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Datasheet for the decision of 14 November 2023

Case Number: T 0630/21 - 3.3.03

Application Number: 14191905.0

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Language of the proceedings: EN

Title of invention:
Stabilized matrix-filled liquid radiation curable resin compositions for additive fabrication

Patent Proprietor:
Covestro (Netherlands) B.V.

Opponent:
3D Systems, Inc.

Relevant legal provisions:
RPBA 2020 Art. 13(2), 12(4), 12(6)
EPC Art. 56, 83, 123(2)

Keyword:
Amendment to case - exercise of discretion
Amendments - Auxiliary request 2 - allowable (yes)
Sufficiency of disclosure - Auxiliary request 2 (yes)
Inventive step - Auxiliary request 2 (yes)
Amendment after notification of summons - exceptional circumstances (no)

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Case Number: T 0630/21 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 14 November 2023

Appellant: (Opponent)	3D Systems, Inc. 333 Three D Systems Circle Rock Hill, SC 29730 (US)
Representative:	dompatent von Kreisler Selting Werner - Partnerschaft von Patent- und Rechtsanwälten mbB Deichmannhaus am Dom Bahnhofsvorplatz 1 50667 Köln (DE)
Respondent: (Patent Proprietor)	Covestro (Netherlands) B.V. Urmonderbaan 22 6167 RD Geleen (NL)
Representative:	V.O. P.O. Box 87930 2508 DH Den Haag (NL)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 9 March 2021 rejecting the opposition filed against European patent No. 2868692 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	F. Rousseau
Members:	D. Marquis
	A. Bacchin

Summary of Facts and Submissions

I. The appeal lies against the decision of the opposition division concerning the rejection of the opposition against the European patent No. 2 868 692.

II. Claims 1 and 3 of the patent as granted read as follows:

"1. A liquid radiation curable composition for additive fabrication comprising:
(a) a cationically polymerizable aliphatic epoxide;
(b) a multifunctional (meth)acrylate component;
(c) a cationic photoinitiator;
(d) a free-radical photoinitiator; and
(e) a filled matrix comprising

a nanoparticle constituent comprising a plurality of inorganic nanoparticles, and
a microparticle constituent comprising a plurality of inorganic microparticles;

wherein the ratio by weight of the microparticle constituent to the nanoparticle constituent is from 1 : 1 to 12 : 1, more preferably from 4 : 1 to 8 : 1, and wherein the ratio of the average particle size of the inorganic microparticles in the microparticle constituent to the average particle size of the inorganic nanoparticles in the nanoparticle constituent is from 2.41 : 1 to 100 : 1, wherein the average particle size is measured using laser diffraction particle size analysis in accordance with ISO13320:2009".

"3. The liquid radiation curable composition for additive fabrication of claim 1 or 2, wherein the composition has a viscosity, when measured at 30 degrees Celsius, of between 500 mPa·s and 1500 mPa·s (500 cPs and 1500 cPs), more preferably between 600 mPa·s and 1200 mPa·s (600 cPs and 1200 cPs), and after full cure with actinic radiation and 60 min UV and thermal postcure, has the following properties:

(a) a heat distortion temperature at 1.82 MPa of between 80 degrees C and 120 degrees C, and
(b) a flexural modulus of between 8000 MPa and 12 000 MPa".

The following documents were, *inter alia*, cited before the opposition division:

D1: EP 1 508 834 A2
D2: US 2012/0251841 A1
D8: Experimental report submitted with the notice of opposition
D14: Declaration of Filip Oosterlinck, dated 18 December 2018
D15: Declaration of Lan Yin Liu dated 17 December 2018
D16: Affidavit from Loic Schmidlin dated 6 June 2019
D30: Supplemental experiments from Loic Schmidlin dated 21 January 2020
D31: Affidavit of Loic Schmidlin dated 7 January 2020
D32: Declaration of Lan Yin Liu dated 7 February 2020
D35: Declaration of Lan Yin Liu dated 1 December 2020

III. The decision under appeal concluded that granted claims 1 and 14 found a basis in the application as filed. D30 and D31 were admitted into the proceedings. Granted claims 1, 3 and 4 were sufficiently disclosed. Taking into account the experimental evidence contained in the patent in suit and in D8, D15, D16, D30, D32 and D35, granted claim 1 involved an inventive step starting from D1 as the closest prior art.

IV. The opponent (appellant) lodged an appeal against the decision of the opposition division. The following documents were filed with the statement of grounds of appeal:

D30a: Corrected supplemental report D30
D36: Supplemental experimental report of Loic Schmidlin dated 9 July 2021
D37: Affidavit of Bettina Steinmann dated 15 July 2021

V. The respondent (patent proprietor) filed auxiliary requests 1 to 10 with the reply to the statement of grounds of appeal requesting as their main request that the appeal be dismissed. The following documents were filed with the rejoinder:

D38: Declaration of Lan Yin Liu dated 22 November 2021
D39: Markus Pfaffinger in Optik & Photonik, 2018, 4, pages 99-101
D40: Declaration of Rolf van Benthem dated 23 November 2021

VI. Oral proceedings took place on 14 November 2023 in the presence of the parties in the course of which the respondent withdrew their main request and first auxiliary request

VII. The final requests of the parties were as follows:

(a) The appellant requested that the decision under appeal be set aside and that the patent be revoked.

(b) The respondent requested that the appealed decision be set aside and that the patent be maintained on the basis of auxiliary request 2, or in the alternative on the basis of any of auxiliary requests 3 to 10, all filed with the reply to the statement of grounds of appeal.

The claims of auxiliary request 2 corresponded to the claims as granted from which dependent claim 3 was deleted, claims 4-15 being renumbered and their back references adapted accordingly.

VIII. The appellant's arguments, in so far as they are pertinent to the present decision, may be derived from the reasons for the decision below. They are essentially as follows:

- Documents D30a, D36 and D37 should be admitted into the proceedings. D38, D39 and D40 should not be admitted into the proceedings.

- Auxiliary request 2 should not be admitted into the proceedings.

- Claim 1 of auxiliary request 2 did not meet the requirements of Article 123(2) EPC.

- The subject matter of claim 1 of auxiliary request 2 was not sufficiently disclosed.

- Claim 1 of auxiliary request 2 lacked an inventive step starting from D1 or D2. The line of attack based on the comparison of examples contained in D16 (examples 4, 5 and 6) with the modified examples I, II and III in table 2 of exhibit 2 in D30a which would disprove that the particle size ratio in accordance with operative claim 1 was causative for the effects alleged by the respondent should be admitted into the proceedings.

IX. The respondent's arguments, in so far as they are pertinent to the present decision, may be derived from the reasons for the decision below. They are essentially as follows:

- While there was no objection against the admittance of D30a, D36 and D37 should however not be admitted into the proceedings. D38, D39 and D40 should be admitted into the proceedings.

- Auxiliary request 2 should be admitted into the proceedings.

- Claim 1 of auxiliary request 2 met the requirements of Article 123(2) EPC.

- The subject matter of claim 1 of auxiliary request 2 was sufficiently disclosed.

- Claim 1 of auxiliary request 2 involved an inventive step starting from D1 or D2. The line of attack of the appellant considering the comparison of D16 with D30a was first raised at the oral proceedings proceedings before the Board and should not be admitted into the proceedings.

Reasons for the Decision

1. Admittance of documents

1.1 D30a was provided with the statement of grounds of appeal. D30a essentially corresponds to D30 which was admitted into the opposition proceedings and decided upon in the decision under appeal but with minor corrections that do not change the evaluation of that document but improves its readability (statement of grounds of appeal, pages 2 and 23 and letter of 28 July 2023, section 2.1). Since the corrections made in D30a did not alter the content of D30 and the admittance of that document was not contested anymore at the oral proceedings before the Board, the Board found it therefore appropriate to exercise their discretion under Article 12(4) RPBA 2020 by admitting D30a into the proceedings.

1.2 The experimental report D36 was filed with the statement of grounds of appeal. The report was meant to reproduce examples 4 and 6 of the closest prior art D1 and to show that the alleged technical effect (higher initial viscosity, fast viscosity increase, quick settling to hard pack) was not achieved even with a monomodal distributed composition (statement of grounds of appeal, page 27). It was argued that D36 was submitted in appeal in reaction to the impugned decision, on the grounds that the opposition division ignored the data of the opponent in D30. This is not convincing, since it is apparent from the decision under appeal (page 12, first paragraph) that D30 was not ignored but instead was considered by the opposition division and that the data could not prove a lack of a technical effect, since they concerned a bimodal particle size distribution of the inorganic particles which in the opposition division's opinion was not within the scope of the opposed patent. Moreover, this experimental report could and should have been submitted earlier, i.e. before the opposition division, since examples 4 and 6 of D1 were cited in the notice of opposition as closest prior art and the technical effects concerned were already addressed in respect of those starting points. The Board does therefore not find that the circumstances of the case justify the admittance of D36 into the appeal proceedings (Articles 12(4) and 12(6) RPBA 2020).

1.3 D37 is an affidavit of Dr. Bettina Steinmann filed with the statement of grounds of appeal. D37 was intended to provide additional information about the common general knowledge. In addition, D37 has been filed as a legitimate reaction to a new argument of the patentee during the oral proceedings that a partially gelling composition according to the tests carried out in the experimental part could still be used in a printing process (last paragraph of point 6.5 of the Reasons of the contested decision). The Board found it therefore appropriate to exercise their discretion under Article 12(4) RPBA 2020 by admitting D37 into the proceedings.

1.4 D38 (declaration of Lan Yin Liu), D39 (publication on hot lithography) and D40 (declaration of Rolf van Benthem) were filed with the reply to the statement of grounds of appeal.

1.4.1 D38 was said to be provided in direct response to D36. In view of the negative decision of the Board on the admittance of D36, there was no justification for the admittance of D38 into the appeal proceedings (Article 12(6) and 12(4) RPBA 2020).

1.4.2 D39 was argued to be submitted in response to a new argument of the appellant made on page 17 of the statement of grounds of appeal (reply to the statement of grounds of appeal, page 6). In particular, the respondent referred to the argument of the appellant about the last example in Exhibit 4 of D15 concerning a composition which in view of its high initial viscosity of 16930 cps at 30°C would allegedly not be usable for additive manufacturing. The appellant argued that the filing of D39 was not justified since D15 had already been discussed during the opposition proceedings. The appellant, however, did not argue, let alone show that this specific argument had been already brought forward before the opposition division. It follows that the Board found it appropriate to exercise their discretion under Article 12(4) RPBA 2020 to admit D39 into the proceedings.

1.4.3 D40 was said to have been submitted in response to the filing of the declaration D37 by the appellant with their statement of grounds of appeal (reply to the statement of grounds of appeal, page 6). In view of the decision of the Board to admit D37 into the proceedings, the Board also found it appropriate to exercise their discretion under Article 12(4) RPBA 2020 to admit D40 into the proceedings.

Auxiliary request 2

2. Admittance

2.1 Auxiliary request 2 corresponds to the claims as granted from which dependent claim 3 was deleted, claims 4-15 being renumbered and their back references adapted accordingly. Auxiliary request 2 was an amendment to the respondent's case submitted with the rejoinder. Its admittance into the proceedings was subject to the provisions of Article 12(4) RPBA 2020.

2.2 It was submitted by the respondent at the onset of appeal proceedings and there was no doubt that the deletion of granted claim 3 in this auxiliary request resolved the issue raised under Article 100(b) EPC for that claim without raising any new one. Auxiliary request 2 therefore did not alter the factual or legal framework of the proceedings and its analysis did not involve a need to re-weight in any way the subject of the proceedings. That request therefore was not detrimental to the procedural economy and the fairness of the proceedings. In view of this, the Board found it appropriate to exercise their discretion under Article 12(4) RPBA 2020 to admit auxiliary request 2 into the appeal proceedings.

3. Amendments

3.1 The appellant objected to the definition of the range, in claim 1 of the main request (granted patent), relating to the ratio of the average particle size of the inorganic microparticles in the microparticle constituent to the average particle size of the inorganic nano-particles in the nanoparticle constituent of from 2.41:1 to 100:1 (statement of grounds of appeal, pages 3 and 4). That objection also applies to claim 1 of auxiliary request 2 which corresponds to granted claim 1.

3.2 The respondent argued that claim 1 of auxiliary request 2 found a basis in claim 1 as originally filed. Claim 1 as originally filed defines the ratio as being from about 2.41:1 to about 200:1, more preferably from about 6.46:1 to about 100:1. The same combination of ranges is disclosed in paragraph 120 of the application as filed.

3.3 The range defined in claim 1 of auxiliary request 2 relating to the ratio of average particle sizes of the particles was thus obtained by the combination of ranges that were already disclosed in claim 1 as originally filed. It is obtained by combining the lower limit (2.41:1) of a general range with the higher limit (100:1) of a range lying within said disclosed general range. That type of amendment is allowable according to the established case law of the Boards (Case Law of the Boards of Appeal, 10th Edition, 2022, II.E.1.5.1a)).

3.4 The appellant referred in their argumentation to case law (T 812/09, reasons 3.1 and T 2273/10, reasons 2 and T 948/13, reasons 2) that is not relevant for the amendment made in claim 1 of auxiliary request 2 because that case law concerns situations where multiple selections of features were made in lists, which does not correspond to the present situation.

3.5 The Board therefore finds that claim 1 of auxiliary request 2 fulfils the requirements of Article 123(2) EPC.

4. Sufficiency of disclosure

4.1 The appellant pursued several objections of lack of sufficient disclosure in appeal against granted claim 1. These objections apply to claim 1 of auxiliary request 2 which is identical to granted claim 1.

4.2 The appellant first argued that the patent in suit did not sufficiently disclose the ratio of the particle size of the microparticles to the nanoparticles (statement of grounds of appeal, section 2.1). Operative claim 1 referred to a method (laser diffraction particle size analysis in accordance with ISO 13320:2009) for which D10 showed that it was only applicable to particle sizes of 0.1 to 3 microns and not to nanoparticles of particle sizes of down to 1 nm (paragraph 113 of the patent in suit).

4.2.1 D10, which is the ISO 13320:2009 standard referred to in operative claim 1, makes it however clear in section 1 that while the standard applied to particle sizes of 0.1 µm to 3 mm, it was also applicable to size ranges above 3 mm and below 0.1 µm with special instrumentation and conditions. While D10 does not disclose further details on the special instrumentation required and the conditions of measurements, it has not been shown how that fact alone would prevent the skilled person from providing nanoparticles according to operative claim 1 as there is no reason to doubt that the special instrumentation and conditions mentioned in the norm D10 would have been available to the skilled person for the determination of the particle size of nanoparticles.

4.2.2 In particular, nanoparticles with a size of down to 20 nm could in fact be successfully obtained and measured by the appellant using the same ISO standard as that defined in operative claim 1, in the experimental reports D16 (page 7, first full paragraph) and D30a (page 7, second full paragraph). This at least confirms that the standard described in D10 was sufficiently practicable to obtain microparticles and nanoparticles as defined in operative claim 1. In this respect, operative claim 1 does not define a minimum average size for the inorganic nanoparticles, but a ratio of the average particle size of the inorganic microparticles and average particle size of the inorganic nanoparticles.

4.2.3 Furthermore, the question of sufficiency of disclosure of operative claim 1 was related to whether a skilled person, relying also on the common general knowledge, would have been in the position to provide nanoparticles of fillers as defined in operative claim 1. Therefore, even if D10 did not contain the complete set of instructions on how to determine the size of nanoparticles, it was not shown by the appellant why a skilled person would not have been able to provide the required nanoparticles of filler since these could be obtained with the required particle size as commercially available products. Under these circumstances, the Board does not see a reason to deviate from the conclusion reached by the opposition division on that point.

4.3 The appellant also objected to operative claim 1 referring to a liquid composition while the patent in suit would not provide the person skilled in the art with a technical teaching of how such a liquid composition could be obtained (statement of grounds of appeal, section 2.2, pages 6 and 7).

4.3.1 Such an objection of insufficient disclosure presupposes that there are serious doubts, substantiated by verifiable facts supporting the objection raised. The burden of proof was in the present situation on the appellant who had to establish, on the balance of probabilities, that a skilled person reading the patent, using common general knowledge, would not have been able to carry out the invention (Case Law, *supra*, II.C.9).

4.3.2 The appellant referred to the experimental report D8 showing compositions (examples 1-3 and 10-13) according to operative claim 1 whereby these compositions were not liquid. The respondent argued that the compositions according to operative claim 1 could be obtained in liquid form and referred to the guidance contained in the patent in suit concerning the amount of the various components, in particular to paragraph 109 which teaches the impact of the amount of inorganic filler on the fluidity of the composition. Also, document D8 shows in examples 6-17 that it was possible to obtain compositions in liquid form according to operative claim 1. D16 as well as D30a also show that liquid compositions could be obtained for examples 10 and 11 (D16, Table 4) and example 13 (D30a, Table 4). Under these circumstances, the few examples of D8 (examples 1-3 and 10-13) do not suffice to cast a serious doubt as to the lack of guidance in the patent in suit with respect to the preparation of liquid compositions. In particular, it was not shown that the implicit teaching given in paragraph 109 of the specification, i.e. to decrease the amount of filler (as referred to in the rejoinder, page 11, second paragraph), would not allow to fluidify the compositions of the examples of D8 referred to by the appellant.

4.3.3 Furthermore, the prior art document D1 which disclosure is analysed in relation to inventive step (see point 5 below) describes liquid radiation-curable compositions used in the production of three dimensional articles by stereolithography. This document supports the argument that the preparation of liquid compositions in that field were part of the common general knowledge at the priority date of the patent in suit. The declaration D14 also supports that conclusion (page 2). Under these circumstances, the Board finds that the argumentation of the appellant is not persuasive.

4.4 The appellant further objected to the use of the component named DZ-0077 in the examples of the patent in suit not being an "on-the-shelf" product obtainable by the public (statement of grounds of appeal, section

2.4, pages 8 and 9).

DZ-0077 is described on page 21 of the patent in suit (line 50). Its composition is disclosed in that passage and paragraph 141 gives indication as to its preparation. It is not disputed that this product or a product similar to it was preparable nor that the skilled person would not have had the common general knowledge to prepare the compositions according to the examples of the patent in suit. Under these circumstances, the objection of the appellant with respect to the use of DZ-0077 is not persuasive.

4.5 The appellant also objected to the sufficient guidance of the compositions of claim 1 in view of a repetition of examples 13 and 16 of the patent in suit in D35 (statement of grounds of appeal, first paragraph on page 9). Independently of whether or not D35 provides an exact repetition of these examples, that objection is not relevant to operative claim 1 since the settling time is not a feature of the claim (as noted by the respondent, rejoinder, page 17, last full paragraph).

4.6 The Board therefore finds that it was not shown that operative claim 1 lacked sufficiency of disclosure.

5. Inventive step

Closest prior art

5.1 The decision under appeal identified D1 as the closest prior art. This is not contested. The parties submitted their arguments starting from the disclosure of any of examples 4, 5 and 6 of D1 which undisputedly are representative of the teaching of that document.

5.2 The appellant additionally considered D2 as an equally valid closest prior art in their statement of grounds of appeal (section 3.1). The impugned decision is however silent on a disclosure of D2 being used as closest prior art. The position of the appellant in the statement of grounds of appeal was that D2 would be an equivalent starting point to examples 4, 5 and 6 of D1. The appellant stated at the oral proceedings before the Board that the argumentation of inventive step starting from D2 was the same as that starting from D1 and that any conclusion reached in the assessment of inventive step starting from D1 would equally apply to the assessment of inventive step starting from D2. The Board therefore considered D1, which forms the base of the decision under appeal, i.e. its examples 4 to 6 representative of its teaching, as the closest prior art.

Distinguishing feature(s)

5.3 Examples 4, 5 and 6 of D1 disclose liquid compositions (paragraphs 86-88) comprising a nanoparticle filled epoxy resin (Nanopox XP 22/0314), a nanoparticle filled multifunctional (meth)acrylate component (Nanocryl XP 21/0768), a cationic photoinitiator (UVI-6974), a free-radical photoinitiator (Irgacure I-184), and a silane coated silica (Silbond 600 MST)(table 1, pages 8 and 9 of D1). These components of the examples 4, 5 and 6 of D1 correspond to the components (a) to (e) according to operative claim 1.

5.4 The composition of example 4 of D1 has a ratio by weight of the microparticle constituent to the nanoparticle constituent calculated to be 1.28 (statement of grounds of appeal, page 12). That ratio falls within the range of 1:1 to 12:1 as defined in operative claim 1. The ratio of the average particle size of the inorganic microparticles in the microparticle constituent to the average particle size of the inorganic nanoparticles in the nanoparticle constituent (hereafter the particle size ratio) was also calculated to be 200:1 in the statement of grounds of appeal (supra).

5.5 The parties are in agreement that the distinguishing feature between operative claim 1 and example 4 of D1 is therefore only the particle size ratio which ratio is defined in operative claim 1 to be in the range of from 2.41:1 to 100:1 (statement setting out the grounds of appeal, section 3.2 on page 12 and rejoinder, section II.3.4, page 24). It is also undisputed that the composition of operative claim 1 differs from those of examples 5 and 6 of D1 only by said ratio.

Problem successfully solved

5.6 Considering the evidence contained in the patent in suit in conjunction with that provided by the respondent in D15, D32 and D35 and considering the evidence provided in D8, D16 and D30 by the appellant, the opposition division formulated the problem as being the provision of improved liquid radiation curable compositions for additive fabrication (decision under appeal, page 10, second paragraph). The appellant considered in appeal that the problem should be reformulated as the provision of alternative compositions (statement setting out the grounds of appeal, page 28, first paragraph). The respondent formulated the problem at the oral proceedings before the Board as being the provision of improved filled liquid radiation curable compositions for additive manufacturing in particular with respect with low initial viscosity, good viscosity stability and/or low tendency to phase separate.

Experimental data contained in the specification

5.7 The opposition division based their formulation of the technical problem on a comparison of the compositions of example 1 with example 2, example 13 with example 16 as well as example 14 with example 17.

5.7.1 Example 1 of the patent in suit (table 2, page 24 and table 1, pages 20-22) shows a composition containing, among others, a liquid radiation curable composition (paragraph 141) comprising the commercially available compound Heloxy 68 which corresponds, in operative claim 1, to component (a) (cationically polymerizable aliphatic epoxide), SR 351 corresponding to component (b) (multifunctional (meth)acrylate component), Chivacure 1176 corresponding to component (c) (a cationic photoinitiator), IRGACURE 184 corresponding to component (d) (free-radical photoinitiator). The composition of example 1 also contains a filled dispersion comprising Nanopox A 610, a nanoparticle constituent comprising a plurality of inorganic nanoparticles of average particle size 20nm and NP-30S a microparticle constituent comprising a plurality of inorganic microparticles of average particle size 4µm.

5.7.2 The ratio by weight of the microparticle constituent to the nanoparticle constituent is disclosed for example 1 as 3.46:1 and the particle size ratio is 200:1 (table 2). The composition of example 1 is not according to operative claim 1 because its particle size ratio is not in the range of 2.14:1 to 100:1. Considering the value of the particle size ratio of 200:1, which is the only difference with the composition of example 2 representing operative claim 1, the composition of example 1 is a fair representation of the composition of example 4 of D1 as the closest prior art (point 5.4 above).

5.7.3 The composition of example 2 in table 2 of the patent in suit differs from that of example 1 only in the nature of component (e) which comprises a compound referred to as DZ-0077 and defined on page 21 as being a 40% colloidal silica nanoparticles in 60% 3,4-epoxycyclohexylmethyl-3',4'-epoxycyclohexanecarboxylate containing nanoparticles of average particle size of 80 nm. The use of that compound results in the composition of example 2 having a particle size ratio of 50:1, which is in the range according to operative claim 1 (2.14:1 to 100:1). As pointed out in point 5.7.2 above, the compositions according to example 1 (representing the closest prior art D1) and example 2 (according to operative claim 1) differ from one another only in the particle size ratio.

5.7.4 The appellant argued that the examples of the patent in suit lacked validity because the compound referred to as DZ-0077 disclosed on page 21, line 50 was not publicly available (page 15 of the statement setting out the grounds of appeal). It is however clear from the patent in suit that the compound was made from nanoparticles of average particle size 80 nm from Nissan Chemical and from an epoxy component from Daicel (both of which are identified in line 50 as supplier) and it can also be understood from paragraph 141 that DZ-0077 can be obtained by a process similar to that disclosed for MEK-AC-5101. On that basis and as it was not shown that DZ-0077 could not be prepared with the information contained in the patent in suit the Board finds that the examples of the patent in suit using that compound can be considered as valid evidence in the assessment of inventive step.

5.7.5 The properties reported in table 2 (page 24) show that the composition of example 2 displays a lower initial viscosity than the composition according to example 1 and that the viscosity of the composition remains lower for example 2 for a period of time of up to 2 weeks. Between 2 and 4 weeks, the patent in suit does not report values of viscosity for the composition of example 2 which the appellant saw as being a disadvantage of the composition according to operative claim 1. It is however apparent from the information provided in paragraph 145 of the patent in suit that the asterisk reported in table 2 for example 2 means that partial gelling of the composition was observed and as a result an accurate reading could not be obtained. That, in the view of the Board, does not necessarily mean that the overall stability of the composition was decreased by comparison to the composition of example 1, only that a measurement of the viscosity in the composition would not have been reliable. The Board therefore does not find that the composition according to example 2 according to operative claim 1 was inferior in terms of the stability of the viscosity by comparison to that of example 1 representing D1. The settling behaviour, i.e. the resistance to settling, of the composition according to example 2 is also improved by comparison to example 1.

5.7.6 The comparison of the compositions of example 13 with example 16 and example 14 with example 17 of the patent in suit is also relevant (table 3). The compositions of example 13 and example 16 differ from one another only in the types and amounts of nanoparticles present in the compositions, the composition of example 13 containing the product Nanopox A 610 having particles of an average size of 20 nm and the composition of example 16 containing the product DZ-0077 containing nanoparticles having an average size of 80 nm.

5.7.7 As a result, the compositions of examples 13 and 16 differ from one another in the ratio of particle size, the composition of example 13 having a ratio of 200:1 and the composition of example 16 having a ratio of 50:1. The composition of example 13 can thus be seen as representing the composition of example 4 of D1 and the composition of example 16 is according to operative claim 1. The same analysis applies to the compositions of example 14 (ratio of particle size of 200:1) representing the closest prior art and example 17 (ratio of particle size of 50:1) according to operative claim 1. The comparisons of the properties reported in table 3 of the patent in suit for these respective compositions show that the compositions according to operative claim 1 display an improved settling behaviour over the compositions representing the closest prior art.

5.7.8 The appellant also objected to the relevance of the examples of the patent in suit on the grounds that some of the examples of the same composition were shown to have different properties (reference was made to examples 1 and 13 as well as examples 2 and 16 on page 25 of their letter of 28 July 2023). It is however apparent from the list of components and of their amounts reported in tables 2 and 3 that the compositions of examples 1 and 13 (and those of examples 2 and 16 respectively) are not identical. In particular the UV Inhibitor HQMME (page 21, line 20) is used in examples 1 and 2 but not in examples 13 and 16.

Also, since the individual amounts of the components Chivacure 1176 and Irgacure 184 are not given in examples 13 and 16 of the patent in suit a legitimate doubt remains as to whether they would correspond to the amounts given in examples 1 and 2. In view of this, the objection of the appellant with regard to these examples is unfounded.

5.7.9 The appellant further argued on the basis of the experimental data of the patent in suit that the stability of the viscosity over time of the compositions according to operative claim 1 was not satisfactory for printing applications. The argumentation of the appellant was based on the comparison of the viscosity values of the compositions of examples 1 and 2 reported in table 2 of the patent in suit over a period of 4 weeks (statement of grounds of appeal, page 15 and letter of 28 July 2023, pages 25 and 26). The appellant pointed out that the viscosity of a number of compositions reported in table 2, in particular that of example 2 representing operative claim 1, were not reported. The respondent explained that paragraph 145 of the patent in suit clarified that some of the viscosity values were not reported because partial gelling occurred in these compositions. The respondent stated that a measurement of the viscosity would have been possible but that it would not have been accurate and that it was decided not to report it.

5.7.10 The Board also finds that in view of the explanation contained in paragraph 145 of the patent in suit that the lack of values for the viscosity after 2 weeks in the composition of example 2 does not support the argument that the viscosities of the compositions according to operative claim 1 would generally be less stable than that of compositions for which the particle size ratio is outside the claimed range (as represented in example 1). On the contrary, the body of evidence concerning the viscosity stability provided by the respondent in the additional experiments in D15, D32 and D35 overwhelmingly show that the compositions according to operative claim 1 display an improved stability of the viscosity over time than comparative compositions as discussed below in points 5.9 to 5.17.

5.7.11 In addition, the appellant argued that since the compositions of examples 1 and 2 were identical to those of examples 13 and 16 respectively, it followed that the gel time of the composition of example 16 had also to be worse than that of example 13, even though the values of gel time were not provided in these examples. It has however been established in point 5.7.8 above that it could not be concluded that the compositions of examples 1 and 2 were identical to those of examples 13 and 16 respectively. In this respect the Board does not find the comparison based on examples 13 and 16 to be relevant to the discussion of the gel time.

5.7.12 Accordingly, the Board finds that the examples of the patent in suit demonstrate that the compositions according to operative claim 1 result in compositions having at least a lower initial viscosity and an improved stability of the viscosity over time.

5.8 The opposition division also considered that the additional evidence provided by the respondent (then patent proprietor) in D15, D32 and D35 showed that varying the ratio of the average particle size from 200:1 to 76:1, within the range defined in operative claim 1, resulted in compositions having a lower viscosity that could be retained over the course of 4 weeks.

Experimental report D15

5.9 D15 was also discussed in appeal. The table shown in exhibit 1 of D15 contains compositions named "D1, Ex. 4", "D1, Ex. 5" and "D1, Ex. 6" representing the examples of the closest prior art and modified compositions named "D1, Ex. 4 MODIFIED", "D1, Ex. 5 MODIFIED" and "D1, Ex. 6 MODIFIED". The compositions shown differ from one another only in their particle size ratios, the ratio is 200 for the composition named "D1, Ex. 4", "D1, Ex. 5" and "D1, Ex. 6" representing the closest prior art and the ratio is 76 for the compositions named "D1, Ex. 4 MODIFIED", "D1, Ex. 5 MODIFIED" and "D1, Ex. 6 MODIFIED" in accordance with operative claim 1.

5.10 A comparison of the properties reported in the table of exhibit 1 shows that the compositions according to operative claim 1 ("D1, Ex. 4 MODIFIED", "D1, Ex. 5 MODIFIED" and "D1, Ex. 6 MODIFIED") display lower initial viscosities (302, 1120 and 835 cps at 30°C) and a more stable viscosity over time (viscosity increase after 28 days of 24.17%, 40.18% and 33.05%) than the compositions representing D1 ("D1, Ex. 4", "D1, Ex. 5" and "D1, Ex. 6" having initial viscosities of 664, 1980 and 1550 cps at 30°C respectively and a viscosity increase after 28 days of 57.38%, 93.08% and 76.71%). The settling behaviour reported in that table however is the same for all compositions such that it cannot concluded from D15 that the settling behaviour was improved over the closest prior art. Exhibit 1 of D15 however establishes the presence of an effect of lower initial viscosity and viscosity stability over time for the compositions according to operative claim 1 over those of D1.

5.11 D15 contains further sets of examples (Exhibits 2 to 4) which are however not relevant to the present question. Exhibit 2 is a table with examples named "Greystone" corresponding to a formulation described in an annex of the notice of opposition and is unrelated to the present appeal. Exhibit 3 is a table containing two examples referring to document D2 and Exhibit 4 contains examples that are based on compositions of D8. Since Exhibits 2 to 4 do not concern the present document D1 representing the closest prior art, they do not need to be considered for the question of inventive step starting from D1.

Experimental report D32

5.12 D32 was also discussed between the parties in appeal. Exhibit 1 of D32 shows a composition named "D1, Ex.4" with a particle size ratio of 200 that contains components falling under the definitions (a) to (e) according to operative claim 1. The table further contains the composition "D1, Ex.4 MODIFIED I" with a particle size ratio of 76. Since the compositions of "D1, Ex.4" and "D1, Ex.4 MODIFIED I" contain the same microparticles Silibond 600 MST, the Board finds that these two compositions allow a fair comparison of the properties of compositions according to D1 ("D1, Ex.4") and operative claim 1 ("D1, Ex.4 MODIFIED I").

5.13 Exhibit 1 of D32 shows that, all other things being equal, the composition according to operative claim 1 displays a lower initial viscosity than the composition according to D1 (361.9 cps at 30°C for "D1, Ex.4 MODIFIED I" compared to 801.2 cps at 30°C for the composition "D1, Ex.4"). Also, Exhibit 1 shows a higher stability of the viscosity over time for the composition representing operative claim 1 over the composition representing D1 (viscosity increase after 28 days of 20.50% for "D1, Ex.4 MODIFIED" I compared to 123.79% for "D1, Ex.4"). The values reported for the settling behaviour of these composition in Exhibit 1 is however modest (2 for the composition representing D1 and 3 for the composition according to operative claim 1). Exhibit 1 of D32 therefore also supports the effect of lower initial viscosity and viscosity stability over time for the compositions according to operative claim 1 over D1.

5.14 D32 contains other examples (Exhibit 2) concerning compositions (T4, Ex. 8) referring to experimental report D16. Since these examples do not concern document D1 representing the closest prior art, they are not relevant for the question of inventive step starting from D1.

Experimental report D35

5.15 D35 was also discussed between the parties in appeal. Exhibit 1 of D35 contains a table summarizing the properties of compositions relevant to the assessment of inventive step. The composition "Ex.13" contains components (a) to (e) according to operative claim 1 but has a particle size ratio of 200 and therefore represents the compositions of the closest prior art D1. Among the other compositions shown in D35 "Modified Ex. 13", "Modified Ex. 13 II", "Modified Ex. 13 III" and "Ex. 16" differ from one another such that the compositions have a particle size ratio which is respectively 8 for "Modified Ex. 13", 20 for "Modified Ex. 13 II" and 50 for "Modified Ex. 13 III" and "Ex. 16". These compositions are representative of operative claim 1 which defines a range of particle size ratio of 2.41:1 to 100:1. They allow for a valid comparison with the closest prior art.

5.16 The composition "Ex.13" representing D1 has an initial viscosity of 3140 cps at 20°C, a viscosity increase after 28 days of 134.30% and a value of settling behavior (timing) of 2. Apart from the composition "Modified Ex. 13" which shows a higher initial viscosity (7795 cps at 30°C) than "Ex.13", all the other compositions "Modified Ex. 13 II", "Modified Ex. 13 III" and "Ex. 16" show initial viscosities (1439 cps, 1412 cps and 1587 cps at 30°C respectively) that are lower than for "Ex. 13". Also, the compositions of "Modified Ex. 13", "Modified Ex. 13 II", "Modified Ex. 13 III" and "Ex. 16" have a viscosity that is more stable (viscosity increase after 28 days of 95.51%, 55.18%, 16.71% and 21.93% respectively) than for "Ex. 13". In this respect, it can be concluded from D35 that the compositions according to operative claim 1 have lower initial viscosities and a more stable viscosity over time than the compositions of D1.

5.17 The appellant objected to the relevance of D35 as a report showing a valid comparison of compositions according to the patent in suit (examples 13 and 16) with modified versions of these compositions. The appellant noted a discrepancy between the values of settling behaviour reported for examples 13 (2 days) and 16 (3 days) in D35 and in the patent in suit (11 days for example 13 and 28 days for example 16). D35 however indicates that while best efforts were made to rework the examples 13 and 16 of the patent in suit, several choices had to be made in the rework due to some components not being commercially available anymore (page 3 of D35). Because of this and because the settling behaviour in D35 was determined by a different operator and possibly apparatus, it cannot be held that the results concerning the settling behaviour in the patent in suit and in D35 are contradictory and invalidate the respondent's submissions, as the experiments of D35 and those of the patent in suit do not necessarily refer to the same product. The Board therefore finds that the objection against the relevance of D35 is not persuasive. The Board however finds that the values for the settling behaviour of the compositions reported in D35 , apart for "Modified Ex. 13" (value of 7), are such (value of 2 for "Ex. 13" and 3 for "Modified Ex. 13 II", "Modified Ex. 13 III" and "Ex. 16") that they do not support a clear improvement over D1.

Appellant's counter arguments based on experimental evidence

5.18 At the oral proceedings before the Board the appellant submitted that a comparison of examples contained in D16 (examples 4, 5 and 6) with modified examples I, II and III in table 2 of Exhibit 1 in D30a disproved that the particle size ratio in accordance with operative claim 1 was causative for the effects alleged by the respondent. The admittance of that line of attack, which relied on a comparison of properties from compositions taken from two reports (D16 and D30a), was disputed by the respondent and discussed at the oral proceedings. The appellant submitted that the argument could actually be found in their letter of 28 July 2023 in the passage bridging pages 39 and 40. The comparison of examples relied upon by the appellant is however not mentioned in the passage cited, which addresses D16 and D30a in general terms only and separately from one another. Furthermore, the passage cited does not mention the conclusion submitted by the appellant at the oral proceedings, namely that the particle size ratio of the compositions according to operative claim 1 did not provide any effect. This line of attack represents therefore an amendment to the appellant's case within the meaning of Article 13(2) RPBA 2020 which is, in principle, not be taken into account unless there are exceptional circumstances, which have been justified with cogent reasons by the party concerned. The appellant did not refer to such exceptional circumstances, let alone provided justification with cogent reasons in this respect. This new line of attack was therefore not taken into account (Article 13(2) RPBA 2020).

5.19 The appellant also referred to their own experimental evidence provided in D8, D16 and D30a (corrected version of D30) and disputed on their basis that the benefits alleged by the respondent could be brought about by the particle size ratio defined in operative claim 1.

5.19.1 It was argued that table 1 of D8 contained examples (examples 1-3 and 10-13) according to operative claim 1 that did not show an improvement of the viscosity contrary to what was alleged by the respondent, in particular, the compositions obtained were not liquid (statement of grounds of appeal, pages 20 to 22). Operative claim 1 however requires, as feature, that the radiation curable compositions containing components (a) to (e) are liquid. The compositions referred to in table 1 of D8 that are not liquid do not therefore represent compositions of operative claim 1 and therefore cannot show that the compositions claimed fail to show the alleged effects.

5.19.2 D16 was also cited by the appellant in their statement of grounds of appeal (pages 22 and 23) as a document confirming that the alleged technical effects could not be achieved throughout the entire scope of the opposed patent. Reference was made to examples 6 to 11 (according to the invention) and examples 12 to 14 (comparative) of table 4.

5.19.3 It is however immediately apparent that the compositions of table 4 cited by the respondent differ from one another not only in the particle size ratio but also in the weight ratio of the particles. In this respect, D16 cannot answer the question of whether the distinguishing feature over D1 brings a contribution or not.

5.19.4 D30a was also discussed by the appellant. The document was said to show the viscosity and settling properties of compositions according to the examples of the patent in suit comprising the filler DZ-0077 became worse if replacing that filler with another nanofiller mixtures with the same average particle size (statement setting out the grounds of appeal, pages 23 and 24).

5.19.5 It is however apparent from the section "Formulation evaluated" on pages 1 and 2 that D30a is a compilation of compositions from various experimental reports. Only the modified compositions of examples 16 and 17 (versions I and II), of D15 (table 2, Mod I, Mod II and Mod III) and of modified example 13 (table 4) in D30a were actually prepared and subject to viscosity measurements by the appellant. The compositions and properties representing operative claim 1 in examples 16, 17 (in table 1) and example 13 (table 4) are the ones disclosed in the patent in suit and the compositions of properties of relating to examples 4 and 6 of D1 (table 2) are the ones disclosed in exhibit 1 of D15, i.e. also prepared and measured by the respondent. Indeed, the amounts and values of properties reported in tables 1, 2 and 4 for these compositions are in fact those measured and reported in the patent in suit and in D15 (the amounts and values of properties exactly match those of the original compositions). This was addressed by the Board in their communication of 10 October 2023 (point 10.4.4) and not further disputed by the appellant. It means that the results reported in the tables of D30a that were compiled from these different sources concern compositions and properties that were prepared and measured under conditions that cannot be established from D30a. Therefore, the differences in the properties obtained in D30a between the original compositions and the modified ones obtained at a later stage cannot be unambiguously attributed to the particle sizes of the filler in the compositions. D30a therefore does not support the conclusion reached by the appellant.

5.19.6 The additional experimental evidence provided in D8, D16 and D30a therefore does not support the formulation of the problem as providing an alternative composition as argued by the appellant in section 3.4.c of their statement setting out the grounds of appeal.

Conclusion concerning the problem successfully solved

5.19.7 On the basis of the evidence made available in appeal, the Board finds that the problem successfully solved over the closest prior could be formulated as the provision of liquid radiation curable compositions with lower initial viscosity and improved stability of the viscosity over time. Given the partial data provided for the settling behaviour of the compositions by the respondent and considering the fact that the values provided for that property were almost consistently very close to the value of the comparative composition, the Board did not consider that an improvement of the settling behaviour of the composition could be taken into account for the formulation of the problem.

Obviousness of the solution

5.20 The question of obviousness was whether a skilled person starting from examples 4-6 or D1 would have chosen a ratio of average particle size of microparticles to nanoparticles in the range defined in granted claim 1 (from 2.41 to 100) to solve the problem posed. The opposition division concluded that none of the documents on file would have led the skilled person to the solution set out in granted claim 1, corresponding to operative claim 1.

5.21 The appellant argued that starting from D1 it would require only routine work for a person skilled in the art to achieve a formulation in which the size ratio of micro to nano-particles is within the range from 2.41:1 to 100:1 (statement of grounds of appeal, section 3.5). This argument, however, does not relate to the problem set out in point 5.19.9 above, but to the provision of an alternative composition.

5.21.1 D1 discloses ranges of average particle size for the microparticles (about 1 to about 100 µm) and nanoparticles (about 10 to about 999 nm, preferably about 10 to about 50 nm) (paragraphs 19 and 20) that overlap with the ranges disclosed in paragraphs 112 and 113 of the patent in suit (1 to 999 µm for the microparticles and 1 to 999 nm for the nanoparticles). On the basis of the ranges disclosed in D1, the appellant calculated a general ratio of particle sizes in D1 of 80 to 400. That fictive range which can be computed from D1, but is not described therein, overlaps with that defined in operative claim 1 (2.41 to 100).

5.21.2 There is however in D1 no motivation to select a ratio of particle sizes in the range of overlap between D1 and operative claim 1 (80 to 100). The mention of the particle sizes in D1 remains unspecific and there is no indication of a purposive selection of specific ranges of particle sizes of micro- and nanoparticles to provide any improvement, let alone in respect of the initial viscosity and stability of the viscosity over time. Accordingly, there is no teaching in D1 that would have led the skilled person to the ratio of particle sizes defined in operative claim 1 in order to solve the posed problem.

5.21.3 The Board therefore comes to the conclusion that claim 1 of auxiliary request 2 is inventive over D1 as the closest prior art. It was acknowledged by the parties that any conclusion on inventive step for D1 would also apply to D2 as the closest prior art. In view of the conclusion starting from D1, the Board concludes that claim 1 of auxiliary request is also inventive when starting from D2 as the document representing the closest prior art.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the opposition division with the order to maintain the patent on the basis of the claims of auxiliary request 2, filed with the reply to the statement of grounds of appeal and any consequential amendments to the description if necessary.

The Registrar: The Chairman:

Beschwerdekammern des Europäischen Patentamts
Boards of Appeal of the European Patent Office
Chambres de recours de l'Office européen des brevets

D. Hampe F. Rousseau

Decision electronically authenticated