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D E C I S I O N
of 8 September 2004

Case Number: T 0920/02 - 3.3.3

Application Number: 94307163.9

Publication Number: 0647658

IPC: C08F 6/14

Language of the proceedings: EN

Title of invention:
Improvements in or relating to ethylene based emulsion polymers

Patentee:
VINAMUL LTD.

Opponent:
Clariant GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 113(1)

Keyword:
"Novelty (yes) - product-by-process claim not unmistakably anticipated"
"Inventive step - main request (no) - routine modification"
"Second auxiliary request (yes) - transfer of prior art method to different chemical environment not obvious"

Decisions cited:
G 0002/88, G 0006/88, G 0004/92, T 0793/93

Catchword:
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Case Number: T 0920/02 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 8 September 2004

Appellant: (Opponent)
Clariant GmbH
Patente, Marken, Lizenzen
Am Unisys-Park 1
D-65843 Sulzbach (DE)

Representative:
Ackermann, Joachim, Dr.
Postfach 11 13 26
D-60048 Frankfurt am Main (DE)

Respondent: (Proprietor of the patent)
VINAMUL LTD.
Mill Lane
Carshalton
Surrey SM5 2JU (GB)

Representative:
Matthews, Heather Clare
Keith W Nash & Co
Pearl Assurance House
90-92 Regent Street
Cambridge CB2 1DP (GB)

Decision under appeal:
Decision of the Opposition Division of the European Patent Office announced orally on 11 June 2002, issued in writing on 2 July 2002 rejecting the opposition filed against European patent No. 0647658 pursuant to Article 102(2) EPC.

Composition of the Board:

Chairman: R. Young
Members: P. Kitzmantel
A. Pignatelli

Summary of Facts and Submissions

I. Mention of the grant of European patent No. 0 647 658 in respect of European patent application No. 94 307 163.9 in the name of VINAMUL LTD., which had been filed on 30 September 1994 claiming a GB priority of 7 October 1993, was announced on 18 November 1998 on the basis of 11 claims, independent Claims 1, 2 and 11 reading as follows:

"1. A method of making an emulsion polymer containing ethylene, comprising adding urea after, or at a late stage during, the polymerisation process in an amount in the range 0.1 to 1.5% on emulsion weight, at a temperature in the range 25 to 80°C and for a suitable time to reduce free formaldehyde."

"2. Use of urea to reduce free formaldehyde in an emulsion polymer containing ethylene, by treating the emulsion polymer by addition of urea in an amount in the range 0.1 to 1.5% on emulsion weight, at a temperature in the range 25 to 80°C and for a suitable time to reduce free formaldehyde."

"11. A water based paint comprising a polymer in accordance with or produced by the method or use of any one of the preceding claims."

Claims 3 to 10 were dependent on Claims 1 or 2.

II. Notice of Opposition requesting revocation of the patent in its entirety on the grounds of Art. 100(a) and (b) EPC was filed by Clariant GmbH on 18 August 1999.

With letter dated 10 April 2002 the Opponent stated that it would no longer pursue the opposition with regard to Article 100(b) EPC.

The opposition was *inter alia* based on documents

D1: AU-A-31 608/84,
D2: US-A-3 549 589,
D3: US-A-4 473 678,
D4: R.S. Perry et al., "A Search for Potential Formaldehyde Acceptors" Textile Chemist and Colorist, vol. 12, 1980), page 311 to 316,
D5: EP-A-0 438 284, and
D7: CA-A-680 775:

III. By its decision announced orally on 11 June 2002 and issued in writing on 2 July 2002, the Opposition Division rejected the opposition.

It was held in that decision that the subject-matter of Claims 1 and 2 was novel: over D1 *inter alia* because this document did not disclose the temperature at which the emulsion polymer was treated with urea; over D2 because according to its Example 2 the urea containing emulsion was dried at a temperature of 15 to 20°C, which was different from the range of 25 to 80°C specified in Claims 1 and 2.

Novelty of product-by-process Claim 11 was also acknowledged because, in the Opposition Division's view, the Opponent had failed to establish that, contrary to expectation, the use of different urea treatment temperatures according to the claimed invention and

according to D2, Example 2, test 1C did not result in differently constituted emulsions.

The claimed subject-matter was also considered inventive over the closest prior art according to D1: the information in this document would not prompt the skilled person to use urea as formaldehyde scavenger under the claimed conditions because it disclosed that cyclic urea compounds were more effective and because urea caused storage stability problems. The inferior performance of urea in comparison to other formaldehyde scavengers like benzotriazole was also confirmed by D4.

No other conclusion would be arrived at if D2 was taken as closest prior art because the specification of "ambient temperature" given therein could not be interpreted as including the term "room temperature of 18 to 28 degrees Celsius".

IV. On 4 September 2002 the Opponent (Appellant) lodged an appeal against the decision of the Opposition Division and paid the appeal fee on the same day. The Statement of Grounds of Appeal was filed on 7 November 2002. A further written submission dates from 19 May 2004.

With its letter dated 6 September 2004 the Appellant declared that it would not attend the oral proceedings to be held on 8 September 2004 and requested a decision according to the state of the file.

V. The arguments of the Appellant presented in its written submissions may be summarized as follows:

(a) the subject-matter of Claims 1 and 2 was anticipated by D2, Example 2, test 1C which disclosed the use of urea as acetaldehyde scavenger for ethylene vinylacetate copolymer emulsions suitable for paints. It was inevitable that the scavenging effect also extended to the formaldehyde which resulted from the presence of sodium formaldehyde sulphoxyde (SFS) in the emulsion.

(b) While D2, Example 2 disclosed a treatment at room temperature and exemplified a range of 15 to 20°C, the meaning of this term was not restricted thereto but extended to a range of 18 to 28°C as set out in

(i) Wittfoht, Plastics Technical Dictionary, Hanser International, pages 346 to 347 and in

(ii) DIN 50 014, December 1959.

(c) The use of urea at room temperature as formaldehyde scavenger of aqueous polymer emulsions was also known from D3 and D7.

(d) Novelty could also not be based on the alleged criticality of the "selection" of the lower temperature limit of 25°C because it was established by the newly submitted experimental report of Mr Jakob dated 1 November 2002 that the

residual formaldehyde amounts were not different if a urea treatment temperature of 30°C was employed in lieu of 20°C.

(e) In the event that the novelty of the subject-matter of Claims 1 and 2 should nevertheless be acknowledged, the only problem remaining with regard to D2 would be the provision of another scavenging temperature. Since this feature did not give rise to any technical effect it could not contribute an inventive step.

(f) Moreover the subject-matter of the product-by process Claim 11 was anticipated by paint formulations comprising the emulsions prepared according to D2, Example 2, test 1C because their constitution was not different from those prepared according to Claim 1 of the patent in suit. This included the reduced formaldehyde content which could not be identified as originating from a different urea scavenging temperature.

VI. The Respondent Patentee submitted its arguments in letters dated 19 May 2003 and 6 August 2004 as well as at the oral proceedings. The submission of 6 August 2004 also comprised sets of claims of a first, second, third and fourth auxiliary request. During the oral proceedings the Respondent superseded these second, third and fourth auxiliary requests by the following revised sets of claims:

- second auxiliary request (2A),
- second auxiliary request (2B),
- third auxiliary request (3A),

– third auxiliary request (3B),
– fourth auxiliary request (4A),
– fourth auxiliary request (4B),
– fifth auxiliary request, and
– sixth auxiliary request.

The claims of the first auxiliary request differ from the granted version of the claims only by deletion of product-by-process Claim 11.

Claims 1 and 2 of the second auxiliary request (2A) differ from their granted version by the additional statement (emphasis by the Board):

"... to reduce free formaldehyde, wherein the polymer comprises vinyl acetate and ethylene, and is free of methylol and N-methylol monomers".

VII. The arguments of the Respondent may be summarised as follows:

(a) D2's most pertinent disclosure was contained in Example 2, test 1C. According to this experiment urea was added as colour stabilising agent to an ethylene vinylacetate interpolymer latex and "evaporated to dryness at ambient temperature (15-20°C)".

(b) The subject-matters of Claims 1 and 2 were novel over this disclosure because it did not comprise a treatment temperature in the range of 25 to 80°C and because D2 failed to mention that the urea treatment was carried out for the purpose of reducing the formaldehyde content of the latex.

(c) Also the paint composition of Claim 11 was novel over D2's disclosure because the colour stabilising agents like urea used according to this document were described to react with adjacent multiple ketone groupings and not with acetaldehyde as asserted by the Appellant. There was no information in D2 on the basis of which it could be concluded that urea added for the afore-mentioned purpose would react with any formaldehyde resulting from the use of SFS during the preparation of the latex. The Appellant had failed to discharge its burden of proof to the standard required in a case concerning the inevitable outcome of an express literal disclosure in a particular prior art document because according to T 793/93 of 27 September 1995 (not published in the OJ EPO) in such a case the standard was that of "beyond all reasonable doubt".

(d) This conclusion was not affected by the experimental results of Mr Jakob submitted by the Appellant because these experiments were not repetitions of Example 2 of D2.

(e) The claimed subject-matter was also novel over D3 and D7 because these documents did not relate to emulsion polymers comprising ethylene. Moreover according to D7 urea was added in order to improve the emulsion's freeze-thaw stability.

(f) None of the documents D2, D3 and D7 were suitable starting points for the assessment of inventive step because D2 and D7 were not concerned with the

reduction of formaldehyde and D3 which addressed this issue related to different polymers, i.e. to self-crosslinking resins containing hydroxyalkyl ester units absent from the polymers of the patent in suit, which units were disclosed in D3 to be involved in a specific interaction with urea. Moreover, according to D3 urea was not the most effective of known formaldehyde receptors.

(g) Also with regard to D1 an inventive step had to be recognized because this document not only emphasised severe drawbacks associated with the use of urea as formaldehyde scavenger, and therefore instead turned to cyclic urea compounds, but was furthermore silent about any urea treatment temperature and disclosed its use in amounts higher than those used according to the patent in suit.

(h) In view of this situation the skilled person had had no reason to expect that the use of urea as formaldehyde scavenger under the "inventive" conditions would lead to the enhanced scavenging effect evidenced by Mr McLennan's experimental report filed with the Respondent's submission dated 6 August 2004.

(i) The conclusion was even more convincing in relation to the subject-matter of the second auxiliary request which excluded the presence in the emulsion of polymers comprising units derived from methylol and N-methylol monomers because these were the only polymers considered in D1.

(j) That the formaldehyde scavenging reaction was dependent on the structure of the formaldehyde releasing polymer was highlighted by D3 (column 2, lines 32 to 36) which stressed the importance for the desired reduced liberation of formaldehyde of the absence of "other major sources of formaldehyde ... ".

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

The Respondent requested that the appeal be dismissed or, in the alternative, that the patent be maintained on the basis of the first auxiliary request filed with the letter dated 6 August 2004, or,

- the second auxiliary request (2A) or
- the second auxiliary request (2B) or
- the third auxiliary request (3A) or
- the third auxiliary request (3B) or
- the fourth auxiliary request (4A) or
- the fourth auxiliary request (4B) or
- the fifth auxiliary request or
- the sixth auxiliary request

each submitted at the oral proceedings.

Reasons for the Decision

The appeal is admissible.

1. *Article 113(1) EPC*

The Appellant did not attend the oral proceedings. In accordance with the opinion of the Enlarged Board of Appeal G 4/92 (OJ EPO 1994, 149, Reasons 10) a decision may be issued based on arguments which do not change the grounds on which the decision is based and do not constitute new grounds or evidence, but are reasons based on the facts and evidence which have already been put forward. This is the case here.

Main request

2. *Novelty, Claims 1, 2 and 11*

2.1 Document D1

Claim 1 of this document relates to a formaldehyde-free aqueous plastics dispersion containing cyclic urea derivatives, preferably ethylene urea (page 6, lines 14 to 19), said dispersion being based on a crosslinkable polymer of ethylenically unsaturated monomers containing N-methylolamide and/or N-methylol ether-amide groups, eg copolymers of vinyl acetate/ ethylene/ N-methylolacrylamide (Examples 1, 5, 6).

Example 5 compares the wet tenacities of papers impregnated with such dispersions on the basis of vinyl acetate, ethylene and N-methylolacrylamide which either comprise urea or ethylene urea. In the case of urea amounts of, respectively, 2 and 4% by weight were added to the dispersions; further conditions of this addition and of the dispersions' subsequent fate, a possible temperature treatment inclusive, are not disclosed.

2.1.1 The subject-matter of Claims 1 is therefore novel over D1, both in view of the higher amounts (at least 2% as compared with an "inventive" maximum of 1.5% based on the weight of the emulsion) and because D1 does not disclose a treatment with urea within the temperature range of 25 to 80°C.

2.1.2 Since use Claim 2 comprises the same procedural restrictions as method Claim 1 it is likewise novel over D1.

2.1.3 The same conclusion applies to the product-by-process Claim 11 *inter alia* because D1 does not disclose paint compositions.

2.2 Document D2

Claim 1 of this document relates to an interpolymer of ethylene and vinyl acetate stabilized against discolouration upon heating by containing homogeneously admixed therewith in an amount of from about 0.1 to 5 parts by weight per 100 parts by weight of said interpolymer of certain nitrogen-containing organic compounds *inter alia* comprising urea (Claim 7).

It is speculated in D2 (column 2, lines 33 to 47; column 4, lines 16 to 49) that these nitrogen-containing organic compounds react with colour-forming multiple ketone groupings of the interpolymer and produce colourless amido reaction products.

According to Example 2, test 1C (column 5, line 60 to column 6, line 17) an ethylene/vinyl acetate/acrylic acid interpolymer (during whose preparation sodium formaldehyde sulfoxylate SFS was present: cf. Example 1: column 4, line 60 to column 5, line 58) was very efficiently stabilised (column 6, Table I: visual rating 9, 10 being the optimum) with one part of urea per 100 parts of dry weight interpolymer. This was *inter alia* achieved by evaporating the stabiliser/latex mixture to dryness "at ambient temperature (15 - 20°C)".

2.2.1 The subject-matter of Claim 1 is novel over D2 because this document does not disclose a treatment with urea in the temperature range of 25 to 80°C. The Appellant's contention that the skilled person would consider the term "ambient temperature" to comprise 25°C (cf. section V(b) above) is logically unsustainable in the face of the explicit indication in D2 of the temperature range 15 to 20°C.

2.2.2 The subject-matter of the Claim 2 is novel over D2 for the same reason and moreover because there is no information in this document concerning the functional feature of this use claim ie "to reduce free formaldehyde" which according to G 2/88 and G 6/88 (OJ EPO 1990, 093 and 114) is a separate distinguishing technical feature.

2.2.3 Nor is the disclosure of D2 novelty destroying for the subject-matter of Claim 11. The Appellant's speculation that the urea added to the polymer latex according to Example 2, test 1C would inevitably scavenge formaldehyde released from the SFS ingredient is not supported by the information in D2 which reports a

reaction of urea with adjacent multiple ketone groupings. The mere (moreover remote) possibility of a reaction of some urea with some released formaldehyde is not sufficient to satisfy the strict criterion for a disclosure to be novelty destroying, namely that of its clarity and unmistakability.

Since the experimental report of Mr Jakob filed with the Appellant's submission dated 6 November 2002 does not repeat Example 2, test 1C of D2 (but instead works with terpolymer dispersions according to the contested patent), it is unsuitable to establish D2's reaction conditions and thus a possible formaldehyde scavenging effect occurring according to this Example. This report cannot therefore discharge the Appellant Opponent's burden of proof as set out in T 793/93 (cf section VII(c) above).

The Board is moreover satisfied that D2's disclosure does not encompass a water based paint formulated on the basis of the urea treated emulsions of Example 2, test 1C, because, in view of the possibility according to D2 of other uses the use for paints is not inevitable (cf D2 column 8, lines 7 to 61).

3. *Inventive step, Claims 1 and 2*

3.1 Though this is not a preferred embodiment, the emulsions specified in these claims, comprise polymers from ethylenically unsaturated monomers containing N-methylol groups, ie polymers according to document D1 (page 2, lines 34 to 43).

3.2 In the Board's judgment, it does not require an inventive effort to modify the teaching of D1 by using urea in the amounts and in the temperature range specified in Claims 1 and 2 of the patent in suit, the reasons being as follows:

3.2.1 Firstly D1 is an appropriate starting point for the assessment of inventive step because it unmistakably discloses that the use of urea for the reduction of the formaldehyde content of N-methylol group containing crosslinkable resin compositions was a technique employed usually (page 5, line 27 to page 6, line 3) (emphasis by the Board).

The fact that D1 reports some problems encountered in connection with this technology (separating out: page 6, lines 3 to 8) and that it recommends the use of cyclic ureas as a remedy for this drawbacks does not, in the light of its established usefulness for the purpose of scavenging formaldehyde, make urea a candidate not to be considered as a formaldehyde scavenger.

Nor can the reference in D1 to the afore-mentioned disadvantages be considered as an established prejudice against the use of urea as formaldehyde scavenger, even less in the light of the further citations D3 and D4 which are in the opposition proceedings. D3 (abstract) specifically recommends the use of urea as formaldehyde scavenger for latices from polymers comprising N-methylol groups and D4, a scientific article concerning the performance of formaldehyde scavengers in polymer systems comprising N-methylol groups, discloses that urea has been used for many years for

this purpose (page 311, right hand column, lines 30 to 31).

3.2.2 The problem objectively underlying the subject-matter of Claim 1 of the patent in suit vis-à-vis D1 can thus be formulated as the development of a method for the preparation of analogous aqueous polymer emulsions whose undesired formaldehyde content is effectively reduced.

3.2.3 The Board is satisfied, in the light of the evidence in the patent specification, that this problem has effectively been solved by the addition of urea to ethylene containing emulsion polymers after or at a late stage during the polymerisation process in an amount in the range 0.1 to 1.5% on emulsion weight, at a temperature in the range 25 to 80°C and for a suitable time.

3.2.4 However in view of the fact that the use of urea had been known from D1 for the identical purpose, ie for the reduction of the formaldehyde content of methylol functional polymer latices, it does not require more than routine experimentation for the skilled person to find out the most appropriate urea amounts and the most appropriate temperature conditions.

As to the quantity to be used, it is immediately apparent that this is governed by the amount of formaldehyde released from the polymer emulsion and the desired level of its reduction (see eg D1 page 8, lines 7 to 12). The adjustment to this criterion is therefore a matter of mere workshop modification.

The same conclusion applies to the determination of the optimum temperature. It belongs to the basic laws of chemistry that reaction rate and equilibrium conditions are temperature dependent and it is therefore obvious for the skilled person to take this into account in its investigations.

This fact is not only recognised in D4 (page 312, right hand column) where it is set out that "such basic parameters as cure time, cure temperature and pH of the treating bath were studied to understand their effect on formaldehyde release in the system", but is even implicitly referred to in the patent specification itself by the statement on page 2, lines 56 to 58: "The appropriate reaction time depends on factors including the polymer, the original level of formaldehyde and desired degree of reduction, reaction temperature, and possibly also pH, and can readily be determined by experiment in any given situation".

3.2.5 It follows that neither the method steps specified in Claim 1 nor the use and process characteristics comprised by Claim 2 involve an inventive step.

3.3 The main request must therefore be refused.

4. Since Claims 1 and 2 of the *first auxiliary request* are identical to the granted version of the main request, this request must be refused for the same reasons.

Second auxiliary request (2A)

5. The Board admits this request into the appeal proceedings in spite of its presentation only at the oral proceedings, and in the Appellant's absence, because

- it is based on the set of claims of a second auxiliary request filed with the Respondent's submission dated 6 August 2004, ie slightly more than 1 month before the oral proceedings, not commented upon by the Appellant prior to these proceedings,

- this previous second auxiliary request had been filed in reaction to the Board's communication dated 9 June 2004 and with the intention to set aside concerns expressed therein,

- the amendment carried out in said previous second auxiliary request itself only concerned a combination of granted Claims 1 and 4,

- the further amendment of said previous second auxiliary request at the oral proceedings only concerned the combination of granted Claims 2 and 4, and

- none of the amendments have any bearing on the legal or factual framework of the case.

6. *Article 123(2) and (3) EPC*

The amendment of Claims 1 and 2 is based on Claim 4 of the application as filed (corresponding to Claim 4 of the patent specification) and restricts their scope.

The only other amendments concern the deletion of granted Claim 4 and the ensuing renumbering of the subsequent Claims 5 to 11 to 4 to 10.

The Claims of the second auxiliary request thus comply with the requirements of Article 123(2) and (3) EPC.

7. *Novelty*

The novelty of the subject-matter of the main request (section 2 above) entails the novelty of the subject-matter of this request which is narrower in scope.

8. *Inventive step*

8.1 All relevant citations in the proceedings (D1, D3, D4) concern the provision of aqueous polymer emulsions having a low content of formaldehyde originating from the presence in the polymer structure of methylol groups. It is in this context only that the usefulness of urea as a formaldehyde scavenger is discussed in these documents.

8.2 The technical problem underlying the claimed subject-matter with regard to this prior art can be seen in the development of a method for the provision of aqueous emulsions of polymers without methylol functions but

comprising other sources of formaldehyde contamination which emulsions have a reduced formaldehyde content.

8.3 The Board is satisfied, on the basis of the available evidence, that this problem is solved by the method of Claim 1, ie by the use of urea as formaldehyde scavenger in the specified amounts and at the temperature range of 25 to 80°C.

8.4 Since emulsions of polymers which are derived from methylol and N-methylol monomers are specifically excluded from the subject-matter of the second auxiliary request, a decision on the issue of obviousness requires to consider the technical implications resulting from the difference of the polymer structures between the claimed subject-matter and the prior art.

8.5 It is well known to the skilled person that the methylol functionality present in the prior art polymer emulsions is either derived from the reaction of a polymer precursor monomer with a formaldehyde donor or by incorporation of an analogously pre-formed methylol functional monomer. The subsequent release of formaldehyde is dependent on the reaction parameters governing the respective chemical equilibria, as eg set out in the first paragraph on page 311 of D4.

The suitability and effectiveness of any agent used to prevent an undesired formaldehyde content in the final composition must therefore be chosen in consideration of and dependent on its impact on said equilibria which in the case of the use of urea comprises the formation of N-methylol urea (D1 page 6, lines 19 to 25).

8.6 The complexity of this situation, governed by mutually competing reactions, is emphasised in document D3 which is concerned with aqueous dispersions of polymers *inter alia* derived from N-methylol (meth)acrylamide and hydroxyalkyl esters of carboxylic acids which contain from 0.2 to 5 weight percent of urea as formaldehyde acceptor (Claim 1; abstract).

The statement set out in this connection in column 2, lines 30 to 36 of D3 reads:

> "The dispersions in accordance with the invention are suited for use in all fields where self-crosslinking resin dispersions with N-methylol groups are used. The reduced liberation of formaldehyde comes into play only when no other major sources of formaldehyde, for example, substantial amounts of amino resins or phenolic resins, are concurrently present" (emphasis by the Board).

This suggests that even the nature of the backbone of the methylol functional polymer may have an impact on the formaldehyde scavenging.

8.7 In the Board's judgment, it is therefore not possible, without undue *ex post facto* analysis, to assume with any certainty on the basis of the available prior art that urea will be an effective formaldehyde scavenger in a chemical environment comprising a different polymer not containing methylol functional groups and instead comprising another source of formaldehyde release like the SFS reducing agent employed during the

preparation of the polymer emulsions exemplified in the patent in suit. It is even less obvious to expect that in this situation the effect of the urea treatment is not reversible (page 3, line 7 of the specification) and increasingly proportional to the treatment temperature (cf. Experimental report of Mr McLennan).

8.8 The claimed solution of the technical problem underlying the subject-matter of Claim 1 vis-à-vis the state of the art is thus considered non-obvious.

8.9 The same conclusion applies *a fortiori* to the subject-matters of the use Claim 2 and of the product-by-process Claim 10 which both comprise the limitation to aqueous emulsions of polymers not comprising methylol functional groups.

8.10 The set of claims of the second auxiliary request (2A) therefore complies with the requirements of Article 54 and 56 EPC.

9. There is therefore no need to consider the further auxiliary requests.

10. In view of the substantial modification of the subject-matter of the second auxiliary request (2A) a corresponding adaptation of the description is called for.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to maintain the patent on the basis of Claims 1 to 10 of the second auxiliary request (2A) filed at the oral proceedings, and after any necessary consequential amendment of the description.

The Registrar: The Chairman:

E. Görgmaier R. Young