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Datasheet for the decision of 21 April 2026

Case Number: T 0770/24 - 3.3.02

Application Number: 17712363.5

Publication Number: 3426737

IPC: C09D11/10, B29C67/00, C09D11/101, C09D11/54

Language of the proceedings: EN

Title of invention:
NON-ISOCYANATE POLYURETHANE INKS FOR 3D PRINTING

Patent Proprietor:
3D Systems, Incorporated

Opponent:
ARKEMA FRANCE

Headword:

Relevant legal provisions:
EPC Art. 83, 111
RPBA 2020 Art. 11, 12

Keyword:
Sufficiency of disclosure
Remittal

Decisions cited:

Catchword:

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Beschwerdekammern

Boards of Appeal

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Case Number: T 0770/24 - 3.3.02

D E C I S I O N
of Technical Board of Appeal 3.3.02
of 21 April 2026

Appellant: (Patent Proprietor)	3D Systems, Incorporated 333 Three D Systems Circle Rock Hill, SC 29730 (US)
Representative:	dompatent Partnerschaft von Patentanwälten und Rechtsanwälten mbB Deichmannhaus am Dom Bahnhofsvorplatz 1 50667 Köln (DE)
Respondent: (Opponent)	ARKEMA FRANCE 51 Esplanade du Général de Gaulle La Défense 92800 Puteaux (FR)
Representative:	Bandpay & Greuter 11 rue Christophe Colomb 75008 Paris (FR)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted/electronically transmitted on 27 March 2024 revoking European patent No. 3426737 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	P. O'Sullivan
Members:	S. Bertrand
	B. Burm-Herregodts

Summary of Facts and Submissions

I. The appeal of the patent proprietor ("appellant") lies from the opposition division's decision to revoke European patent No 3 426 737.

II. The patent concerns an ink for use in a three-dimensional (3-D) printing system comprising a cyclic carbonate monomer, an amine monomer and a further ethylenically unsaturated monomer (claim 1).

III. The following documents are referred to in the present decision:

D19 Experimental report filed by the respondent as "Rapport d'essai"

D20 Chen et al: "Comparing cost and print time estimates for six commercially-available 3D printers obtained through slicing software for clinically relevant anatomical models." 2021

A21 Experimental report filed by the appellant as "Test Report", dated 24 July 2024

A22 Declaration of Pingyong Xu

A23 Excerpt from the website "engineering.com": "A First Look at Figure 4, Industrial 3D Printing from 3D Systems"

A24 Excerpt from the Advantage 3D Solutions webpage: "3D Systems DLP 3D Printing"

A25 Excerpt from the Formero webpage: "Figure 4 DLP"

IV. In the impugned decision, the opposition division's conclusions included that:

- None of the claims of the main request and auxiliary requests 1 to 6 complied with Article 83 EPC.

- Documents D19 and D20 were admitted into the proceedings.

V. In its statement of grounds of appeal, the appellant contested the findings of the opposition division. The appellant filed documents A21, A22, A24 and A25 during the appeal proceedings.

VI. With its reply to the grounds of appeal, the opponent ("respondent") contested the appellant's submissions and filed document A23.

VII. The board summoned the parties to oral proceedings as requested and subsequently issued a communication pursuant to Article 15(1) RPBA.

VIII. Oral proceedings before the board took place on 21 April 2026 by videoconference in the presence of both parties.

IX. The parties' requests

The appellant requested that:

- the decision under appeal be set aside and the case be remitted to the opposition division for deciding on the grounds for opposition other than Article 100(b) EPC, or alternatively

- the decision under appeal be set aside and the patent be maintained on the basis of the main request filed with the letter of 18 December 2023

and re-filed with the statement of grounds of appeal, or alternatively

- the decision under appeal be set aside and the patent be maintained on the basis of one of the claim sets of auxiliary requests 1 to 9 filed with the statement of grounds of appeal,

- the opposition division's decision to admit D19 and D20 into the proceedings be overturned, and

- A23 not be admitted into the proceedings.

The respondent requested that the appeal be dismissed and that A21, A22, A24 and A25 not be admitted into the proceedings.

X. The parties' submissions relevant to the present decision are addressed in the reasons for the decision below.

Reasons for the Decision

Main request

1. Admittance of D19 and D20

1.1 The respondent filed D19 and D20 before the opposition division on 23 December 2023, prior to the final date set under Rule 116 EPC.

D19 is a post published experimental report comprising three compositions A, B and C and the evolution of their viscosity over time.

D20 is a post-published document comparing the cost and print time estimates for six commercially available 3-D printers.

The opposition division decided to admit D19 and D20 into the proceedings (point 1.2 of the reasons for the decision).

1.2 The appellant requested that the opposition division's decision to admit D19 and D20 into the proceedings be overturned.

1.3 The board decided not to exclude D19 and D20 from the proceedings. Since the decision is in the appellant's favour (see below), there is no need for the board to provide its reasons.

2. Admittance of A21 to A25

2.1 A21 and A22 were filed by the appellant with the statement of grounds of appeal.

A21 contains experimental data. It reproduces compositions A to C of D19, measures the dynamic viscosity of compositions A and B, and reports on 3-D printing tests. It further discloses two additional compositions (1 and 2) allegedly falling under claim 1 of the main request, together with viscosity measurements and printing results.

A22 is a technical expert declaration explaining the "two-ink material system" and "single-ink material system" disclosed in the patent.

2.2 A23 was filed by the respondent with its reply to the grounds of appeal.

A23 is a post published excerpt from the website "engineering.com" concerning the Figure 4® industrial 3D-printing system.

2.3 A24 and A25 were filed by the appellant with the letter dated 25 August 2025.

A24 is a post published excerpt from the Advantage 3D Solutions webpage on Figure 4® DLP technology.

A25 is a post published excerpt from the Formero webpage on Figure 4® DLP technology.

2.4 The board decided to admit documents A21, A22, A23, A24 and A25 into the proceedings.

Since documents A21 to A25 were not found relevant for the present decision (see below), no reasoning is needed as regards their admittance.

3. Sufficiency of disclosure - claim 1 - Article 83 EPC

3.1 Claim 1 of the main request reads as follows:

"*1. An ink for use in a three-dimensional printing system comprising:*

a cyclic carbonate monomer in an amount of 10 to 70 wt.-% based on the total weight of the ink;
an amine monomer in an amount of 10 to 70 wt.-% based on the total weight of the ink; and further comprising an ethylenically unsaturated monomer other than the cyclic carbonate monomer and the amine monomer in an amount of up to 80 wt.-% based on the total weight of the ink."

3.2 Claim 1 of the main request is directed to an ink defined, *inter alia*, as being for use in a three-dimensional printing system. As agreed by the parties during the oral proceedings, the functional feature

"for use in a three-dimensional printing system" constitutes a limiting technical feature of the claim.

According to Article 83 EPC, the application as filed must disclose the invention in a manner sufficiently clear and complete for it to be carried out by the skilled person over the whole scope claimed. In the present case, this requires that the skilled person, on the basis of the application as filed and common general knowledge, is able to prepare inks within the claimed compositional ranges which are suitable for use in a three-dimensional printing system, without undue burden.

The disclosure of the application as filed must therefore allow the skilled person to identify, without undue burden, which compositions comprising a cyclic carbonate monomer, an amine monomer and an ethylenically unsaturated monomer other than the cyclic carbonate monomer and the amine monomer within the claimed ranges, are suitable for three-dimensional printing.

Since the parties relied on passages of the patent specification, the board refers to the patent in the following for ease of reference.

3.3 The respondent relied on the experimental data disclosed in document D19. It argued that compositions A to C disclosed therein exhibited a significant increase in viscosity over time, rendering them unsuitable for 3-D printing processes. This alleged lack of suitability was, in the respondent's view, inconsistent with paragraph [0078], point 3, of the patent, which required that inks in the non-cured state possessed the property of thermal stability for at

least 6 months at room temperature, "thermally stable" being defined as exhibiting no greater than about a 35 percent change in viscosity over a specified time period. The respondent further submitted that the patent did not provide sufficient guidance on how to prevent premature curing or how to select suitable monomers so as to ensure 3-D printability. Consequently, the skilled person would not be able to obtain "compositions for use in a three-dimensional printing system" as required by claim 1 of the main request.

The board is not persuaded by these arguments.

Document D19 reports three compositions A, B and C. Composition A comprises 15 wt.-% of glycerol carbonate methacrylate (a cyclic carbonate monomer according to claim 1 of the main request), 34 wt.-% of Jeffamine T403 (i.e. an amine monomer according to claim 1 of the main request) and 49 wt.-% of trimethylene glycol dimethacrylate (an ethylenically unsaturated monomer according to claim 1 of the main request). Composition B comprises the same ingredients as composition A in the same amount, except that tetraethylene glycol diacrylate was used instead of trimethylene glycol dimethacrylate. Composition C comprises 24.4 wt.-% of TMP tricyclocarbonate (a cyclic carbonate monomer according to claim 1 of the main request), 24.7 wt.-% of Jeffamine T403 (i.e. an amine monomer according to claim 1 of the main request) and 49 wt.-% of tetraethylene glycol diacrylate (an ethylenically unsaturated monomer according to claim 1 of the main request). Thus each of compositions A to C comprises a cyclic carbonate monomer, an amine monomer and an ethylenically unsaturated monomer in amounts falling within the scope of claim 1.

The viscosity of compositions A and B was measured at 25°C. Composition A has a viscosity from 24.8 (initial) to 101.3 cP (after 18 hours). Composition B has a viscosity from 32 (initial) to 3450 cP (after 18 hours). It was observed that composition C gelled after two hours.

It follows that the reported data show that the viscosity of these compositions increases over time under the storage conditions investigated, and that one composition forms a gel after a certain period.

However, these observations do not demonstrate that the invention as defined in claim 1 of the main request cannot be carried out.

First, claim 1 of the main request does not contain any limitation regarding viscosity, viscosity stability or storage stability.

Paragraph [0078] of the patent, relied on by the appellant, reads as follows:

"*[0078] Further, inks described herein, **in some embodiments**, can exhibit a combination of one or more desirable features. In **some cases**, for instance, an ink in the non-cured state has one or more of the following properties:*

1. Freezing point below about 30°C, below about 25°C, or below about 15°C;

2. Viscosity of about 9-14 cP at 70-95°C or about 400-1000 cP at 25-35°C; and

3. Thermal stability for at least 6 months at room temperature (25°C). As described above, viscosity can be measured according to ASTM D2983 (e.g., using a Brookfield Model DV-II+ Viscometer). In addition, for reference purposes herein, a "thermally stable" material exhibits no greater

than about a 35 percent change in viscosity over a specified time period (e.g., 3 days) [...]." (emphasis added by the board)

As emphasised above, the properties mentioned in paragraph [0078] of the patent are explicitly disclosed only for "some embodiments" and in "some cases". They are therefore optional and at least for this reason cannot be read into claim 1 as additional requirements of the claimed compositions as argued by the respondent.

Secondly, the respondent's argument is based on a particular mode of implementation, namely a single-pack composition stored for extended periods prior to use. However, as submitted by the appellant, the disclosure of the application as filed is not limited to such embodiments.

Paragraphs [0006] and [0007] of the patent reads as follows:

"*[0006] In some embodiments, an ink for use in a 3D printing system described herein comprises a cyclic carbonate monomer and an amine monomer. Such an ink might be particularly useful for a 3D printing system, such as a contacting stereolithography (cSLA) printing system or other stereolithography (SLA) printing system, in which the cyclic carbonate and amine monomers are combined under conditions (e.g., time and temperature conditions) that are not sufficient for substantial reaction between the cyclic carbonate and amine monomers to occur prior to printing.*"

"*[0007] Alternatively, as described further hereinbelow, 3D printing may be carried out using a plurality of inks, wherein a first ink comprises a*

cyclic carbonate monomer, and a second ink comprises an amine monomer. Such a dual ink system may be particularly useful for a 3D printing system, such as multi-jet modeling (MJM) system, in which it may be desirable not to combine the cyclic carbonate monomer with the amine monomer prior to printing."

As is derivable from paragraphs [0006] and [0007] of the patent, the invention also encompasses embodiments in which the reactive components are kept separate and combined only shortly before or during the printing process. Indeed, it is explicitly taught that the components of the composition are combined under conditions of time and temperature that are not sufficient for substantial reaction between the cyclic carbonate and amine monomers to occur prior to printing. Therefore, if the skilled person were to observe such substantial reaction, the patent teaches to adapt said conditions to prevent it before printing. In such embodiments, for example, in multi-jet modelling processes as illustrated in paragraphs [0118], [0119] and [0121] of the patent, different components may be supplied via separate channels and mixed upon deposition. Likewise, in stereolithography-type processes (paragraph [0122] of the patent), components may be combined shortly before use. Claim 1 does not impose limitations in terms of when the components of the claimed composition must be combined together - rather, it concerns the composition subsequent to said combination.

Under these conditions, the increase in viscosity during prolonged storage observed in D19 is not necessarily relevant for the suitability of the ink for three-dimensional printing. The respondent has not provided evidence that inks prepared according to such

embodiments could not be suitable for use in a three-dimensional printing system.

Moreover, the respondent has not shown that the skilled person, relying on common general knowledge and the information provided in the application as filed, would be unable to select appropriate monomers or process conditions so as to obtain inks suitable for printing. As argued by the appellant, if a particular combination of components falling within claim 1 were to display increases in viscosity over time (premature curing), it would be within the skilled person's common general knowledge to use said composition in a 3-D printing process shortly after its preparation and before the point in time at which viscosity issues would render 3-D printing problematic. As further argued by the appellant, if premature curing were to occur before use, the skilled person would readily recognise this and, on the basis of common general knowledge concerning ink preservation, would replace the composition, or adapt the time and temperature conditions as taught in paragraph [0006] as addressed above, if necessary. Furthermore, the skilled person would know that certain amines and carbonates are more reactive than others and would therefore be able, with a limited amount of trial and error, to predict the viscosity increase to a certain extent.

The objections raised therefore amount, at most, to the identification of potential difficulties in certain embodiments, however, without any evidence that these difficulties could not be overcome by the skilled person as set out above. Hence, D19 does not establish the existence of serious doubts, substantiated by verifiable facts that the invention cannot be carried out over the whole scope claimed.

Consequently, the viscosity behaviour reported in D19 under storage conditions and the alleged absence of information in the patent on premature curing cannot demonstrate a lack of sufficiency of disclosure.

3.4 The respondent submitted that the patent did not contain any example relating to the preparation of compositions according to claim 1 of the main request and to 3-D printing. Furthermore, the patent did not contain any information concerning the physical properties of items printed using the claimed compositions. In particular, example 7 of the patent disclosed only the preparation of a kit of parts. According to the respondent, such a kit of parts was excluded from the subject-matter of claim 1 of the main request, since it formed the subject-matter of a divisional application. In the absence of any example relating to compositions according to claim 1 of the main request and to a 3-D printing process using such compositions, or to the properties of the printed items, the claimed invention could not be carried out without undue burden.

The board does not agree with the respondent.

The board acknowledges that claim 1 of the main request does not relate to a kit of parts.

However, as set out above, claim 1 of the main request does not impose limitations in terms of when the components of the claimed composition must be combined in order to form the claimed composition.

Even if it is accepted that example 7 of the patent discloses the preparation of a kit of parts, namely a first ink ("Part A", paragraph [0118]) and a second ink ("Part B", paragraph [0119]), the patent nevertheless provides the skilled person with the information

required to prepare a composition according to claim 1 of the main request, namely by mixing the first and second inks as described in paragraphs [0121] and [0122] of the patent.

With regard to the absence in the patent of an example relating to 3-D printing, the board notes, in line with the appellant's submissions, that the respondent did not provide any evidence showing that the compositions falling within the scope of claim 1 of the main request could not be used for 3-D printing.

The respondent's argument that printing was not carried out in D19 (see point 3.3 above) due to concerns regarding damaging printing equipment is without merit, since printing could have been attempted immediately after preparation of the compositions when viscosity levels were unproblematic.

Finally, the board is not persuaded by the respondent's argument concerning the absence in the patent of information relating to the physical properties of items after printing using the claimed compositions. Claim 1 of the main request is directed to a composition and does not define any property or performance requirement for a printed item obtained therefrom. Consequently, the question whether the patent discloses specific physical properties of printed items is not decisive for the assessment of whether the skilled person, on the basis of the information in the patent and the common general knowledge, is capable of preparing compositions defined in claim 1 for use in 3-D printing.

For the purposes of Article 83 EPC, as set out in point 3.2, above, the relevant issue is whether the skilled person, on the basis of the information provided in the

patent and common general knowledge, can prepare the claimed compositions suitable for 3-D printing without undue burden. As established above, the patent provides sufficient information enabling the skilled person to prepare such compositions. The absence of experimental data or detailed information concerning the properties of printed items therefore does not establish a lack of sufficiency of disclosure.

The respondent's submission based on the lack of example in the patent according to claim 1 of the main request is thus not convincing.

3.5 It follows that the subject-matter of claim 1 of the main request is sufficiently disclosed.

4. Sufficiency of disclosure - claim 14 - Article 83 EPC

4.1 Claim 14 of the main request reads as follows:

"*14. A method of printing a three-dimensional article comprising:*
selectively depositing layers of an ink in a fluid state onto a substrate, wherein the ink comprises the ink of claims [sic] *13;*
wherein the method further comprises curing the (meth)acrylates with UV light; and
wherein the method further comprises thermally curing the cyclic carbonate monomer and the amine monomer."

Claim 13 reads as follows:

"*The ink of any of the preceding claims, where in the ethylenically unsaturated monomer comprises a (meth)acrylate.*"

4.2 The respondent argued that since the skilled person reading the patent was not in a position to implement the feature of the ink "for use in a three-dimensional printing system" of claims 1 to 13 of the main request, they would be even less in a position to implement the printing methods of claim 14 of the main request. According to the respondent, claim 14 of the main request also encompassed 3-D printing processes different from processes using only single-ink compositions.

Since the board has concluded above that the skilled person was in a position to implement the feature of the ink "for use in a three-dimensional printing system" of claim 1 of the main request, this argument cannot succeed. The respondent has not provided any additional reasons why the method of claim 14 could not be carried out by the skilled person.

4.3 It follows that the subject-matter of claim 14 of the main request is sufficiently disclosed.

5. Sufficiency of disclosure - claims 2 to 13 and 15 - Article 83 EPC

In the absence of any separate objections, and for the same reasons as set out for claims 1 and 14, the board concludes that the requirements of Article 83 EPC are met for claims 2 to 13 and 15 of the main request.

Remittal - Article 111 EPC and Article 11 RPBA

6. The appellant requested that the case be remitted to the opposition division for deciding on the grounds for opposition other than Article 100(b) EPC.

6.1 In the present case, the decision of the opposition division was solely based on the grounds for opposition under Article 100(b) EPC. Since the grounds for opposition under Article 100(a) EPC are not part of the decision under appeal, they also do not form the basis for appeal proceedings in accordance with Article 12 RPBA. Furthermore, objections under Articles 84 and 123(2) EPC against the claims of the main request and the auxiliary requests were raised by the respondent/opponent (page 2 of the letter of 22 December 2023) and are not part of the decision under appeal either. These objections also do not form the basis for appeal proceedings in accordance with Article 12 RPBA.

6.2 Consequently, since the set of claims of the main request complies with the requirements of Article 83 EPC, and as requested by the appellant and accepted by the respondent during oral proceedings, the board decided to remit the case to the opposition division for further prosecution.

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 for further prosecution.

The Registrar: The Chairman:

U. Bultmann P. O'Sullivan

Decision electronically authenticated