjugated diene monomer, and paper coating compositions containing said latexes. A similar subject-matter is disclosed in document (2), which the Board, like the Opposition Division, regards as the closest state of the art. That document describes aqueous heterogeneous polymer latexes comprising (1) 50 to 90 weight percent of a soft interpolymer domain comprising (a) 30 to 69 weight percent of a monovinylidene aromatic monomer, (b) 30 to 60 weight percent of an open chain aliphatic conjugated diene having 4 to 9 carbon atoms, and (c) 1 to 10 weight percent of a monoethylenically unsaturated carboxylic acid; and (2) 10 to 50 weight percent of a hard resinous interpolymer domain (Claim 1). The term "soft interpolymer domain" means that the interpolymer forming such domain has a glass transition temperature equal to or less than room temperature, in practice thus lower than 25°C (page 7, paragraph 2). The hard resinous polymer domain can be any

polymer having a glass transition temperature of at least 85°C, preferably at least 100°C (page 12, lines 4 to 10). Papers coated with such latexes exhibit a desirable combination of properties. Firstly, they possess a pigment binding strength which can be as high as 86.9 m/min, as provided by IGT Pick testing pursuant to TAPPI Standard T-499 (page 28, paragraph 2 and page 31, paragraph 3; Example 1, Table I; Example 2, Table II); secondly, the overall combination of coating properties, gloss, ink receptivity, smoothness, wet binding strength and dry binding strength, is relatively little affected by the processing temperature fluctuations encountered in conventional drying and finishing processes (page 24, end of paragraph 2).

In the light of this prior art teaching, the technical problem underlying the patent in suit can thus be seen in providing a further class of heterogeneous polymer particles which, when used as latex binders in paper coating compositions, impart similar advantageous properties to the coated paper articles.

According to the patent in suit this problem is solved by heterogeneous polymer latex particles comprising 20 to 45 weight percent of the soft interpolymer domain with a glass transition temperature lower than 25°C, and 55 to 80 weight percent of a hard interpolymer domain with a glass transition temperature higher than 25°C comprising 70 to 90 weight percent of units derived from a monovinylidene aromatic monomer and 10 to 30 weight percent units derived from an open chain aliphatic conjugated diene monomer.

In view of the experimental results of Examples 1 to 3 in Table I of the patent in suit, which demonstrate that paper samples coated with aqueous polymer latexes according to Claim 1 have at least comparable binding

strength, and of the general properties of these latexes mentioned in the patent specification (page 7, lines 39 to 44), which have not been disputed by the Appellant, the Board is satisfied that the above defined problem has been effectively solved.

3. The Board cannot accept the Appellant's arguments that the solution claimed in the patent in suit has already been disclosed in document (1).

3.1 That document describes a method for producing aqueous polymer latexes by a two-step emulsion polymerization process of a monomer mixture of 58 to 75 percent by weight of a monoethylenic aromatic monomer, e.g. styrene, and 42 to 25 percent by weight of a conjugated diolefin, e.g. butadiene. In the first stage of that process, all of the butadiene and 10 to 50 percent by weight of the total of said monoethylenic monomer are subjected to polymerization to effect a conversion of 40 to 90 percent by weight of the two monomers; in the second stage, the withheld monoethylenic monomer is added to the resultant emulsion system and polymerized until substantially complete conversion is obtained (Claim 1 in combination with column 2, lines 34 to 51). According to Example 1, to which the Appellant referred more specifically, a plurality of polymerizations of a monomer mixture of 67 percent by weight of styrene and 33 percent by weight of butadiene are conducted, in which all of the required charge water, activator, emulsifiers and butadiene are charged to the polymerization reactor. Styrene is withheld in amounts varying between 0 (sample 1) and 50 percent by weight (sample 4); when conversion has reached 70%, the remaining styrene is introduced at the rate of 4.7 parts per hour until the reaction reaches 100% conversion. Calculation of the composition of the latex particles,

partially made by Opponent 02 in the notice of opposition (page 3), shows that the two-stage copolymer according to sample 4 consists of 46.55 weight percent of a first copolymer comprising 50.4 weight percent of styrene and 49.6 weight percent of butadiene in polymerized form, and 53.45 weight percent of a second copolymer comprising 81.6 weight percent of styrene and 18.4 weight percent of butadiene in polymerized form.

3.2 Without disputing the fact that this specific teaching is not, strictly speaking, novelty destroying, since the amounts of soft interpolymer (46.55%) and hard interpolymer (53.45%) are outside the ranges specified in Claim 1 of the patent in suit (20 to 45%, respectively 55 to 80%), the Appellant has argued, in the first place, that the skilled man upon reading Example 1 would readily modify the teaching thereof concerning the monomer conversion rate after the first stage from 70 to 65%, and that this sole modification would give rise to polymer latex particles comprising relative amounts of soft and hard interpolymers within the ranges required in the patent in suit.

In the Board's view, this extension of the literal teaching of Example 1 is not acceptable. As specified in the citation (column 5, lines 57 to 72), the above-described process encompasses many embodiments which may vary depending upon the nature of the monomer polymerized with butadiene, the ratio of butadiene to monoethylenic monomer, the amount of withheld monomer and emulsifier, the initial monomer conversion rate, and the activator used. It is self-evident that, in view of the broad class of monoethylenic monomers listed in column 2, lines 40 to 51, which comprises compounds as different as monovinyl and divinyl aromatic compounds, (meth)acrylic acid as well as esters, nitriles and amides thereof, and further

unsaturated compounds which are functionally and structurally even more remote, like vinyl and vinylidene halides, vinyl acetate, methyl vinyl ether and methyl vinyl ketone, the operative features must be defined fairly broadly. Conversely, the monomer conversion rate of 70% disclosed in Example 1 must be regarded as optimal for the polymerization of specifically butadiene and styrene carried out under the given conditions; this is supported by Example 2, wherein the first stage polymerization is performed up to the same conversion rate, although the emulsifier is introduced there in a different manner. But even if, for the sake of argumentation, one adopted the whole content approach in the manner suggested by the Appellant, i.e. if one regarded the monomer conversion rate of 70% as merely indicative and sought for alternative values within the general teaching of document (1), in the Board's view, higher values in the middle of the usual range of 60 to 90% would be more likely to be envisaged than lower values, which are at the limit of the just acceptable range.

3.3 The Appellant has also assumed, on the sole basis of close compositional similarity, that, although there is no reference in document (1) to the glass transition temperature, the copolymer obtained in Example 1 implicitly meets the requirements regarding that parameter expressed in the patent in suit, i.e. that the relatively soft interpolymer domain has a glass transition temperature lower than 25°C, and the relatively hard interpolymer domain, irrespective of the possible differences in operative features, has a glass transition temperature higher than 25°C. In the Board's view, on the contrary, a specific range of glass transition temperature cannot be associated with these interpolymers upon reading that citation for two reasons. Firstly, in view of the many embodiments suggested by the whole content approach

and the broad class of copolymers envisaged in that disclosure, there can be no reason to relate the properties of each interpolymer to an undisclosed parameter like the glass transition temperature, let alone implicitly define two ranges below and above the critical limit of 25°C. Secondly, the Appellant, who as Opponent carries the burden of proof, has not provided evidence that paint latexes having the requisite freeze-thaw stability for withstanding without coagulation two freeze-thaw cycles as specified in Claim 1 of that citation, would necessarily comprise a first copolymer having a glass transition temperature lower than 25°C and a second copolymer having a glass transition temperature higher than 25°C. For both these reasons, it follows that the teaching of document (1) does not extend to the existence of two domains of glass transition temperature values as required in Claim 1 of the patent in suit.

3.4 In conclusion, neither the literal teaching of Example 1 of document (1), nor the broader teaching thereof based on the whole content approach, can be regarded as anticipating the claimed subject-matter.

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

4.1 In spite of the close compositional similarity of the polymer latex particles disclosed in document (1) and those claimed in the patent in suit, that document is irrelevant for the issue of inventive step.

The method described therein concerns the production of aqueous paint latexes having a freeze thaw stability sufficient to withstand without coagulation two freeze-thaw cycles, in which a sample is subjected to 16 hours at

sub-freezing temperature and then allowed to thaw to room temperature (Abstract and Claim 1). The main features of the process discussed above, especially the amount of monoethylenic compound withheld for subsequent addition and the extent to which the initial charge of monomers is converted, have a direct bearing on the freeze resistance properties of the resultant latex (column 3, lines 19 to 47). The same applies to the emulsifier, since it is further specified that the freeze stability is also influenced by an initial withholding thereof (column 3, line 70 to column 4, line 1).

Such teaching bears obviously no relation to properties like binding strength and stiffness of coated paper products and cannot, therefore, contribute to the solution of the above-defined technical problem.

4.2 The objection of lack of inventive step with regard to the teaching of document (2) raised by the Appellant (statement of grounds of appeal, point 2) boils down to the allegation that, in view of the experimental results in Examples 5 to 7, it was obvious simultaneously to increase the amount of hard interpolymer in the latex particles and to reduce the amount of hard monomer in that component.

According to those examples, two-stage latexes are prepared having varying amounts of a 99:1 weight ratio styrene/acrylic acid copolymer formed in the first stage emulsion polymerization relative to the amount of styrene/butadiene/acrylic acid interpolymer formed in the second stage emulsion polymerization from a monomer charge comprising 59 weight percent of styrene, 40 weight percent of 1,3-butadiene and 1 weight percent of acrylic acid. The latex particles according to Examples 5, 6 and 7 comprise, respectively, 10, 20 and 30 weight percent of the above

styrene/acrylic acid copolymer, and 90, 80 and 70 weight percent of the above ternary copolymer containing, respectively, 63/36/1, 67/32/1 and 71/28/1 of the three monomers in polymerized form (page 45, Table IV). The experimental results in Table IV (Minimum film forming temperatures), Table V (TAPPI 75° gloss) and Table VI (K&N ink receptivity) show that all three properties are the lowest for the latexes according to Example 5 and the highest for the latexes according to Example 7, i.e. according to the Appellant, that these properties improve with the relative amount of hard interpolymer in the latex particles.

Although this trend is not disputable, it should be noted that the exact values in those tables are not strictly comparable, since the composition of the three soft interpolymers is not exactly the same. However, this point is of minor importance in view of the fact that the technical problem underlying the patent in suit is not, as the Appellant argued, to achieve an improvement in terms of gloss and ink receptivity, but merely to provide latexes having similar properties to those already known from document (2). It follows that, having that objective in mind, the skilled man had no reason to increase the relative amount of hard interpolymer in these latex particles.

Furthermore, no argument has been provided by the Appellant why it should be so obvious, firstly, additionally to modify the composition of that hard interpolymer in the manner claimed in the patent in suit, i.e. substitute part of styrene by butadiene, and, secondly, to choose a range for the glass transition temperature of that component starting at 25°C instead of 85°C. In particular, the reference to the results obtained in the Comparative Example C-3 of document (2) is not

appropriate, since the latex particles used therein do not possess a heterogeneous structure, but are homogeneous copolymers containing 71 weight percent of styrene, 28 weight percent of butadiene and 1 weight percent of acrylic acid in polymerized form (page 45, Table IV). As noted in point 2 above, the only requirement concerning the hard interpolymer in the latex particles described in document (2) is that it should have a glass transition temperature of at least 85°C; the polymers quoted as suitable for this purpose encompass polymers as different as (co)polymers of monovinylidene aromatic monomers and acrylic resins, whose hardness may even be increased by incorporating a minor amount of a difunctional cross-linking monomer, such as divinylbenzene and ethylene dimethacrylate (page 12, paragraph 2 to page 13, paragraph 1). The compositional features of the hard interpolymers according to document (2) are thus of minor importance, provided the requirement of high glass transition temperature is met. The Appellant has given no reason why the skilled man, faced with the above-defined technical problem, should have deviated from that conclusion.

In view of the foregoing, the combination of features of the latex particles claimed in the patent in suit cannot be inferred from document (2).

4.3 A further point raised by the Appellant concerns the lack of relevance of the examples in the patent in suit. According to that objection, the single stage latex used for the Comparative Example cannot be regarded as an appropriate reference to demonstrate that paper samples coated with heterogeneous polymer latexes according to the patent in suit exhibit superior pigment binding strength and at least comparable stiffness.

In the Board's judgment, the critical comparison that had to be made, in view of the definition of the problem underlying the patent in suit, was not so much with homogeneous polymer particles as with the heterogeneous polymer particles described in document (2), because the latter are structurally much closer to the latexes defined in Claim 1. As already noted in the last paragraph of point 2 above, the experimental results of Examples 1 to 3 in Table I of the patent in suit demonstrate that the latexes claimed therein and the latexes according to document (2) exhibit comparable properties and, thereby, that the combination of features specified in Claim 1 provide effectively a solution to the technical problem underlying the patent in suit. As to the single stage latex copolymer used by the Appellant, it merely corresponds to the interpolymer used in the Comparative Example C-3 of document (2), which has been shown to be inappropriate for the present comparative purposes (cf. point 4.2 above). The fact that different drying conditions may have been used by the Appellant and by the Respondent is consequently irrelevant.

4.4 As underlined by the Appellant, the definition of the claimed heterogeneous polymer latex particles is fairly broad, in that it only specifies the major monomer components, e.g. butadiene and styrene, of the interpolymers, leaving thus open the presence of further monomers. This option is explicitly predicted in the description of the patent in suit and, according to the preferred embodiments, unsaturated carboxylic acids are used for the preparation of the soft interpolymer (page 4, lines 53 to 64) as well as the hard interpolymer (page 4, lines 18 to 34). The fact that non-carboxylated latexes may have a lower compatibility with pigments than the corresponding carboxylated latexes, and therefore require the incorporation of special additives (page 6, lines 15

to 17 and 42 to 45) is irrelevant to the issue of inventive step, since, as laid down in Article 56 EPC, the only requirement for a claim to involve an inventive step is for it to be non-obvious to a person skilled in the art. In this respect, the conclusion reached by the Board in point 4.2 above is not affected by the presence or the absence of carboxylic groups in the heterogeneous polymer latex particles. Furthermore, the patent specification clearly indicates the type of compounds to be added in order to control various properties of the non-carboxylated latexes and it can hardly be disputed that polymer compositions usually comprise such additives. In addition, the Appellant, on whom the burden of proof rests, has not provided any evidence that non-carboxylated heterogeneous polymer latex particles, after stabilisation, would not be suitable in order to achieve the desired properties. It follows that there can be no question of an insufficiency of disclosure, as implied by the Appellant.

Accordingly, the Board finds that the non-carboxylated heterogeneous polymer latex particles represent, as do the carboxylated heterogeneous polymer latex particles, effective solutions to the above-defined technical problem.

4.5 In conclusion, for all these reasons, the subject-matter of Claim 1 involves an inventive step.

5. Claim 1 being allowable, the same applies to dependent Claims 2 to 7, which represent preferred embodiments of the subject-matter of Claim 1, as well as to Claim 8, which is drafted as a product-by-process claim for the preparation of the aqueous polymer latex according to Claim 1, and further to Claims 9 and 10, which are directed to an aqueous paper coating composition

comprising a polymer latex according to Claim 1 and whose inventiveness is supported by that of the main claim.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar: **The Chairman:**

E. Görgmaier F. Antony