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**Datasheet for the decision
of 30 May 2018**

Case Number: T 0428/15 - 3.3.03

Application Number: 05765070.7

Publication Number: 1775315

IPC: C08G18/38, C08G75/06, G02B1/04

Language of the proceedings: EN

Title of invention:
POLYMERIZABLE COMPOSITION

Patent Proprietor:
MITSUBISHI GAS CHEMICAL COMPANY, INC.

Opponent:
PPG Industries Ohio, Inc.

Relevant legal provisions:
EPC Art. 54, 56
RPBA Art. 12(4)

Keyword:
Novelty (yes)
Inventive step (yes)
Experimental report submitted with statement of grounds of
appeal - admitted

Decisions cited:

T 0035/85, T 0181/82



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Case Number: T 0428/15 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 30 May 2018

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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 19 December
2014 rejecting the opposition filed against
European patent No. 1775315 pursuant to Article
101(2) EPC.**

Composition of the Board:

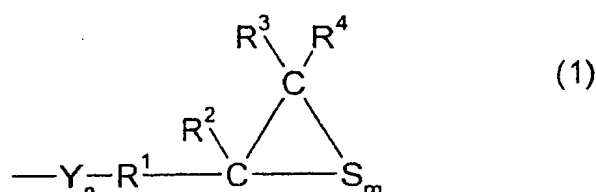
Chairman D. Semino
Members: F. Rousseau
C. Brandt

Summary of Facts and Submissions

I. The appeal lies against the decision by the opposition division, posted on 19 December 2014, rejecting the opposition against European patent No. 1 775 315, whose claim 1 read as follows:

"1. A polymerizable composition comprising:

- (A) a compound having two mercapto groups in one molecule and a compound having three or more mercapto groups in one molecule;
- (B) a NCO-terminated polyurethane prepolymer;
- (C) a polyisocyanate compound; and
- (D) an episulfide compound having in its molecule at least one structural group represented by the following formula 1:



wherein R¹ is a divalent hydrocarbon group having 1 to 10 carbon atoms or a single bond, R², R³ and R⁴ are each independently a hydrocarbon group having 1 to 10 carbon atoms or hydrogen, Y is O or S, m is an integer of from 1 to 5, and n is an integer of from 0 to 5."

II. The following evidence was submitted inter alia during the opposition proceedings:

- D1: JP2004-185625 and English translation thereof
- D2: JP2005-086536 and English translation thereof
- D3: JP2005-008678 and computer generated English translation thereof

D4: EP 1 099 721 A1

D5: US 6,130,307

D6: EP 0 936 233 A2

D7: US 2003/0149217 A1

E1: Experimental data concerning Example 6 of D3 embedded in section 3.1.1 of the letter of the patent proprietor of 11 July 2013

E2: Comparative data embedded in section 4.1.1 c) of the letter of the patent proprietor of 11 July 2013.

III. In the impugned decision the opposition division held inter alia that D3 was state of the art according to Article 54(2) EPC, since the claim to priority based on D1 and D2 was invalid. Novelty was acknowledged over the composition described in Example 6 of D3, because that composition had not been shown to comprise a compound having three or more mercapto groups in one molecule. Moreover, the multiple selections of features operated by the opponent within the description of each of D4 to D6 was not suitable for challenging novelty in view of any of those documents, reference being made to decisions T 401/94 and T 7/86. The subject-matter claimed was found to involve an inventive step, when starting from Example 6 of D3 or Example 6 of D7 as the closest prior art. Based on E2 the opposition division was satisfied that the problem successfully solved over the closest prior art by the claimed composition was the provision of a polymerizable composition allowing the preparation of lenses having improved impact strength. However, none of the prior art documents cited suggested that this problem could be solved by the additional use of a compound having more than three mercapto groups in one molecule. Accordingly, the opposition was rejected.

IV. The opponent (appellant) lodged an appeal against the above decision.

V. With the statement of grounds for appeal of 20 April 2015, the appellant submitted a test report D12.

VI. The patent proprietor (respondent) submitted with its rejoinder of 27 August 2015 the following document:

D11: A. Stopper et al, Inorganic Chemistry, ACS publications, 2014, Vol. 53, pages 9140-9150.

VII. Additional submissions of the appellant were made with letter of 29 December 2015.

VIII. Oral proceedings were held on 30 May 2018.

IX. The appellant's arguments, as far as relevant to the present decision, were essentially as follows:

Novelty over D3

(a) The polymerisable composition of Example 6 of D3 described in Table 1 comprised all components in accordance with claim 1 of the opposed patent. Component A1 of that composition was according to paragraph [0057] of the translation submitted the preliminary reaction product obtained by reacting bis-(beta-epithiopropyl)sulfide and 2 aminobenzenethiol, i.e. as described in paragraph [0049] the product present in chloroform after the reaction mixture had been dissolved therein. A purification step was not disclosed. From the data submitted by the respondent with E1 the product obtained did not only contain the targeted product 1,9-bis(2-aminophenyl)-3,7-dimercapto-1,5,9-

trithianonane, but also 1 wt-% of unreacted bis-(beta-epithiopropyl)sulfide and 2.3 wt-% of an oligomer derived from bis-(beta-epithiopropyl)sulfide, confirming that the preliminary reaction product mentioned in D3 had not been purified. Furthermore, E1 showed that the reaction product did not contained the starting 2-amino benzene thiol. The statement in E1 that the IR Spectroscopy of the oligomer did not show any mercapto groups was contrary to the other statement in E1 that 2.3 wt-% of an oligomer derived from bis-(beta-epithiopropyl)sulfide was found. Having regard to the presence of oligomers and of unreacted bis-(beta-epithiopropyl)sulfide in the mixture obtained, it was evident based on the common general knowledge in the art in organic chemistry that some of the bis-(beta-epithiopropyl)sulfide molecules had reacted with the targeted 1,9-bis(2-aminophenyl)-3,7-dimercapto-1,5,9-trithianonane, which reaction involved opening of at least one epithio ring of a bis-(β -epithiopropyl)sulfide and the nucleophilic amino groups of the 1,9-bis-(2-aminophenyl)-3,7-dimercapto-1,5,9-trithianonane leading to a compound having three or more mercapto groups in the molecule. The teaching of D11 concerned a reaction involving aromatically bound thiol groups catalysed with a basic tertiary amine catalyst. D11 was therefore not suitable to indicate how the mercapto groups of 1,9-bis-(2-aminophenyl)-3,7-dimercapto-1,5,9-trithianonane, which were not aromatically bound and therefore less active, would react in presence of tetrabutylphosphonium bromide which could not act as basic catalyst. When using tetrabutylphosphonium bromide as a catalyst, the bromide attacked and opened the epithio ring and

then preferably reacted with a nucleophilic side having higher nucleophilicity and less steric hindrance, i.e. the aromatic bound terminal -NH₂ groups of the trithionane compound. Accordingly, considering that at least an infinitely small amount of the remaining bis-(beta epithiopropyl)sulfide would react with an -NH₂ group of the 1,9-bis-(2-aminophenyl)-3,7-dimercapto-1,5,9-trithianone rather than with one of its -SH group, the composition of claim 1 of the opposed patent was anticipated by D3, as that claim did not specify any amounts of the components of the claimed composition, in particular any amount of the compound having three or more mercapto groups in one molecule.

Novelty over D4

- (b) Document D4 disclosed in paragraph [0009] and in claim 1 a polymerizable composition comprising as component (a) component (D) of claim 1 of the opposed patent, an isocyanato-functional component (b) and a component (c) comprising at least one mercapto group in one molecule. Paragraph [0023] disclosed addition products of polyisocyanates with alcohols, which corresponded to component (B) of claim 1 of the contested patent, which component was also a polyisocyanate compound (C). In addition paragraph [0025] in combination with paragraph [0029] disclosed that a combination of two or more of mercapto-functional compounds could be used, which compounds included compounds having two mercapto groups, as well as compounds having three or more mercapto groups in one molecule. D4 disclosed therefore a polymerizable composition

falling within the definition of claim 1 of the contested patent.

Novelty over D5

(c) D5 disclosed in column 2, lines 34-51, a polymerizable composition comprising a compound (a) having an epoxy or episulfide group in combination with a compound (b) having one or more isocyanato groups, episulfide compounds being preferred as shown in column 3, lines 37-45. As to compound (b) described from column 4, line 66 to column 5, line 38, addition products of polyisocyanates with alcohol, as well as the combination of one or more of the previously described polyisocyanate compounds were disclosed, with the result that also a combination of an isocyanato-functional prepolymer with an additional polyisocyanate was disclosed in that document. Finally, D5 disclosed from column 8, line 52 to column 9, line 67, possible compounds having two or more thiol groups whereby explicitly compounds having two thiol groups as well as compounds having three or more thiol groups were exemplified. Finally it was disclosed in column 9, lines 62 and 63, that a combination of two more of these compounds could be used. Thus the subject-matter of claim 1 of the contested patent was also disclosed in D5.

Novelty over D6

(d) Claim 1 and paragraph [0009] of D6 disclosed a polymerizable composition comprising a compound (b) having one or more isocyanate groups in combination with a compound (a) having epoxy groups or preferably epithio groups as indicated in paragraph

[0014]. Paragraph [0020] disclosed for compound (b) several diisocyanato-functional compounds, as well as the addition products of these polyisocyanates with alcohols and paragraph [0023] described that a combination of one or more of these compounds could be used, thus also a combination of a polyisocyanate with an isocyanato functional urethane prepolymer. Finally, paragraph [0026] disclosed several compounds having thiol groups including compounds having two thiol groups, as well as compounds having three or more thiol groups, which compounds in the light of paragraph [0031] could be used also in a combination. Therefore, the subject-matter of claim 1 of the contested patent was also known from D6.

Inventive step

- (e) The closest state of the art was represented by D3, in particular the polymerizable composition disclosed in Example 6, which was structurally closer to the subject-matter of claim 1 as granted than the compositions described in the compositions exemplified in D7, since the composition disclosed in Example 6 of D3 contained two compounds having mercapto groups. The compositions according to claim 1 of the patent in suit differed from that disclosed in Example 6 of D3 solely in that they also comprised a compound having three or more mercapto groups in one molecule.

- (f) The compositions compared in E2 differed in the relative amounts of the monomers, which did not make it possible to attribute any technical effect to the use of a compound having three or more mercapto groups in one molecule. Moreover, E2 did

not provide a comparison with compositions comprising two compounds having two mercapto groups in one molecule as in Example 6 of D3, so that the comparison offered, which was not made with the closest prior art, did not fulfill the requirements of the case law of the Boards of Appeal. In addition, an improvement in terms of impact resistance of the lenses prepared with the claimed composition over those prepared with the compositions disclosed in D3 had not been demonstrated, since the compositions of D3 gave values for the average falling ball impact energy of the resin of at least 12 J, whereas the compositions according to claim 1 of the opposed patent led to lower values as shown in Table 2 of the patent in suit and in E2. Furthermore, the lenses prepared in D3 were optically clear, as shown by the description in this document that the polymer of the invention obtained were "water-white", whereas the comparative lenses used in E2 exhibited whitening. The whitening was a sign of the presence of defects such as tiny bubbles having their origin in the preparation of the samples, those defects constituting predetermined breaking points which led to poorer impact properties. Accordingly, the comparative compositions of E2 could not be considered to represent the closest prior art and the alleged improvement of impact properties reported in E2 was not attributable to the features distinguishing the claimed compositions from the closest prior art. Furthermore, the improvement allegedly obtained over the closest prior art was not achieved over the whole scope of claim 1, since claim 1 allowed the use of infinitesimal amounts of a compound having three or more mercapto groups in one

molecule. In addition D12 showed that no improvement in impact resistance was achieved by using a combination of a dimercapto compound with a compound having at least three mercapto groups compared to an exactly same composition comprising only a compound having two mercapto groups. For all these reasons, the problem successfully solved by the subject-matter of granted claim 1 was the mere provision of an alternative composition.

- (g) D3 taught the skilled person in paragraph [0036] that instead of DMDS, compounds having three or more mercapto groups could be used. Therefore, a person skilled in the art found the motivation in D3 to substitute the DMDS compound of Example 6 of D3 by one of the compounds having three or more mercapto groups disclosed in D3, thus arriving at the subject-matter of claim 1 of the contested patent in an obvious manner. Claim 1 lacked therefore an inventive step in view of D3 alone.

- (h) The subject-matter of granted claim 1 lacked also an inventive step over D7 alone, the most suitable starting point being represented by Example 11 of that document, which only differed from the composition of granted claim 1 in that it did not contain a compound having three or more mercapto groups in one molecule. The use of such compound as shown by D12 did not lead to any improvement regarding impact resistance. From paragraph [0064] of D7 it was evident that polythiols having two, three or more mercapto groups in one molecule could be employed, as well as mixtures thereof. This paragraph gave the person skilled in the art the hint that instead of DMDS also a mixture of DMDS with PTMA could be used. Accordingly, essentially

for the same reasons as those provided in respect of D3, claim 1 as granted lacked an inventive step in view of D7 alone.

- X. The respondent's arguments, as far as relevant to the present decision, may be summarised as follows:

Novelty

- (a) The appellant had not provided any evidence for the allegation that the composition of Example 6 of D3 contained a component having three or more mercapto groups in one molecule. It was not clear based on the translation of D3 submitted whether the whole composition prepared in that example had been dissolved in chloroform or part of the reaction mixture remained undissolved. Furthermore, it was not specified in D3 which solvent had been used for the "after-rinsing" step. In addition, the unclear wording "The preliminary reaction thing" employed to defined compound A1 of Table 1 of D3 did not make it possible to understand which compound had been used for the preparation of the composition of Example 6 of D3. As to E1, the argument that the oligomers had to comprise mercapto groups was not only contrary to the finding reported in E1, but purely speculative, since no evidence had been submitted that the epithio group would react with the amino group either of the starting compound 2-aminobenzene thiol or the amino group of the 2-aminobenzene thiol after reaction of the thiol group. D11 on page 9141 further showed that the reactivity of the mercapto group in a nucleophilic substitution reaction was higher than that of the amino group. Since it had not been shown that what was disclosed in D3 would inevitably lead the

skilled person to subject-matter falling within the scope of claim 1 of the opposed patent, novelty over D3 was to be acknowledged.

- (b) Regarding novelty of claim 1 over any of D4 to D6 the opposition division had followed the argumentation provided by the patentee that those documents did not provide a direct and unambiguous disclosure of granted claim 1, as in order to read in those documents the subject-matter of claim 1 it would be required to make a multiple selection of features throughout the description of those documents for which there was no indication to do so. No arguments had been provided by the respondent as to why the reasoning of the opposition division was not correct.

Inventive step

- (c) The closest prior art was represented by Example 6 of D3. Having regard to the disclosure of D3, the technical problem solved by the subject-matter of granted claim 1 was the provision of polymerizable compositions resulting in an improved impact resistance and colorless transparency of the polymerized material. Experimental data E2 showed that said technical problem was successfully solved by the claimed subject-matter, as demonstrated with a comparison of Comparative Examples (5) and (6) with Examples 1 and 2, respectively or of Example 3 with Comparative Example (6). The compositions in accordance with the patent in suit lead to lenses which exhibited average falling ball impact energy values which were higher than those obtained with the comparative compositions. In addition, the cured articles according to the invention had a

good colorless transparency, whereas the compositions of the prior art resulted in cured articles which were whitened. The comparative tests E2 were in line with the criteria established in the case law, reference being made to T197/86 (OJ 1989, 371).

- (d) The values of impact energy disclosed in D3 could not be compared with those provided in the patent in suit, because the impact test in D3 was carried out on a plate of 2.5 mm thickness, whereas the impact test in the patent in suit had been carried out on a lens.

- (e) Experimental report D12 should have been submitted before the opposition division and accordingly, should not be admitted into the proceedings pursuant to Article 12(4) RPBA. The comparison offered with D12 was not suitable, as it concerned compositions in which also the amount of mercapto compound had been varied. Moreover, the impact energy given in D12 and in Example 11 of D7 were both merely indicated to be > 4.95 Joule, which did not allow to conclude that the impact energies obtained in D7 and with the patent in suit were identical. Accordingly D12 was not suitable to prove that the problem solved by the present invention over D3, was not solved over the whole range.

- (f) There was no indication in the prior art that this problem could be solved by a compound having three or more mercapto groups in one molecule.

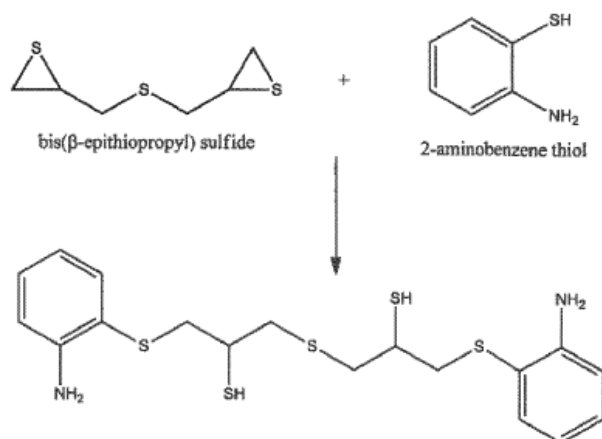
- XI. The appellant requested that the decision under appeal be set aside and that European patent No. 1 775 315 be revoked.
- XII. The respondent requested that the appeal be dismissed (main request) or, alternatively, that the patent be maintained in amended form according to any of auxiliary requests 1 to 9 filed with letter dated 10 September 2014.

Reasons for the Decision

Novelty over D3

1. The finding by the opposition division that the patent as granted does not enjoy the priority dates of applications D1 and D2 with the consequence that document D3 is a prior art document pursuant to Article 54(2) EPC was not disputed by the parties. The Board has no reason to take a different view.
2. The objection of lack of novelty over D3 is only based on the specific embodiment described with Example 6 of that document which is in Japanese language. The submissions of the parties were made by reference to a computer generated English translation thereof. In the following, any indication to passages of D3 refers therefore to the computer generated translation of this document. It is undisputed that Example 6 of D3 does not explicitly disclose a composition comprising a compound having three or more mercapto groups in one molecule. It is, however, the position of the appellant that such a compound having three or more mercapto groups in one molecule is inherently formed during the preparation of component A1 used for the preparation of the composition of Example 6 of D3. It is undisputed in

view of paragraph [0049] that A1 is prepared by reacting bis-(β -epithiopropyl)sulfide and 2-amino-benzenethiol leading to the formation of 1,9-bis-(2-aminophenyl)-3,7-dimercapto 1,5,9-trithianonane according to:



The appellant supports the view that at least one epithio ring of a bis-(β -epithiopropyl)sulfide would further react with an amino group of the 1,9-bis-(2-aminophenyl)-3,7-dimercapto 1,5,9-trithianonane leading to a compound having three or more mercapto groups in the molecule. This argumentation is based on E1, i.e. the experimental results reported by the respondent in section 3.1.1 of its letter of 11 July 2013, according to which the product of the reaction also contains 2.3 wt% of an oligomer derived from bis-(beta epithiopropyl)sulfide and 1.0 wt% of bis-(beta epithiopropyl)sulfide.

- 2.1 The footnote of Table 1 in paragraph [0057] of the translation of D3 defines A1 to be "*The preliminary reaction thing of bis-(beta-epithiopropyl)sulfide and 2-MINOBENZENThiol (sic)*". According to paragraph [0049] after addition, mixing and reaction of the reactants "*The reaction mixture was dissolved in chloroform, the after-rinsing chloroform layer was dried, the solvent*

was removed and 101.81 g of 1,9-bis(2-aminophenyl)-3,7-dimercapto 1,5,9-trithianonane which is an object was obtained (95% of yield)." It is not clear from that passage whether the expression "*The preliminary reaction thing*" used in the translation should be understood to refer to the reaction mixture as obtained during the preliminary reaction step described in paragraph [0049] before apparently the mixture is dissolved in chloroform or to the product obtained after all these additional steps, which also would constitute a reaction product which needs to be first prepared for the formulation described in Table 1 and accordingly could be understood to be the "*preliminary reaction thing*". The latter would appear to be more likely in view of paragraph [0029] which appears to define various steps to be used after synthesis of the diamine prepared by the reaction of an episulfide compound with an aromatic thiol such as "*acid cleaning, base washing and rinsing*". Obviously, such a rinsing step, whether or not it was preceded by other cleaning or washing steps took place in the preliminary reaction described in paragraph [0049]. Moreover the indication that 1,9-bis(2-aminophenyl)-3,7-dimercapto 1,5,9-trithianonane was characterised by 1H-NMR and obtained with a yield of 95% does not allow to conclude whether the yield is determined on the basis of the NMR spectra or on the basis of the amount of product obtained after the solvent was removed. It is also not clear whether an additional solvent was used or only chloroform, in which case removal of the solvent meant only removal of the chloroform. It is in this context referred to paragraph [0026] mentioning the use of solvents, including chloroform. Consequently, the objection that D3 anticipates the subject-matter of claim 1 is based on passages of a computer-generated translation whose quality does not allow the Board to understand with a

sufficient degree of certainty what is in fact described in D3. Furthermore, the appellant did not submit a man-made translation of the relevant passages which would have clarified the issue, or provide technical explanations which would render credible that the true meaning of the vague passages concerning the use of chloroform and the apparently described rinsing step would be immaterial to the conclusion to be drawn in respect of the nature of product A1 obtained.

2.2 Furthermore, the experimental data concerning Example 6 of D3 which are referred to by the appellant are to be found in section 3.1.1. on page 4, last paragraph of the respondent's letter of 11 July 2013. This paragraph reads: *"Moreover, the proprietor carried out the synthesis example 1 for the production of 1,9-bis(2-aminophenyl)-3,7-dimercapto-1,5,9-trithianonane (cf. paragraph [0049] of D3). The analysis of the reaction product revealed that the reaction product contained 96.7 wt% of 1,9-bis(2-aminophenyl)-3,7-dimercapto-1,5,9-trithianonane, 2.3 wt% of an oligomer derived from bis-(beta-epithiopropyl)sulfide and 1.0 wt% of bis-(beta epithiopropyl)sulfide. The oligomer derived from bis-(beta epithiopropyl)sulfide was further analyzed by using a GPC-IR method to examine whether the oligomer contains any mercapto group. The GPC-IR method means that firstly the oligomer was separated by GPC (Gel Permeation Spectrography) and that secondly the separated oligomer was analyzed (sic) using IR (Infrared) Spectroscopy. The resulting IR chart did not show any absorption peak of a mercapto group. Thus, the oligomer does not contain any mercapto group"*. It is conspicuous that the details of the experiments carried out by the respondent are not provided. It is in particular not indicated at which point and how the amount of the various components indicated were

determined, any mention of a step of dissolving the reaction product in chloroform and any possible subsequent step like the one which are apparently meant to be described in paragraph [0049] of the translation being missing. Having also regard to the content of the target product which is of 96.7 wt% in the experiment reported by the respondent, whereas the translation of D3 indicates a yield of 95% for this product, it is furthermore questionable whether the reaction product which was analysed in this experimental report can be considered to represent that described to be obtained in the translation of D3. In view of the above it cannot be ascertained whether the experiment report mentioned by the respondent represents a fair repeat of what appears to be described in paragraph [0049] of the translation of D3 for the preparation of product A1.

2.3 Furthermore, in the absence of a detailed report on the experiment carried out by the respondent, including not only an exact description of the steps employed for the synthesis, but also a description of the analytical methods used and of the data obtained, there is no apparent justification to accept on the one hand the conclusion by the respondent that the reaction product contains an oligomer derived from bis-(beta epithio-propyl)sulfide and some bis-(beta epithiopropyl)-sulfide, but on the other hand to refute that the oligomer obtained would not comprise mercapto group, which is also indicated in the report, but is disputed by the appellant. This would require more information on the experiments carried out, which however is not available. Whereas the Board agrees that the ability of the aromatic bound terminal $-NH_2$ groups and of the mercapto groups of the 1,9-bis(2-aminophenyl)-3,7-dimercapto-1,5,9-trithianonane to react with the intermediate resulting from the opening of an epithio

ring of the bis-(beta epithiopropyl)sulfide depends on their relative nucleophilicity and steric hindrance, no evidence has been submitted in support of the allegation, that in the specific situation of Example 6 of D3 these factors would result in the reaction of the aromatic bound terminal -NH₂ groups, at least to the extent that compounds having 3 or 4 mercapto groups necessarily result therefrom and can be detected. Having regard to the technical meaning of a claim, the point is not whether such oligomers are theoretically present in an infinitesimal amount, as argued by the appellant, but whether that amount is technically sensible, in the sense that its presence is noticeable using conventional technics in the art. This, however, was not demonstrated by the appellant.

- 2.4 On that basis, the Board can only come to the conclusion that no case has been made that the subject-matter of granted claim 1 lacks novelty over the disclosure of Example 6 of D3.

Novelty over each of D4 to D6

3. The submissions of the appellant in respect of the objections that the claimed subject-matter lacks novelty over each of D4 to D6 do not go beyond showing that each of the features listed in operative claim 1 is disclosed in any of those documents. However, it is established case law that a claimed subject-matter lacks novelty only if a "clear and unmistakable teaching" of a combination of the claimed features can be found in a prior art disclosure (see Case Law of the Boards of Appeal of the EPO, 8th edition, 2016, I.C. 4.2). In the absence of any pointer in those documents to the specific combination of features defined in operative claim 1, and none is apparent, as all those

passages appear in separate parts of those documents, the Board has no reason to consider that claim 1 as granted lacks novelty over any of D4 to D6. This was already the position of the opposition division in the decision under appeal which was not refuted by any of the arguments of the appellant.

4. Consequently, novelty of the subject-matter of the granted patent is acknowledged.

Inventive step

Closest state of the art

5. The closest prior art for the purpose of assessing inventive step is that which corresponds to a purpose or effect similar to that of the invention and requiring the minimum of structural and functional modifications (Case Law, supra, I.D.3.1). The appellant argues inventive step of the subject-matter of claim 1 starting from either Example 6 of D3 or Example 11 of E7 as closest prior art.

- 5.1 The present invention relates to polymerizable compositions for producing optical materials (paragraph [0001]). The patent in suit is in particular concerned with the production of spectacle lenses, required to exhibit colorless transparency, a high refractive index and a high Abbe's number, as well as high mechanical strength (paragraphs [0002] and [0003] of the patent in suit). According to paragraph [0009], an object of the present invention was to provide a polymerizable composition for the production of optical materials which have a refractive index of around 1.60, an Abbe's number of around 40 and a high impact resistance. Both D3 and D7 are considered to represent a realistic

starting point for the skilled person concerned with the goal of the present invention as mentioned in paragraph [0009] of the patent in suit, since they disclose compositions having the corresponding properties profile (D3: paragraphs [0013] and [0048] and Table 2; D7: paragraphs [0004], [0131] and [0132] and Table 1 on page 16).

- 5.2 As regards the structural features, the subject-matter of claim 1 solely differs from the composition disclosed in Example 6 of D3 in that it contains a compound having three or more mercapto groups in one molecule, as follows from the above assessment of novelty over D3.
- 5.3 Concerning the structural differences between the claimed subject-matter and the composition disclosed in Example 11 of D7, the latter comprises bis-epithiopropyl sulfide (i.e. compound (D) according to the operative claim 1) and a reactive polyisocyanate prepolymer 2 described in Example 2 of that document. It is undisputed that the reactive polyisocyanate prepolymer 2, which is obtained by reaction of a mixture of polyols and diisocyanates using a NCO/OH equivalent ratio of 2.86, comprises a mixture of NCO-terminated polyurethane prepolymer chains, some of which will comprise at least two isocyanate groups and may therefore be qualified as polyisocyanate compounds within the meaning of compound (C) of claim 1. Accordingly the reactive polyisocyanate prepolymer 2 described in Example 2 of D7 may be considered as a mixture of compounds (B) and (C) as defined in operative claim 1. The composition of Example 11 of D7 is also described to comprise DMDS, which undisputedly stands for bis(2-mercaptoethyl) sulfide, designated in paragraph [0064] of that document as 2,2'-

thiodiethanethiol, i.e. a compound having two mercapto groups in one molecule. Consequently, the composition according to operative claim 1 also differs from Example 11 of E7 solely in that it contains a compound having three or more mercapto groups in one molecule.

- 5.4 Accordingly, both Example 6 of D3 and Example 11 of D7 are considered to represent an adequate (and equivalent) starting point for assessing inventive step, from which the claimed compositions differ solely by the presence of a compound having three or more mercapto groups in one molecule.

Problem successfully solved

6. Having regard to the disclosure of the closest prior art, the appellant and the respondent were divided as to which problem could be considered to be successfully solved by the subject-matter of claim 1 of the opposed patent. Relying on the experimental results described in E2, the respondent argued that the technical problem solved by the subject-matter of claim 1 of the main request over the closest prior art was the provision of polymerizable compositions resulting in an improved impact resistance and colorless transparency of the polymerized composition, whereas the appellant submitted that the problem solved by the claimed subject-matter was to provide an alternative to the polymerizable compositions of the prior art based on the comparative tests D12 and the argument that the comparisons offered with E2 lacked pertinence.

Experimental data E2

- 6.1 Having regard to E2, the respondent referred to a comparison of Comparative Examples (5) and (6) with

Examples 1 and 2 (according to the invention), respectively. In addition Example 3 (in accordance with the present invention) was compared with Comparative Example (6). The compounds employed in those comparative tests (i.e. PR1, PR2, HMDI, DMDS, 3TP and 4TP) are the same as those used in the experimental part of the patent in suit, whose meaning is provided on page 13 of the specification. Flat lenses were prepared in accordance with the procedure employed in example 1 of the contested patent.

6.1.1 The three above comparisons submitted by the respondent are made with compositions containing the same proportions of compounds PR1/PR2, HMDI and D1. In addition the proportion of mercapto groups used, i.e. relative to the other compounds (PR1/PR2, HMDI and D1), was retained between the comparative examples and the examples, so that any difference in the properties obtained for the polymerized compositions cannot be attributed to the use of a different amount of mercapto groups. Finally, the compositions compared by the respondent differ only by the use of a mixture of a compound having two mercapto groups (DMDS) and a compound having three or four mercapto groups (3TP or 4TP), instead of only DMDS, the total amount of mercapto groups being the same as indicated above. Accordingly, the appellant's argument which was submitted in writing, but was not pursued during the oral proceedings, according to which there is no example according to the contested patent and a respective comparative example that differ only in the feature distinguishing the claimed composition from the closest prior art, since the comparisons submitted also differ in the relative amounts of the monomers, which does not make it possible to attribute any technical

effect to the distinguishing feature, fails to convince.

6.1.2 As to the technical effects addressed in E2, it follows from the comparisons offered by the respondent, that with respect to the compositions of Comparative Examples (5) and (6) a large improvement of the impact resistance (expressed by an average falling ball impact energy value) is observed, as well as an improvement in terms of colorless transparency, which can be attributed to the use of a mixture of a compound having two mercapto groups in one molecule and a compound having three or four mercapto groups in one molecule, the refractive index and the Abbe's number staying substantially constant with values of 1.60 and 40, respectively.

6.2 The appellant also argued that the comparisons provided with E2 concerned composition comprising only one compound having two mercapto groups in one molecule, but not two of those compounds as was the case in Example 6 of D3. Accordingly, that comparison which was not made with the closest prior art would not *"fulfill the requirements of the case law of the Boards of Appeal"*.

6.2.1 The appellant did not indicate *"which requirements of the case law of the Boards of appeal"* would as a matter of principle not allow the use of a comparison made with a variant of the closest prior art, which possibility has been recognized by the Boards of Appeal as early as T 35/85 (Case Law, *supra*, I.D.10.9). According to point 4 of the reasons for this decision the applicant or patentee may discharge his onus of proof by voluntarily submitting comparative tests with newly prepared variants of the closest state of the art

making identical the features common with the invention in order to have a variant lying closer to the invention so that the advantageous effect attributable to the distinguishing features of the invention is thereby more clearly demonstrated.

6.2.2 What counts is whether the effect demonstrated in the framework of the comparative examples of E2 can be considered to take place also when starting from the composition identified as the closest prior art, namely Example 6 of D3 or Example 11 of D7. It appears credible to the Board that the use of a compound having three or more mercapto groups in one molecule in addition to the use of a compound having two mercapto groups in one molecule will lead to a different polymeric network, resulting in particular in different mechanical properties. The Board therefore considers credible that the measure of adding a compound having three or more mercapto groups in one molecule in order to bring about improved impact resistance in the context of experimental report E2 would also bring about the same effect in the context of Example 11 of D7 or of Example 6 of D3 where use is made of two compounds having two mercapto groups in one molecule. In the absence of further experimental evidence or of a technical explanation as to why colorless transparency of the polymerized composition would also be the result of using a compound having three or more mercapto groups in one molecule in the framework of Example 6 of D3 or Example 11 of D7, the Board has no reason to consider credible that this part of the problem is also effectively solved by the composition of granted claim 1.

6.2.3 Accordingly, the appellant's arguments as to the lack of suitability of E2 to demonstrate the achievement of

a technical benefit over the closest prior art as far as an improvement of impact resistance is concerned cannot convince.

6.3 Moreover, the Board does not share the appellant's view that an improvement in terms of impact resistance was not shown over D3, as that document indicated values for the average falling ball impact energy of at least 12 J, whereas the values indicated in Table 2 of the patent in suit were lower. As recognized by the Case Law as early as in T 0181/82 (OJ 1984, 401; see point 4 of the Reasons for the decision), regarding only the preferred compounds from a citation as the necessary comparative composition in a comparative test implies that one concentrates on the technical progress obtained vis-à-vis the known substances considered most effective. Technical progress, however, is not a requirement for a patent under the European Patent Convention. What counts is that an effect demonstrated by means of a suitable comparative test can be regarded as an indication of inventive step. As concluded in above section 6.2.2, the Board considers credible in the light of E2 that the measure of adding a compound having three or more mercapto groups in one molecule would bring about an improved impact resistance, also in the context of Example 6 of D3. The present invention lies in the finding that the impact resistance can be improved by the use of a compound having three or more mercapto groups in one molecule, which is reflected in the wording of claim 1 as granted by the definition that the composition comprises said compound.

6.4 In that respect, the present invention resides in the use of that compound, but not in a particular amount thereof. In other words, the present invention does not

reside in the finding that the selection of a particular amount of a compound is linked with an unforeseen advantage which would justify acknowledgement of an inventive step (e.g. if the use of that compound were already known in the art, but the use of a new amount thereof would provide said unforeseen advantage), but rather on the idea that the use of said compound is advantageous, which constitutes the technical contribution to the art which could in principle justify a patent monopoly. Accordingly, the appellant's objection that the problem addressed by the respondent cannot be solved over the whole scope of claim 1 on the basis that it covers infinitesimal amounts of a compound having three or more mercapto groups in one molecule fails to convince.

6.5 Moreover, the appellant's argument that a compound having three or more mercapto groups in one molecule would not lead to the improvement addressed by the respondent over the whole breadth of the claim is not supported by any evidence. In that respect the appellant submitted experimental report D12 with its statement setting out the grounds of appeal. Article 12(4) RPBA requires the Board to take into account everything presented by the parties under Article 12(1) RPBA if and to the extent that it relates to the case under appeal and meets the requirements in Article 12(2) RPBA. D12 provides the impact resistance of a cured material in accordance with claim 1 as granted, which value is compared to the value obtained in Example 11 of D7 in order to show the influence of a compound having four mercapto groups in one molecule on the impact resistance of the cured material. D12 relates therefore to the case under appeal and constitutes a response to one of the essential aspects of the reasons for the contested decision, namely that

the problem solved over the closest prior art was the provision of a polymerizable composition allowing the preparation of lenses having improved impact strength. Although the data of D12 could have been submitted in the first instance, there is no indication of a lack of diligence by the patent proprietor, nor does its later filing cause unfairness to the other party. Moreover, the submission before the first instance would not have led to a more efficient processing of the case. Under the present circumstances, the Board sees no reason to make use of its discretionary power under Article 12(4) EPC to hold inadmissible D12. However, D12 does not lead to any conclusion as to the influence of a compound having three or more mercapto groups in one molecule on the impact resistance of the polymerized material, since the impact energy value obtained with the composition according to the claimed invention (prepared and tested in D12) and the impact energy value obtained with the composition of Example 11 of D7 (D7, Table 1, paragraph [0161]) are both indicated to be "> 4.95 J" without indicating any precise value for any of the two and already for this reason cannot be compared. Moreover, it was also acknowledged by the appellant that in the composition meant to represent the composition in accordance with operative claim 1 the combined amount of DMDS and PTMA (indicated to be "pentaerythritol tetrakis-3-mercapto acetate", which obviously is meant to designate pentaerythritol tetrakis-2-mercapto acetate, i.e. a compound having three or more mercapto groups in one molecule) had been slightly reduced, as well as the amount of bis-(beta-epitiopropyl)sulfide. In fact the total amount of mercapto groups in the composition was not retained as was made by the respondent with E2, but in fact is only 77 % of the amount used in Example 11 of E7, whereas the amounts of reactive polyisocyanate prepolymer 2,

DETDa and MDA were kept constant and the amount of bis-(beta-epitiopropyl)sulfide was only 93% of the amount used in Example 11 of E7. This also shows that the comparison of the impact energy values provided in D12 and in Example 11 of E7 is not suitable to assess the influence of a compound having three or more mercapto groups in one molecule on the impact resistance of the polymerized material, since the compositions compared differ in more than one feature.

6.6 In view of the above mentioned evidence and arguments submitted by the parties, the Board is therefore satisfied that the technical problem effectively solved by the subject-matter of granted claim 1 over the closest prior art is the provision of polymerizable compositions resulting in an improved impact resistance of the polymerized composition.

6.7 An additional argument was also submitted by the appellant during the oral proceedings according to which that the lenses prepared in D3 were optically clear, reference being made to the wording "the polymer obtained by this example 1 was water-white" present in paragraph [0052] of the computer-made translation. It was held that the whitening of the cured articles observed for Comparative Examples (5) and (6) of E2 was the result of a lack of homogeneity and the presence of defects in the material tested, in particular the presence of tiny bubbles, which had their origin in the preparation of the samples, these inhomogeneities constituting predetermined breaking points in the flat lenses prepared. Accordingly, Comparative Examples (5) and (6) could not be considered to represent the closest prior art and the improvement of impact properties reported in E2 was not attributable to the features distinguishing the claimed compositions from

the closest prior art. This was in the appellant's opinion confirmed by the fact that Comparative Examples (1) and (3) of E2 which did not result in whitening corresponded to the comparative examples having the highest impact energy.

6.8 The Board notes that the improvement of impact strength recognized by the opposition division was already based on E2. The opponent and now appellant, however, did not repeat the experiments presented with E2, in particular the comparative examples of E2, in order to show that those if conducted correctly would lead to lenses which are not whitened, but merely criticized the improper preparation of the samples tested in E2 in order to rebut the conclusions based on E2. The mere submission of these unsubstantiated allegations concerning the preparation of the samples in E2, which were submitted for the first time during the oral proceedings, so that neither the Board, nor the opposing party could assess their pertinence, is however not sufficient to raise doubts as to the validity of the conclusion concerning the technical problem effectively solved by the subject-matter of granted claim 1 over the closest prior art.

6.9 Consequently, the technical problem effectively solved by the subject-matter of granted claim 1 over the closest prior art is the provision of polymerizable compositions resulting in an improved impact resistance of the polymerized composition.

Obviousness

7. The question remains to be answered if the skilled person desiring to solve the problem identified above, would, in view of the prior art, have modified the

disclosure of the closest prior art in such a way as to arrive at the subject-matter of operative claim 1. Although the closest prior art documents D3 and D7 were indicated to teach the use of a compound having three or more mercapto groups in one molecule, the appellant did not point to any knowledge of the skilled person or passage of those documents, which would suggest to use one of those compounds in order to solve the problem identified in above point 6.9. For this reason, the Board has no reason to consider that the use of a compound having three or more mercapto groups in one molecule constitutes an obvious solution to the problem underlying the patent in suit.

8. For these reasons, the Board concludes that the objection that the subject-matter of claim 1 does not involve an inventive step within the meaning of Articles 52(1) and 56 EPC fails to convince.

Order

For these reasons it is decided that:

The appeal is dismissed

The Registrar:

The Chairman:



I. Aperribay

D. Semino

Decision electronically authenticated