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**D E C I S I O N**  
**of 31 August 2000**

**Case Number:** T 0286/98 - 3.3.6

**Application Number:** 86306125.5

**Publication Number:** 0211667

**IPC:** G03F 7/022

**Language of the proceedings:** EN

**Title of invention:**

Radiation-sensitive resin composition

**Patentee:**

JAPAN SYNTHETIC RUBBER CO., LTD.

**Opponent:**

Morton International, Inc.  
Wolfgang BLUM  
Mitsubishi Kasei Co.  
Shipley Company Inc.  
Tokyo Ohka Kogyo Co., Ltd.

**Headword:**

Ethyl lactate/JAPAN SYNTHETIC RUBBER

**Relevant legal provisions:**

EPC Art. 54, 56, 84, 123

**Keyword:**

"Novelty (yes) - no evidence of prior use"  
"Inventive step (no) - use of a solvent obvious for  
environmental reasons and prompted by paper of the  
Environmental Protection Agency (US)"

**Decisions cited:**

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**Catchword:**

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Case Number: T 0286/98 - 3.3.6

**D E C I S I O N**  
**of the Technical Board of Appeal 3.3.6**  
**of 31 August 2000**

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**Decision under appeal:** Interlocutory decision of the Opposition Division  
of the European Patent Office posted 22 January  
1998 concerning maintenance of European patent  
No. 0 211 667 in amended form.

**Composition of the Board:**

**Chairman:** P. Krasa  
**Members:** G. N. C. Raths  
C. Rennie-Smith  
G. Dischinger-Höppler  
J. H. P. Willems

## Summary of Facts and Submissions

I. This appeal is from the Opposition Division's decision maintaining European patent No. 0 211 667 in amended form. In five notices of opposition, all based on lack of inventive step, four in addition on lack of novelty, and two in addition on insufficiency of disclosure, the following documents had been submitted, inter alia:

(1) US-A-3 589 898;

(6) US-A-4 008 084;

(33) Verification Experiments enclosed as Annex 2 to the notice of opposition of Opponent 03;

(36) JP-A-60 42 753;

(English Abstract and partial translation)

(37) US-A-3 666 473;

(38) JP-A-50 141 614 (partial translation);

(65A) US equivalent (Docket No. 1013) to JP-A-51-28001;

(78) Patty's Industrial Hygiene and Toxicology, 3rd revised edition; vol. 2A, Toxicology, George D. Clayton, Florence E. Clayton, Editors, A Wiley Interscience publication, 1981;

(89) Federal Register, Vol. 49, No. 16, Proposed Rules, Environmental Protection Agency, 24 January 1984, 2921-4.

During the opposition proceedings, the Proprietor filed document

(94) Statutory declaration by Toshiyuku Ota,  
17 September 1993.

II. Claim 1 of the patent as maintained by the Opposition Division read as follows:

"1. A radiation-sensitive resin composition comprising a solution of a) 100 parts by weight of at least one alkali-soluble resin selected from novolaks, polyhydroxystyrenes and their derivatives, styrene-maleic anhydride copolymers, polyvinyl hydroxybenzoates and carboxyl group-containing methacrylate resins and b) 5 to 100 parts by weight of a 1,2-quinone-diazide compound as radiation-sensitive compound in a solvent comprising a monooxymonocarboxylic acid ester having the formula (I):



wherein  $R^1$  is a hydrogen atom, or an alkyl group having 1 to 2 carbon atoms;  $R^2$  is an alkylene group having 1 to 4 carbon atoms; and  $R^3$  is an alkyl group having 1 to 3 carbon atoms, wherein the monooxymonocarboxylic acid ester is at least one of alkyl oxyacetates, alkyl alkoxyacetates, alkyl 3-oxypropionates, alkyl 2-oxypropionates, alkyl 2-alkoxypropionates, alkyl 2-oxy-2-methylpropionates, alkyl 2-alkoxy-2-methylpropionates, alkyl 2-oxy-3-methylbutanoates, alkyl 2-alkoxy-3-methylbutanoates, methyl 3-methoxypropionate and ethyl 3-methoxypropionate."

III. In its decision, the Opposition Division found that the

patent in suit contained sufficient information for carrying out the invention; that the subject-matter of the claims as maintained was not anticipated by an alleged prior public use or by a prior public oral disclosure of ethyl 3-ethoxypropionate (EEP) as a solvent for photoresists or by document (65A); and that the same subject-matter was inventive over documents (1) and (65A).

- IV. The Appellants II and IV (Opponents 02 and 04) lodged appeals against this decision and submitted in essence
- that Claim 1 as maintained violated Articles 84 and 123(3) EPC;
  - that the subject-matter of Claim 1 was not novel in view of document (65A) or of a prior public oral disclosure of EEP as a substitute solvent for photoresists by KODAK at a meeting with IBM staff on 25 June 1985;
  - that Claim 1 covered embodiments not solving the problem stated in the patent in suit;
  - that the subject-matter of Claim 1 as maintained did not involve an inventive step either in view of documents (36) and (65A) or in view of documents (65A), (6), (37) in combination with (38) and the oral disclosure already mentioned.
- V. The Respondent (Proprietor) contested these submissions in writing and orally; it submitted by letter of 28 July 2000 a main request and seven auxiliary requests and argued in essence

- that there was no prior public oral disclosure or prior public use since KODAK and IBM had to be seen as collaborating companies which observe rules of confidentiality in the early stages of development of a product (letter of 28 July 2000, page 3, lines 1 to 12 from the bottom);
- that there was a difference between radiation-sensitive resin compositions for the manufacture of integrated circuits which require a high degree of particle fineness and those compositions for the manufacture of printed circuits which may have a resolution only of the order of millimetres (letter of 28 July 2000, page 5, lines 1 and 2).

VI. During oral proceedings which took place on 31 August 2000 the Respondent filed an amended main request and seven amended auxiliary requests.

VI.1 The main request contained 7 claims of which Claim 1 differed from Claim 1 as maintained by the Opposition Division in that the passage "R<sup>3</sup> is an alkyl group having 1 to 3 carbon atoms" was changed to "R<sup>3</sup> is an alkyl group having 1 to 2 carbon atoms".

VI.2 The first auxiliary request contained 7 claims of which Claim 1 differed from that of the main request in that "for use in the manufacture of integrated circuits, the radiation-sensitive resin composition" was inserted after " A radiation-sensitive resin composition".

VI.3 The second auxiliary request contained 6 claims, Claim 1 of which read:

"1. A radiation-sensitive resin composition comprising



a solution of a) 100 parts by weight of at least one alkali-soluble resin selected from novolaks, polyhydroxystyrenes and their derivatives, styrene-maleic anhydride copolymers, polyvinyl hydroxybenzoates and carboxyl group-containing methacrylate resins and b) 5 to 100 parts by weight of a 1,2-quinone-diazide compound as radiation-sensitive compound in a solvent comprising a solvent selected from the group consisting of alkyl 2-oxypropionates, wherein the alkyl group has from 1 to 2 carbon atoms, and methyl 3-methoxypropionate."

VI.4 The third auxiliary request contained 5 claims of which Claim 1 read:

"1. A radiation-sensitive resin composition comprising a solution of a) 100 parts by weight of at least one alkali-soluble resin selected from novolaks, polyhydroxystyrenes and their derivatives, styrene-maleic anhydride copolymers, polyvinyl hydroxybenzoates and carboxyl group-containing methacrylate resins and b) 5 to 100 parts by weight of a 1,2-quinone-diazide compound as radiation-sensitive compound in a solvent comprising a solvent selected from the group consisting of ethyl 2-oxypropionate and methyl 3-methoxypropionate."

VI.5 The fourth auxiliary request contained 5 claims of which Claim 1 differed from Claim 1 of the third auxiliary request only in that "for use in the manufacture of integrated circuits, the radiation-sensitive resin composition" had been inserted after "A radiation-sensitive resin composition".

VI.6 The fifth auxiliary request contained 5 claims of which

Claim 1 differed from Claim 1 of the main request in that "wherein the monooxymonocarboxylic acid ester is present in an amount of from 40 to 90% by weight of the composition" had been added at the end.

- VI.7 The sixth auxiliary request contained 5 claims of which Claim 1 differed from Claim 1 of the third auxiliary request in that the passage ", the radiation-sensitive resin composition" was inserted between "A radiation-sensitive resin composition" and "comprising a solution"; and in that "in a solvent comprising a solvent" was replaced by "in a solvent comprising from 40 to 90 % by weight of the composition of a solvent".
- VI.8. The seventh auxiliary request contained 5 claims of which Claim 1 differed from Claim 1 of the third auxiliary request in that the passage ", the radiation-sensitive resin composition" was inserted between "A radiation-sensitive resin composition" and "comprising a solution" and in that the passage "a solvent selected from the group consisting of ethyl 2-oxypropionate and methyl 3-methoxypropionate" was replaced by "ethyl 2-oxypropionate".
- VII. The Appellants requested that the decision under appeal be set aside and that the European patent No. 0 211 667 be revoked.

The Respondent requested that the appeal be dismissed and that the patent be maintained on the basis of the amended main request or alternatively one of the amended auxiliary requests 1 to 7 filed during the oral proceedings.

- VIII. At the end of the oral proceedings the chairman

announced the decision of the Board.

## Reasons for the Decision

### 1. *Main request*

#### 1.1 Articles 84 and 123 EPC

The Board is satisfied that the claims of the main request comply with the requirements of Articles 84 and 123 EPC. It is not necessary to give further details since this request fails for other reasons.

However it is appropriate to comment on two specific issues which were controversially discussed by the parties and have a particular bearing on the interpretation of Claim 1:

- 1.1.1 First of all the Appellants argued that the formulation "... a solution of a) 100 parts by weight of at least one alkali-soluble resin..." violates Article 123(3) EPC since Claim 1 of the patent as granted read: "...a solution of 100 parts by weight of a) at least one alkali-soluble resin...". Whereas the latter formulation allowed only for both components (a) and (b) a sum of 100 parts by weight, the former wording, i.e. that of present Claim 1 allowed for the sum of both components from 105 to 200 parts by weight, thereby extending the scope of the claim as granted and, thus, not complying with the requirements of Article 123(3) EPC.

The Board cannot accept this argument. A total allowable amount of 100 parts by weight for both

components together would mean that Claim 1 reads on compositions comprising no resin at all, i.e. compositions with 100 parts by weight of component (b), necessitating zero parts by weight for component (a). A skilled person would have realised immediately that there was a mistake in Claim 1 as granted since a "radiation-sensitive resin composition" and a resin content of zero parts by weight was a clear contradiction obviously resulting from the wrong position of "a)". Therefore, repositioning "a)" in present Claim 1, offered as an amendment by the Respondent, is accepted, since it is immediately evident that nothing else was intended (Rule 88 EPC).

- 1.1.2 Second, Appellant IV objected under Article 84 EPC to the terms "alkylene" and "oxy" - both used in the definition of the compounds covered by formula I. It argued in essence that a lack of clarity resulted from these terms since they were not used in accordance with the well recognised rules of chemical nomenclature.

This argument is not convincing. The addressee of a patent is the notional skilled person. In the present case this skilled person is a chemist with an university degree in organic chemistry and practising in the field of photoresists. Whereas this skilled person is of course familiar with the rules of chemical nomenclature he is also aware that, in practice, these rules are often applied incorrectly. Therefore, as soon as he encounters terminology not strictly in line with such rules, he will look to examples to resolve any doubt. In the present case reading not only the numerous examples but also dependent claim 2 would have resolved any doubt about the meaning of formula I.

1.2 Novelty

1.2.1 Claim 1 is directed to a radiation-sensitive resin composition comprising a resin, a 1,2-quinone-diazide radiation sensitive compound and a solvent.

The argument regarding novelty centred on two issues: prior public oral disclosure and prior public use.

1.2.2 Prior public oral disclosure

It is not contested that some IBM staff were informed by KODAK in a meeting on 25 June 1985 about EEP as a substitute solvent for cellosolve; also, according to the minutes of evidence of the witness Stepanoff at the oral proceedings before the Opposition Division, several customers were informed. The disclosure however was limited to a (possible) use of the solvent EEP as a substitute for cellosolve; whether the persons present at that meeting were bound by a secrecy obligation is not relevant for assessing novelty since the disclosure did not contain all the features of Claim 1 and consequently, did not anticipate the subject-matter of this claim.

1.2.3 Prior public use

According to the minutes of evidence at the oral proceedings before the Opposition Division IBM had received the photoresist composition "KMPR 820" containing EEP as a substitute solvent for cellosolve products in order to run evaluation tests.

However, the evidence did not answer all the key questions concerning an alleged prior public use

(when?, where?, what?, how?). For example no evidence was provided identifying the date of shipment of the photoresist composition, nor the date of reception, nor the addressee.

Therefore, the evidence on file is insufficient to prove that a radiation-sensitive composition falling within the terms of Claim 1 had been made available to the public by use. The argument of anticipation by prior public use can not be sustained.

#### 1.2.4 Prior documents

Although document (65A) teaches that either negative working or positive working sensitizers may be used for making coatings (see page 9, lines 23 and 24), *inter alia*, for printed circuits (page 18, lines 25 to 31), the coatings of the examples comprise only negative working sensitizers. The radiation-sensitive resin composition according to Claim 1 of the patent in suit, however, comprises a 1,2-quinone-diazide compound which means that it is a positive working sensitizer.

In order to be novelty destroying the citation has to disclose directly and unambiguously all the features of the positive working radiation-sensitive resin composition according to Claim 1 of the patent in suit. The mere reference to positive working sensitizers (to be used for the coatings) (see document (65A), page 9, lines 23 and 24) does not reveal all the components of a positive working sensitized composition, in particular not a positive working sensitizer in combination with the particular resins and solvents defined in Claim 1. Since a positive working radiation-sensitive resin composition having the same features as

those of the patent in suit was not disclosed by document (65A), the subject-matter of Claim 1 is not thereby anticipated.

#### 1.2.5 Conclusion

The Board is also satisfied that none of the other documents on file discloses the subject-matter of Claim 1. Since no objections based on the disclosure of the other documents were raised, further details are not necessary. The subject-matter of Claim 1 is, therefore, novel.

#### 1.3 Inventive step

1.3.1 Claim 1 concerns a radiation-sensitive resin composition comprising a solution of a resin, a 1,2-quinone-diazide radiation-sensitive compound and a solvent which might be, inter alia, an alkyl 2-oxypropionate.

1.3.2 The technical problem as stated in the patent in suit was to provide a radiation-sensitive resin composition which gives rise to very little formation of fine particles and is suited for use as a resist (page 3, lines 29 and 30).

1.3.3 None of the cited prior art addresses this problem. Therefore, the prior art to form the starting point for evaluating inventive step is a document which deals with the same technical field as the patent in suit and discloses a photoresist composition having the most features in common with the claimed composition. Document (37) is suitable for that purpose, because it discloses a fast positive photoresist composition

comprising a mixture of a phenol-formaldehyde novolak and resole resins and a 1,2-quinone-diazoketone type as photosensitizer (column 1, lines 14 to 19 and column 2, lines 50 to 60); the resist formulation is prepared by dissolving the components in a solvent so that the composition can be coated as a thin film on a substrate; the solvent may be, for instance, ethyl cellosolve acetate (column 2, line 70 to column 3, line 3).

- 1.3.4 The runs 1 and 2 (out of 12 runs in all) of table 2 of document (33) show that the problem is solved when ethyl lactate is used as a single solvent with the novolak resin and quercetin-1,2-naphthoquinonediazido-5-sulfonic acid tetraester as the diazide compound (acting as radiation-sensitive compound).

Also the runs of the table of document (94) show that the problem is solved when ethyl lactate, or methyl 3-methoxypropionate or ethyl 3-ethoxypropionate is used as a single solvent with a novolak resin and 2,3,4,4'-tetrahydroxybenzophenone-1,2-naphthoquinonediazido-5-sulfonic acid tetraester as radiation-sensitive compound.

So, there is evidence that the above mentioned specific combinations of solvent, resin and radiation-sensitive compound solve the problem as stated in the patent in suit.

- 1.3.5 Since Claim 1 fails for other reasons (see point 1.3.7), it is not necessary to investigate whether the technical problem is solved by all embodiments encompassed by the claim.



1.3.6 Since January 1984 the U.S. Environmental Protection Agency was exploring regulatory means to reduce or eliminate the risks of exposure to cellosolve products (document (89), column 1, summary) and was looking for suitable substituents (page 2923, left column, 3rd paragraph) and for further information on the toxicity of cellosolve products (page 2923, item 4, toxicity).

Ethyl lactate, which is ethyl 2-hydroxypropionate i.e. an alkyl 2-oxypropionate in terms of the patent in suit (see Claim 1 of the patent in suit), was known since 1981 as a relatively low toxic solvent (see document (78)); among others, ethyl lactate and methyl cellosolve acetate, were recommended as high boiling point solvents for the resin by document (65A) (page 17, 7 to 8 lines from the bottom) which is directed to sensitized coatings on substrates. The Respondent argued that the process disclosed by document (65A) required two different solvents, namely a high boiling point solvent (for instance ethyl lactate) for the resin and a low boiling point solvent (for instance methyl cellosolve) for the light sensitive component (page 16, line 3 to page 17, 3 lines from the bottom) whereas Claim 1 of the patent in suit would not make a distinction between two solvents having different boiling points. However, the Respondent overlooked that its Claim 1 does not only allow for alkyl 2-oxypropionate, or ethyl 2-hydroxypropionate which is ethyl lactate, but also for a further solvent since the term "comprising" does not exclude the possibility to use a further solvent for the photosensitive compound; in Claim 10 of the patent in suit the other solvent is specified as being for instance ethylene glycolmonomethylether which is methyl cellosolve (a low boiling point solvent in terms of document (65A)).

Since ethyl lactate was disclosed as a solvent in the field of photoresists and since this solvent was known to be less toxic than the cellosolve products, the skilled person would have tried this solvent in the positive photoresist composition according to document (37); at the very least being aware of the current environmental requirements he would have reduced the amount of the toxic cellosolve product and replaced it by ethyl lactate.

Hence the use of ethyl lactate does not involve an inventive step, irrespective of the circumstances that very little formation of fine particles may be obtained. The state of the art represented by the "Proposed Rules of the Environmental Protection Agency" (see document (89)) would have prompted the skilled person to be increasingly aware of the environmental importance of trying to replace the conventional cellosolves with ethyl lactate as a solvent. So, the skilled person trying to safeguard the future use (and future sales) of the radiation-sensitive resin compositions would have arrived at the same solution as the Respondent, albeit for different reasons, namely environmental protection. Therefore, the Board concludes that the subject-matter of Claim 1 does not meet the requirement of Article 56 EPC.

2. *Auxiliary requests 1 to 7*

2.1 Articles 54, 84 and 123 EPC

The claims of these requests and their subject-matter comply with the requirements of Articles 54, 84 and 123 EPC. Since these requests fail for other reasons (see below point 2.2), further details are unnecessary.

2.2 Article 56 EPC

Since Claim 1, in all its versions appearing in the auxiliary requests 1 to 7, allows for ethyl lactate as a solvent, the findings under points 1.3.1 to 1.3.7 above also apply, mutatis mutandis, also to auxiliary requests 1 to 4 and 7, since differences in their wording do not provide any additional essential technical feature which would have to be taken into account when assessing inventive step.

Auxiliary requests 5 and 6 contain an additional technical feature specifying the amount of the monooxymonocarboxylic acid ester as "of 40 to 90 % by weight of the composition". This feature does not contribute an inventive step either since no particular effect was ascribed to this amount which moreover is of the order of magnitude used according to examples 1, 2 and 3 of document (65A)(see 70 parts by weight of cyclohexanone, respectively, methyl cellosolve acetate, or 60 parts by weight of ethyl lactate for dissolving the epoxy resin; page 27, lines 5 and 25; page 28, line 5). Hence, this feature is obvious and the subject-matter of auxiliary requests 5 and 6 does not involve an inventive step either.

Consequently, none of the auxiliary requests is allowable since the requirement of Article 56 EPC is not met by any of them.

**Order**

**For these reasons it is decided that:**

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:

G. Rauh

P. Krasa