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Datasheet for the decision of 16 October 2020

Case Number: T 1715/17 - 3.3.03

Application Number: 08170049.4

Publication Number: 2065403

IPC: C08F2/38, C08F8/00, C08G81/02

Language of the proceedings: EN

Title of invention:
Method For Making Polymers

Patent Proprietor:
Rohm and Haas Company

Opponent:
BOHEST AG

Relevant legal provisions:
EPC Art. 56
RPBA Art. 13(1), 13(3)

Keyword:
Inventive step - (no)
Late-filed auxiliary request- admitted (no)

Decisions cited:
T 0939/92

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Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

Case Number: T 1715/17 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 16 October 2020

Appellant: (Patent Proprietor)	Rohm and Haas Company 100 Independence Mall West Philadelphia, PA 19106-2399 (US)
Representative:	Kent, Venetia Katherine Patent Outsourcing Limited 1 King Street Bakewell Derbyshire DE45 1DZ (GB)
Respondent: (Opponent)	BOHEST AG Holbeinstrasse 36-38 4051 Basel (CH)
Representative:	Bohest AG Holbeinstrasse 36-38 4051 Basel (CH)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 8 June 2017 revoking European patent No. 2065403 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	D. Semino
Members:	M. C. Gordon
	W. Ungler

Summary of Facts and Submissions

I. The appeal of the patent proprietor lies from the decision of the opposition division posted on 8 June 2017 revoking European patent number 2 065 403.

II. The patent was granted with a set of 9 claims, whereby claim 1 read as follows:

"A process for modifying a (co)polymer (a) containing acid groups comprising reacting (a) with (b) wherein

(a) is selected from one or more (co)polymer comprising at least 5% by weight of a (co)polymerized monoethylenically unsaturated monomer containing acid groups and having a weight average molecular weight from 1000 to 200,000, and

(b) is selected from one or more compounds of formula I, II, III or IV

$R^1-O-(CHR^2-CHR^3-O)_n H$ I

$R^1-O-(CH_2-CH_2-CH_2-CH_2-O)_n-H$ II

$NH_2-(CHR^2-CHR^3-O)_n-R^1$ III

$$HO-CHR^2CHR^1-N(R^4)-R^1$$ IV

wherein R^1 is selected from C_1-C_{50} alkyl; R^2 and R^3 are independently selected from H, methyl or ethyl; and R^4

is independently selected from C_1-C_{50} alkyl, hydroxyethyl, acetoxyethyl, hydroxy-isopropyl, or acetoxy-isopropyl; and
n is an integer from 1-230;
wherein the reaction of (a) and (b) is conducted at up to 250°C.[sic], and wherein (1) the (co)polymer(s) used as component (a) are obtained by free-radical polymerization of monoethylenically unsaturated acids in aqueous solution in the presence or absence of other monoethylenically unsaturated monomers and in the presence of at least 2 % by weight, based on the monomers used in the polymerization, of a.[sic] hypophosphite-containing chain transfer agent; or (2) wherein the reaction mixture of (a) and (b) further comprises a hypophosphorous acid or salt(s) thereof."

Claims 2-9 were dependent on claim 1.

III. A notice of opposition was filed in which revocation of the patent on the grounds of Article 100(a) EPC (lack of novelty, lack of inventive step) and Article 100(b) EPC was requested.

The following documents, *inter alia*, were relied upon by the opponent:

D6: US 6 846 882 B2
D18: US 2 587 904
D19: US2003/0008978 A1

whereby D6 had been cited with the notice of opposition and D18 and D19 were cited with a letter of 8 March 2017.

IV. The decision of the opposition division was based on the claims as granted as main request and 4 auxiliary

requests.

The relevant findings of the decision can be summarised as follows:

- D19 was admitted to the proceedings. No decision on admittance was taken in respect of D18;
- The requirements of sufficiency of disclosure were met;
- Novelty was acknowledged;
- An inventive step was denied for process variant (1), i.e. that wherein the copolymers (a) had been prepared in the presence of a hypophosphite-containing chain transfer agent. No assessment in respect of the process variant (2) was given;
- None of the auxiliary requests introduced further distinguishing features, and hence these shared the fate of the main request.

Accordingly the patent was revoked.

V. The patent proprietor (appellant) lodged an appeal against the decision.

VI. Together with the statement of grounds of appeal the requests underlying the decision were maintained whereby the auxiliary requests were filed again. A further set of claims - auxiliary request 5 - was also filed.
Nine further documents - D20-D28 - were submitted whereby D20 was an experimental report.

VII. In its reply the opponent (respondent) maintained objections of lack of sufficiency of disclosure, lack of novelty and lack of inventive step.
Inter alia the respondent relied on D18 in its

submissions on inventive step.

A further document:

D29: Ullmann's Encyclopedia of Industrial Chemistry, Volume A21, pages 143-156 (1992)

was cited.

VIII. With letter of 11 April 2019 the appellant filed a further experimental report - D30 - a new main request, revised auxiliary requests 1-5 and new auxiliary requests 6-13, whereby claim 1 of auxiliary request 12 read as follows:

"A process for modifying a (co)polymer (a) containing acid groups comprising reacting (a) with (b)
wherein

(a) is selected from one or more (co)polymer comprising at least 5% by weight of a (co)polymerized monoethylenically unsaturated monomer containing acid groups and having a weight average molecular weight from 2000 to 20,000,
wherein (a) is selected from homopolymers of acrylic acid or methacrylic acid or copolymers of methacrylic acid and acrylic acid or acrylic acid and maleic acid or partial salts thereof,

and

(b) is selected from one or more compounds selected from methylpolyethylene glycols or methylpolyalkyleneglycols comprising ethylene oxide and propylene oxide, in each case having number average molecular weights of from 200 to 10,000;

wherein the reaction of (a) and (b) is conducted at up to 250°C.[sic], and wherein (1) the (co)polymer(s) used as component (a) are obtained by free-radical polymerization of monoethylenically unsaturated acids in aqueous solution in the presence or absence of other monoethylenically unsaturated monomers and in the presence of at least 2 % by weight, based on the monomers used in the polymerization, of a hypophosphite-containing chain transfer agent; or (2) wherein the reaction mixture of (a) and (b) further comprises a hypophosphorous acid or salt(s) thereof."

In its submissions the appellant did not address the arguments advanced in the rejoinder with respect to D18.

IX. The Board issued a summons to oral proceedings.

In a communication the Board set out its preliminary view of the case.

Inter alia it was noted that process variant (1) appeared to give rise to the technical effect of improving the efficiency of the esterification and amidation reaction of polymer (a), and that the problem to be solved could be formulated in these terms. For process variant (2) no technical effect could be perceived by the Board meaning that the objective technical problem for this variant could be formulated only as the provision of a further process.

X. Oral proceedings were held before the Board on 16 October 2020.

At the outset of the oral proceedings the appellant

stated that it would pursue auxiliary request 12 as the main request.

Following discussion of this request, a further auxiliary request, designated "auxiliary request 1'" was submitted.

Claim 1 of this request read as follows:

"A process for modifying a (co)polymer (a) containing acid groups comprising reacting (a) with (b), wherein

(a) is selected from one or more (co)polymer comprising at least 5% by weight of a (co)polymerized monoethylenically unsaturated monomer containing acid groups and having a weight average molecular weight from 2,000 to 20,000, wherein (a) is selected from homopolymers of acrylic acid or methacrylic acid or copolymers of methacrylic acid and acrylic acid or acrylic acid and maleic acid or partial salts thereof, and

(b) is selected from one or more compounds selected from methylpolyethylene glycols or methylpolyalkylene glycols comprising ethylene oxide and propylene oxide, in each case having number average molecular weights of from 200 to 10,000;

wherein the reaction of (a) and (b) is conducted at up to 250°C.[sic], and wherein (1) the (co)polymer(s) used as component (a) are obtained by free-radical polymerization of monoethylenically unsaturated acids in aqueous solution in the presence or absence of other monoethylenically unsaturated monomers and in the presence of at least 2 % by weight, based on the monomers used

in the polymerization, of a hypophosphite-containing chain transfer agent

characterised in that the (co)polymer (a) comprises at least 5% by weight of a (co)polymerized monoethylenically unsaturated monomer containing acid groups and having a weight average molecular weight from 1000 to 200,000."

Following discussion of auxiliary request 1' and announcement of the decision that it was not admitted, all the remaining requests, i.e. the main request, auxiliary requests 1-11 and auxiliary request 13 were withdrawn.

XI. The arguments of the appellant, insofar as relevant for the decision, can be summarised as follows:

(a) Admittance of documents

Document D18 had not been invoked in the decision and during the appeal proceedings had been referred to for the first time only at the oral proceedings. Therefore its status was questionable.

Regarding D29 its admittance was not to be objected to. On the contrary, its teachings were relevant in support of inventive step.

(b) Regarding process variant (2), the closest prior art was D6. In example 1 thereof a polycarboxylic acid was reacted with methylpolyethylene glycol in the presence of sulphuric acid as catalyst.

(c) The subject-matter claimed was distinguished therefrom by the feature that the reaction mixture

of (a) and (b) contained a hypophosphorous acid or salt(s) thereof.

(d) The reports D20 and D30, in particular comparative example 2 and example 3 showed an improvement in the extent of esterification as a result of the use of post-added NaHP, i.e. as esterification catalyst. The same trend could be seen from comparative example 8 and example 9. The problem solved was therefore the provision of a process with improved esterification.

(e) This effect was not derivable from the prior art. D18 related to the reaction of low molecular weight acids with a low molecular weight hydroxy functional compound, i.e. the document did not relate to reactions of polymeric compounds. It was known, as reported in D29, that "polymer analogous" reactions could not necessarily be expected to proceed in the same manner as the corresponding reactions when carried out with low molecular weight reactants.

Consequently even if the skilled person would have taken D18 into account there was no basis for assuming that the reactions reported therein would proceed in the same manner when applied to polymeric reactants.

Furthermore, D18 would not lead to the claimed subject-matter since it demonstrated that hypophosphorous acid gave significantly lower esterification reaction rates than sulphuric acid. Thus D18 did not suggest to make the necessary modification of D6.

D19 did not relate to modification of a polymeric acid with a monofunctional compound as defined in the claim, but to crosslinking of the polymeric acid with a low molecular weight crosslinker. Accordingly it was questionable whether this document would be taken into account by the skilled person in seeking to solve the problem of the patent in suit.

In any case D19 did not demonstrate anything like the level of performance shown in the examples of D30.

On that basis an inventive step should be acknowledged.

(f) Admittance of auxiliary request 1'

The request had been filed in reaction to the findings of the Board, indicated for the first time at the oral proceedings, that process variant 2 was not founded on an inventive step. The decision under appeal had considered only process variant 1. The Board in its communication had given the impression it concurred with the findings of the opposition decision. Furthermore it had appeared from the communication that the Board considered the second embodiment to be better than the first. Thus there had been no basis on which the outcome reached at the oral proceedings could have been predicted from the written procedure, meaning the request could not be regarded as having been late filed.

The features of the claim were cumulative and independent so that no lack of clarity had been

introduced by the addition of the further feature at the end of claim 1.

XII. The arguments of the respondent, insofar as relevant to the decision can be summarised as follows:

(a) Admittance of documents

D18 had been cited in the opposition proceedings in the letter of 8 March 2017 and had been relied on in the rejoinder to the statement of grounds of appeal specifically in the context of process variant (2). No objection to the admittance thereof had been raised prior to the oral proceedings. The document should therefore be admitted.

(b) The closest prior art for process variant (2) was D6.

(c) The subject-matter claimed was distinguished therefrom by the use of hypophosphorous acid or salt(s) thereof in the reaction of (a) and (b) instead of sulphuric acid.

(d) The evidence provided by the appellant did not demonstrate any technical effect arising from this difference.

From D18 it was known that in esterification reactions sulphuric acid provided better outcome in terms of reaction rate than did sodium hypophosphite. Hence the objective problem could only be formulated as the provision of a further process for esterification of polymeric acids with hydroxy functional compounds, regardless of the

efficiency.

(e) Both D18 and D19 taught that sodium hypophosphite could be employed as an esterification catalyst in reactions analogous to those of the patent in suit.

As noted, D18 showed that in the reaction of a diacid with a hydroxy functional compound sulphuric acid as employed in D6 led to faster reaction than sodium hypophosphite.

D19 related to the acceleration of crosslinking by esterification or amidation of polyacrylic acid and confirmed that sodium hypophosphite was effective as an accelerator for these reactions.

In this respect it was to be noted that the relevant skilled person would be an expert in polyacrylic acid chemistry in general as well as in comb polymers, i.e. those that resulted from the claimed process, and hence would be aware of the different aspects of the underlying esterification reactions.

The fact that D19 related to different types of polymers to those of the patent and D6 and the fact that D18 did not relate to polymers at all would not, due to the underlying similarity of the chemistry involved and the expected knowledge level of the skilled person, pose an impediment to relying on the teachings of either D18 or D19 in combination with D6.

With respect to the question of feasibility of "polymer analogous reactions" with reference to D29, the skilled person would understand that

hypophosphorous acid as employed in D18 would also work in the context of the process of D6 since it was possible to use any acid to promote the esterification. Furthermore D6 showed that the problem had indeed been solved in the context of polymers and that the esterification reaction of interest did work also for such species.

(f) In view of the objective problem of providing simply a further process, the combination of D6 with either D18 or D19 rendered the claimed subject-matter obvious. An inventive step should therefore not be acknowledged.

(g) Admittance of auxiliary request 1'

The objections leading to the finding of lack of inventive step for process variant 2 had already been raised during the opposition procedure, on the basis of the same documents, and had been rehearsed in the rejoinder to the statement of grounds of appeal. Despite having had ample time throughout the course of the proceedings to react to these objections, e.g. by filing appropriately amended requests the appellant had elected not to do so until an advanced stage of the oral proceedings.

Thus this newly filed request had to be regarded as late filed.

The amended claim 1 further introduced problems with respect to clarity and potentially added subject-matter due to the dual definition of the molecular weight of copolymer (a). Accordingly it should not be admitted.

XIII. The appellant requested that the decision under appeal be set aside and the patent be maintained on the basis of auxiliary request 12 (new main request), filed with letter dated 11 April 2019, in the alternative on the basis of auxiliary request 1' filed during the oral proceedings of 16 October 2020.

XIV. The respondent requested that the appeal be dismissed.

Reasons for the Decision

1. Admittance of documents

1.1 D18

During the oral proceedings before the Board the appellant questioned the admittance of D18 into the proceedings, in particular since this document had not been invoked in the decision of the opposition division, but had been referred to during the appeal proceedings only at the oral proceedings before the Board.

However, contrary to the submissions of the appellant, the document was cited in the rejoinder to the statement of grounds of appeal (page 10, last paragraph). No objection to the citation of this document was raised at that stage by the appellant. Nor was the document substantively addressed in the written submissions of the appellant.

D18 was therefore referred to by the respondent in its written submissions in appeal, and indeed during the opposition proceedings (letter of 8 March 2017, page 5,

last complete paragraph) in the same context as in the submissions made at the oral proceedings meaning that the respondent had not modified its submissions based on this document to any extent over the course of the appeal proceedings, or indeed the opposition proceedings as a whole.

After the Board had given its position on the admittance of this document, as set out above the appellant did not further pursue its objection to admittance of the document and, on the contrary, dealt with D18 in substance, as reported in section XI.(e), above. Consequently there is no need for the Board to take a decision on admittance of D18 in the proceedings.

1.2 Experimental reports D20 and D30

The admittance of these reports was not challenged by the respondent. On the contrary, the data of these documents was referred to in its submissions on inventive step.

1.3 D29

As recorded in section XI.(a) above, the admittance of this document filed by the respondent was not challenged by the appellant. Indeed, the teachings of this document were relied upon in its oral submissions on inventive step.

Since neither party challenged admittance of the document and the Board similarly had no concerns in dealing with it, there was no need to arrive at a decision in respect of the admittance thereof and it was taken into account in substance.

2. Main request - set of claims designated "auxiliary request 12" - as filed with letter of 11 April 2019 - inventive step

For the purposes of this decision it is only necessary to consider the matter of inventive step of process variant (2), namely the one "wherein the reaction mixture of (a) and (b) further comprises a hypophosphorous acid or salt(s) thereof".

2.1 Closest prior art

It is a matter of consensus between the parties that D6 represents the closest prior art. The Board is aware of no reason to take a different position.

2.2 Distinguishing feature

It is also not disputed between the parties that the subject-matter claimed is distinguished from the disclosure of D6, in particular its example 1, by the feature that the reaction mixture of (a) and (b) contains hypophosphorous acid or salt(s) thereof instead of sulphuric acid.

2.3 Technical effect

Neither the patent or the subsequently filed technical report D20 and D30 contain any data providing a comparison between the esterification reaction in the presence of sulphuric acid and that according to the claim.

In this respect it is worthwhile noting that the examples and comparative examples cited by the appellant (example 3 vs comparative example 2 and

example 9 vs comparative example 8 of D30) provide a comparison between a process in which no acid is added to the reaction mixture and a process in which sodium hypophosphite is added. Therefore they cannot be seen as providing a comparison with the teaching of D6 in which sulphuric acid (a known and effective esterification catalyst) is used.

Accordingly there is no evidence for any technical effect arising from the distinguishing feature with respect to D6.

2.4 Objective problem

Under these circumstances the only technical problem that can be formulated is the provision of a further process for carrying out the reaction of component (a) and (b).

2.5 Obviousness

D18 in its examples discloses the esterification of adipic acid with butoxyethanol to yield bis(butoxy-ethyl)adipate. In one variant - Table 1, example F - the reaction is catalysed by hypophosphorous acid. In another variant - Table 1 example A - sulphuric acid is employed.

The evidence is that sulphuric acid is a more effective catalyst than hypophosphorous acid since the time to a conversion around 98% is 3 hours 20 minutes in the former case and 11 hours in the latter.

It is correct, as argued by the appellant, that D18 relates to reactions of low molecular weight compounds rather than polymers.

Even if, as taught by D29 (section 3.2.5) it is to be expected that in carrying out "polymer-analogous reactions", i.e. transferring reactions from low molecular weight compounds to polymers there might be some difficulties or complexities, it is not said therein, nor is any further evidence available that such a transfer would not be possible or would be dismissed as unfeasible *a priori* by the skilled person. Furthermore closest prior art D6, which relates to the sulphuric acid catalysed esterification reaction of a polycarboxylic acid of molecular weight 4000 with methylpolyethylene glycol of molecular weight 1000, both of which are within the scope of claim 1, confirms that such "polymer analogous" reactions are indeed possible with reactants encompassed by the claimed process.

Accordingly there are no grounds for the skilled person to consider that the esterification process as taught by D18, employing hypophosphorous acid as catalyst would not be applicable in the context of polymeric reactants.

A further indication of the feasibility of such a process is provided by D19 which in Table 1, examples 1 and 2 employs sodium hypophosphite as a cure accelerator in the crosslinking reaction of a polyacrylic acid with either glycerine or triethanolamine. Although in this case the ultimate aim and purpose of the reaction is different to that of the patent or D6, since it is aimed at crosslinking with a non-polymeric reactant rather than functionalisation of the polymeric acid with a monofunctional polymeric compound, the underlying chemistry is the same (i.e. an esterification reaction) meaning that for the reasons

explained above, the skilled person would identify no obstacle to applying such a catalysis as taught in D6 in the type of reaction defined by the operative claim.

It is also noted that according to the case law of the boards of appeal, the answer to the question what a skilled person would have done in the light of the state of the art depends in large measure on the technical result he or she has set out to achieve (see T 0939/92, OJ EPO, 1996, 309, reasons 2.4.2 and 2.5.3). Here, faced with the problem identified in above point 2.4, the skilled person would consider any measure which he or she would consider appropriate to run the esterification reaction, including replacing sulphuric acid as the esterification catalyst with the catalysts known from D18 and D19.

2.6 An inventive step is therefore denied for variant (2).

2.7 As at least one embodiment falling under operative claim 1 does not involve an inventive step, there is no need for the Board to investigate inventiveness with respect to other embodiments.

3. Auxiliary request 1' - admittance

This request was submitted at the oral proceedings following discussion of the aforementioned main request.

Claim 1 was restricted to the process variant (1) and a further condition was added in respect of (co)polymer (a) as characterising feature.

However as recorded in section IX, above, the Board in its communication had distinguished between the two

process variants, concluding that whilst a technical effect could be identified for variant (1), this was not the case for variant (2). A separate attack on this process variant had also been present throughout the opposition and appeal proceedings.

In the light at least of the preliminary finding of the Board it would have been apparent to the appellant that the likely outcomes for the two embodiments of the claim represented by process variants (1) and (2) would be different, providing a reason already at that stage of the proceedings to file correspondingly restricted claims, if the appellant intended to defend variant (1) separately.

This was however not done.

Under these circumstances the filing of this request only at the oral proceedings means that it has to be considered as late and not justified and the admittance thereof is a matter for the discretion of the Board.

Furthermore, claim 1 of this request raises new issues, at least in terms of clarity, related to the amendments made. The claim contains two definitions of the molecular weight of component (a) which differ in terms of the molecular weight, whereby that prefaced with the words "characterised in that" is broader than that in the preamble. There is thus an evident contradiction within the claim. Furthermore this dual definition of the molecular weight - potentially - raises a question as to the basis in the application as originally filed for the claimed subject-matter. Regarding the submission of the appellant that the features were to be regarded as "independent and cumulative" the Board is at something of a loss to understand this. Either

the features are independent, i.e. relating to different aspects, or they are cumulative, i.e. one refines or restricts the other. Logically, they can not be both.

Under these circumstances auxiliary request 1', which it is emphasised was submitted late, i.e. at the very end of the oral proceedings, despite the fact that the need to submit such restricted claims should have been apparent at least from the preliminary assessment of the Board, far from being *prima* facie clearly allowable introduces a further degree of complexity into the case (Article 13(1) RPBA 2007 which is the applicable law - see Article 25(3) RPBA 2020).

Accordingly the Board decided to exercise its discretion not to admit the new auxiliary request to the proceedings.

4. Conclusion

As the requests maintained by the appellant are either not inventive or not admitted into the proceedings, there is no need for the Board to decide on any other issue and the appeal is to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

B. ter Heijden D. Semino

Decision electronically authenticated