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**Datasheet for the decision
of 25 March 2026**

Case Number: T 0245/24 - 3.3.03

Application Number: 15828442.2

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Language of the proceedings: EN

Title of invention:
DUAL CURE POLYTHIOETHER

Patent Proprietor:
3M Innovative Properties Company

Opponent:
PPG Industries, Inc.

Relevant legal provisions:
RPBA 2020 Art. 13(2)
EPC Art. 56

Keyword:
Amendment after Art. 15(1) communication - exceptional
circumstances (no)
Inventive step - (no)



Beschwerdekammern

Boards of Appeal

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Case Number: T 0245/24 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 25 March 2026

Appellant: PPG Industries, Inc.
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted/
electronically transmitted on 15 December 2023
concerning maintenance of the European Patent
No. 3237494 in amended form.

Composition of the Board:

Chairman D. Semino
Members: D. Marquis
L. Basterreix

Summary of Facts and Submissions

I. The appeal lies against the decision of the opposition division concerning maintenance of European patent No. 3 237 494 in amended form on the basis of the claims of auxiliary request 1 filed at the oral proceedings before the opposition division.

II. The decision under appeal was based on the claims as granted (main request) and auxiliary request 1.

III. Claim 1 of auxiliary request 1 which is relevant to the present decision read as follows:

"1. A sealant, comprising a composition that is curable to a polythioether polymer, comprising:

- a) a dithiol monomer;
- b) a diene monomer;
- c) a radical cleaved photoinitiator;
- d) a peroxide; and
- e) an amine;

where the peroxide and amine together are a peroxide-amine redox initiator".

IV. The following documents were *inter alia* submitted during the opposition proceedings:

D1: Cole, M.A., Jankousky, K.C., Bowman, C. N. (2013)
Redox initiation of bulk thiol-ene
polymerizations, Polymer Chemistry, Vol. 4, pp.
1167-1175, <https://doi.org/10.1039/c2py20843a>

D2: WO 2013/052328 A1

D3: WO 2013/013589 A1

D4: US 2008/160320 A1

D5: Studer, K., Nguyen, P.T., Decker, C., Beck, E., Schwalm, R. (2005) Redox and photoinitiated crosslinking polymerization: III. Clear and pigmented acrylic coatings, Progress in Organic Coatings, Volume 54, Issue 3, pages 230-239, <https://doi.org/10.1016/j.porgcoat.2005.06.011>
D8: WO 2014/164244 A1

- V. The decision under appeal, as far as it is relevant to the present appeal, can be summarized as follows:
- Claim 1 of the main request lacked an inventive step in view of D1 seen as the closest prior art.
 - Claim 1 of auxiliary request 1 involved an inventive step starting from D1 and considering the teaching of documents D2-D5.
- VI. The opponent (appellant) lodged an appeal against the decision of the opposition division.
- VII. With letter dated 25 February 2026 the patent proprietor (respondent) filed two sets of claims as auxiliary requests 2 and 3.
- VIII. Oral proceedings before the Board were held on 25 March 2026.
- IX. The final requests of the parties were as follows:
- The appellant requested that the decision under appeal be set aside and that the patent be revoked. The appellant also requested that auxiliary requests 2 and 3 not be admitted into the proceedings.

- The respondent requested that the appeal be dismissed or that the patent be maintained on the basis of any of auxiliary requests 2 or 3 re-filed with letter of 25 February 2026.

X. The parties' submissions, in so far as they are pertinent, may be derived from the reasons for the decision below. The disputed points concerned the admittance of auxiliary requests 2 and 3 as well as of a line of defence of the respondent based on the combination of two features and properties of dual initiation systems for a sealant into the proceedings and inventive step of claim 1 of auxiliary request 1 starting from D1 as the closest prior art.

Reasons for the Decision

1. Admittance

1.1 The respondent filed auxiliary request 2 and 3 with their letter of 25 February 2026. The admittance of these requests was contested by the appellant. The respondent argued that auxiliary requests 2 and 3 should be admitted as they corresponded to auxiliary requests 2 and 3 that were submitted with the reply to the notice of opposition.

1.2 It is apparent from the file history that auxiliary requests 2 and 3, despite having been filed with the reply to the notice of opposition, were not maintained during opposition proceedings, as these requests were withdrawn at the oral proceedings before the opposition division without having been discussed (decision under appeal, page 1, last paragraph and minutes of the oral proceedings, section 5.1).

- 1.3 The respondent additionally argued that auxiliary requests 2 and 3 had been re-introduced into the appeal proceedings together with the rejoinder but no mention of these requests could be found in the rejoinder by the Board, nor any basis was given by the respondent at the oral proceedings before the Board that could support their argument in writing (letter of 25 February 2026, pages 12 and 13). On the contrary, the facts of the case establish that in appeal auxiliary requests 2 and 3 were first filed and substantiated on the issue of inventive step over D1 with the letter of 25 February 2026, sent after the communication of the Board. They are therefore an amendment of the respondent's case filed on that date.
- 1.3.1 According to Article 13(2) RPBA any amendment to a party's appeal case made after the expiry of a period specified by the Board in a communication under Rule 100, paragraph 2, EPC or, where such a communication is not issued, after notification of a communication under Article 15, paragraph 1 shall, in principle, not be taken into account unless there are exceptional circumstances, which have been justified with cogent reasons by the party concerned.
- 1.3.2 The respondent argued in their letter of 25 February 2026 (section IX.1) that the circumstances of the case would justify the reintroduction of auxiliary requests 2 and 3 into the appeal proceedings on the grounds that the Board's preliminary opinion would question inventive step of auxiliary request 1 in a manner that differed from the opposition division's analysis, creating a legitimate need for the respondent to fall back on lower-ranking requests.

- 1.3.3 The preliminary opinion provided by the Board on the question of inventive step starting from D1 is contained in section 6.1 of their communication according to Article 15(1) RPBA. It establishes the presence of two distinguishing features of operative claim 1 ((i) the presence of a radical cleaved photoinitiator and (ii) the explicit disclosure of a sealant) over D1 (section 6.1.2). That assessment is in line with the analysis contained in the decision under appeal (section A.2.1 on page 14). It is indicated in the communication of the Board that feature (i) was found to be obvious in the decision under appeal and that this conclusion had not been disputed by the respondent up to the communication (section 6.1.3). The submissions of the parties on the problem allegedly solved by feature (ii) were summarized in section 6.1.5 and a discussion of feature (ii) was proposed in sections 6.1.6 to 6.1.8 which was along the lines of the arguments provided by the appellant in section 2.3 of their statement of grounds of appeal. The elements of discussion laid out by the Board in their communication had thus already been made available in the decision under appeal and in the statement of grounds of appeal. In view of this the Board does not find in the communication the presence of new facts or arguments that could justify the filing of new requests. The Board therefore does not find in the present case that there are exceptional circumstances justifying the filing of auxiliary requests 2 and 3.
- 1.3.4 In the absence of exceptional circumstances justifying the filing of further auxiliary requests in appeal, the Board decided not to admit auxiliary requests 2 and 3 into the proceedings (Article 13(2) RPBA).

1.4 In their letter of 25 February 2026 the respondent presented a new line of defence concerning inventive step that was based on the combination of the radical cleaved photoinitiator and the concept of a sealant that would be required in order to achieved both rapid on-demand setting capability and the ability to continue curing in regions that are inaccessible to the activation stimulus while maintaining workable processing time for application and assembly (letter of 25 February 2026, section VI). The admittance of that new line of defence into the proceedings was contested by the appellant at the oral proceedings before the Board.

1.4.1 The respondent argued at the oral proceedings before the Board that the new line of defence was introduced in reaction to the communication of the Board on inventive step over D1 which surprisingly deviated from the assessment of the opposition division.

1.4.2 As shown above in section 1.3.3 the communication of the Board did not introduce new facts or arguments into the proceedings that had not already been submitted with the statement of grounds of appeal. In the absence of exceptional circumstances justifying the filing of the new line of defence, the Board decided not to admit it into the proceedings (Article 13(2) RPBA).

2. Inventive step

2.1 D1 as the closest prior art

2.1.1 The opposition division came to the conclusion that granted claim 1 lacked an inventive step in view of D1 as the closest prior art (decision under appeal, section 2, pages 8-14). Claim 1 of auxiliary request 1

pertains to a sealant comprising the composition that was defined in granted claim 1. D1 was further considered to represent the closest prior art for auxiliary request 1. The opposition division came to the conclusion that claim 1 of auxiliary request 1 involved an inventive step in view of D1.

2.1.2 It is apparent and not contested that claim 1 of auxiliary request 1 differs from the disclosure of the redox initiated polymerisable compositions of thiol-enes of D1 in

- (i) the presence of a radical cleaved photoinitiator (compound c),
- (ii) the explicit definition of the composition as part of a sealant.

2.1.3 The appellant argued that none of these features was associated with an effect in the patent in suit so that the problem solved starting from D1 was the provision of an alternative thiol-ene compositions the cure of which can also be initiated by light (statement of grounds of appeal, page 6, first full paragraph).

2.1.4 The respondent addressed the question of inventive step starting from D1 in the rejoinder. Their submissions therein contain a summary of the decision under appeal (section 2) in which the two differences (i) and (ii) over D1 are dealt with separately and a part discussing the arguments made by the opponent in appeal (section 3) in which difference (ii) is also dealt in isolation. The patent in suit discusses the presence of a radical cleaved photoinitiator (compound c) in a composition that is curable to polythioether polymers (paragraphs 7, 17 and 19) and sealants comprising these curable compositions (paragraphs 8, 15, 16, 18). While the

description indicates that the composition (paragraph 9) and the sealant therefrom (paragraphs 15 and 18) have specific properties, there is no disclosure of any effect resulting from the combination of features (i) and (ii) specifically. In view of the negative decision of the Board on admittance of the new line of defence based on such a combination (section 1.4 above) and in the absence of a basis for a combined effect in the patent and in the rejoinder, the two differences (i) and (ii) will be addressed separately.

- 2.1.5 The first difference (i) over D1 was dealt with in the decision under appeal with respect to the discussion of the main request where it was concluded by the opposition division that that feature was obvious in view of D1-D5 (sections 2.6 and 2.7 on pages 10 to 14). It is first with their letter of 25 February 2026 that the respondent argued that feature (i) taken alone was not obvious (section V).
- 2.1.6 The decision under appeal has established that feature (i) was not causally linked to an effect (section 2.4) and formulated the problem as the provision of an alternative curable composition and cured polymer (section 2.5). The respondent did not contest the conclusion that feature (i) was not associated with any effect, nor the problem formulated with respect to that feature. On that basis, the Board does not see any reason to deviate from the formulation of the problem laid out in the decision under appeal with respect to feature (i).
- 2.1.7 The argument of the respondent was that D1 would teach away from adding a photoinitiator to the redox-curable thiol-ene system. D1 taught redox initiation precisely as a way to eliminate the restrictions associated with

photoinitiation in optically thick, pigmented or opaque systems (D1, page 1168, left column). In other words, in the opinion of the respondent, D1 presented redox initiation as an alternative to photoinitiation rather than as a complement.

2.1.8 That passage of D1 cited by the respondent starting in the left column of page 1167 pertains to the general introduction of thiol-ene polymerizations and their applications. Therein it is stressed that the several modes of initiation and reaction known in the art have all their advantages and limitations (page 1168, left column, first paragraph). The passage cited by the respondent indicates that the applications for photochemical (and thermal) initiation of thiol-ene reactions are restricted by their respective capacities to transmit light (and heat) uniformly in opaque system (and withstand elevated temperatures in thermal systems). It has however not been shown why these considerations would be relevant to the present question since they do not directly pertain to the use of a photoinitiator in combination with a redox initiator. The appellant argued in that respect that the sentence following that passage in D1 suggested that the known limitations of the use of a photochemical initiation could be mitigated by carefully considering the sample geometry and the formulation of the composition, but does not contain a teaching that would lead away from the combination of claim 1. Also the Board does not see in the passage cited by the respondent any teaching that would clearly teach away a skilled person from considering a photoinitiator.

2.1.9 The appellant argued that each of the cited documents D2 to D5 relating to the field of coating compositions

cured with dualcure systems in fact disclosed the use of redox- and photoinitiation systems in combination and that these systems were relevant to claim 1 of auxiliary request 1.

- 2.1.10 D2 in particular relates to thiol-ene polymerizations of vinyl esters or vinyl carbonates with multifunctional thiols (claim 1) that are relevant to the polythioether polymers according to operative claim 1. Paragraph 39 of D2 discloses suitable initiator systems for the free radical polymerizations and also the use of photoinitiators in combination with one or more redox initiator systems (lines 8-10 of paragraph 39 and also paragraph 95). As suitable photoinitiators ultraviolet and visible sensitive photoinitiators including acylphosphine oxides, such as 2,4,6-trimethylbenzoyldiphenylphosphine oxide, are disclosed in paragraph 48, whereas redox initiator systems including peroxides such as benzoyl peroxides and tertiary amines are disclosed in paragraphs 50-54. Consequently, the combination of peroxide-amine redox initiators with photochemical initiators forming a dual cure system for thiol-ene polymerizations was already known from D2.
- 2.1.11 D3 discloses a method for bonding substrates having a shadow area and a transparent area by curing an adhesive system using a redox curing system in combination with an UV initiator (claim 1). While the adhesive system of D3 is preferably based on (meth)acrylate monomers (page 9, lines 15-17) and not on polythioethers, it can nevertheless be derived from D3 that it was known to polymerize (meth)acrylic monomers via a radical mechanism in the presence of a redox initiator in combination with a photoinitiator. D3 addresses the problem of incomplete curing in areas

which do not sufficiently transmit light (page 2, lines 4-12) and emphasizes that the claimed combination of a redox- and a photoinitiator can cure after an initial irradiation with UV-light in dark areas at room temperature (page 3, lines 2-10). Consequently, D3 addresses the technical problem of providing a dual cure system.

- 2.1.12 Diphenyl(2,4,6-trimethylbenzoyl) phosphine oxide is disclosed as UV initiator (see page 5, lines 25-27) and an organic peroxide as the oxidizing agent and an amine as the reducing agent are disclosed as preferred components of the redox initiator (page 5, lines 14-20). It is further disclosed that the combination of an organic peroxide, such as benzoyl peroxide, and a tertiary amine, such as dimethylaniline, constitutes a common oxidation-reduction system (see page 7, lines 15-25). D3 therefore also discloses that a combination of radical cleaved photoinitiator, a peroxide and amine could be used to initiate radical polymerizations in the same field of application as that of the patent in suit.
- 2.1.13 Radically curable coating compositions comprising both a redox initiator and photoinitiator in order to achieve a dual cure are also known from D4 and D5.
- 2.1.14 D4 discloses that a redox-initiated polymerization can be used to harden the shadow areas of UV-cured clearcoats or of thick pigmented acrylic coatings (Scheme 2 and Conclusion). While D4 concern the polymerization of acrylate-based dual-cure system which differ from the polythioether polymers of the patent in suit, the document nevertheless shows that a peroxide/amine redox system can be successfully used to accelerate the hardening of the produced coating in the

shadow areas within a few minutes at room temperature (see the abstract of D4). The redox systems described in D4 consists of benzoyl peroxide and a tertiary aromatic amine as redox initiator and 2-hydroxy-2-methyl-1-phenyl-propanone (Darocur® 1173) as radical cleaved photoinitiator (section 3.2.3.6 and Table 7 on page 238) in the dual cure system. In view of this D4 is also a document showing that the association of a redox initiator as that defined in operative claim 1 can be successfully used in the same field of applications as in the patent in suit.

2.1.15 A similar curing-system is disclosed in D5. According to paragraph 14, the object of that patent was the provision of a composition which, through the use of two independent initiator systems, could be cured free radically. Compositions solving this problem according to D5 comprise a component having at least one peroxide group, an aromatic amine and at least one photoinitiator (see claim 1). In Example 3 of D5 (paragraph 224) a redox system comprising benzoyl peroxide and N-phenyldiethanolamine is combined with an acylphosphine oxide photoinitiator for curing polyurethane acrylates. Once again, the combination of redox initiator and photoinitiator as defined in operative claim 1 is used to perform a free radical polymerization.

2.1.16 Documents D2-D5 confirm that redox initiators and radical cleaved photoinitiators as defined in operative claim 1 are compatible and can be combined with each other to obtain a dual cure system according to the specific need of the system with known advantages and disadvantages of the initiation methods. The documents also show that such initiator systems can be combined with quite different monomers, which is not surprising,

as they only initiate the free radical reaction of suitable monomers, but are not incorporated into the polymer obtained. Therefore, the Board finds that the skilled person starting from D1 as the closest prior art would have considered the use of feature (i) in the redox system of D1 to be obvious in the light of the teaching shown in D2 to D5 when aiming at providing an alternative curable composition.

2.1.17 With regard to distinguishing feature (ii), the appellant formulated the problem as the provision of an alternative curable composition (statement of grounds of appeal, page 5, first full paragraph). The respondent formulated the problem as the provision of an alternative sealant as an alternative to the sealants known from the prior art (rejoinder, page 5, last paragraph). It is also apparent from the arguments of the respondent in their rejoinder that the definition of claim 1 as a sealant is not associated with a particular effect.

2.1.18 The sealant defined in claim 1 of auxiliary request 1 is identified as being one of the objects of the patent in suit (paragraphs 1, 8, 15 and 18) in particular a sealant comprising a curable composition that forms polythioether polymers (paragraph 1) and a seal obtained by curing it (paragraph 8). The patent in suit mentions specific properties (fuel resistance, glass transition temperature) and applications (aircraft or automobile) of sealants (paragraphs 9, 15 and 18). These properties and applications mentioned in the patent in suit however refer to specific embodiments that were not shown to be relevant to operative claim 1. There is in particular no example pertaining to the preparation of a sealant in the patent in suit and no effect of limiting the claim to a sealant was laid out

by the respondent. In view of this the problem related to feature (ii) can only be formulated as the provision of an alternative use of the composition.

- 2.1.19 The use of polymer systems based on curable polythioether polymers as sealants has been shown to be known in the prior art by the appellant (statement of grounds of appeal, page 7, last paragraph; page 9, last paragraph). In particular, D8 (claims 1 and 18) relates to compositions which are radiation curable to polythioether polymers and seals and sealants comprising these compositions. The Board thus finds that the skilled person would have considered the use of the curable compositions of D1 as sealants when looking for a further use thereof.
- 2.1.20 Claim 1 of auxiliary request 1 therefore lacks an inventive step starting from D1 as the closest prior art.
3. As claim 1 of the only request in the proceedings lacks an inventive step, there is no need for the Board to decide on any other point and the patent is to be revoked.

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:



D. Hampe

D. Semino

Decision electronically authenticated