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**Datasheet for the decision
of 22 April 2024**

Case Number: T 2172/21 - 3.2.03

Application Number: 07100920.3

Publication Number: 1955792

IPC: B22C1/10, B22C1/16, B22C1/20,
B22C9/12, B22D15/00, B22D29/00

Language of the proceedings: EN

Title of invention:
Process for making foundry shaped cores and for casting metals

Patent Proprietor:
ARKEMA FRANCE

Opponents:
Bröcher, Dirk Joachim
BASF SE

Headword:

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

Keyword:

Inventive step - (no) - effect not made credible within the whole scope of claim - reformulation of the technical problem
Amendment to case - amendment within meaning of Art. 12(4) RPBA 2020 - reasons for submitting amendment in appeal proceedings (yes)
Amendment after summons - taken into account (yes) - cogent reasons (yes)

Decisions cited:

G 0007/93, T 1776/18

Catchword:



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Case Number: T 2172/21 - 3.2.03

D E C I S I O N
of Technical Board of Appeal 3.2.03
of 22 April 2024

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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
21 October 2021 concerning maintenance of the
European Patent No. 1955792 in amended form.**

Composition of the Board:

Chairman C. Herberhold
Members: B. Miller
 N. Obrovski

Summary of Facts and Submissions

- I. European patent No. 1 955 792 B1 ("the patent") relates to binder compositions useful in the foundry field for making cores that harden at room temperature.
- II. Two oppositions against the patent were filed on the grounds of Article 100(b) EPC and Article 100(a) EPC together with Articles 54 and 56 EPC.
- III. *Inter alia*, the following documents were cited during the opposition proceedings:
- D5: D1 JP 2005/329408 A
 - D5a: English machine translation of D5
 - D6: VDG-Merkblatt URETHAN-COLD-BOX-VERFAHREN, R305, February 1998
 - D7: Giessereitechnik kompakt, Werkstoffe, Verfahren, Anwendungen, 2003, Giesserei-Verlag GmbH, Düsseldorf, pages 91 to 93
 - D12: WO 96/26231 A1
 - D13: WO 95/05409 A1
 - D14: WO 98/06766 A2
 - D19: WO 2005/092539 A1
 - D24: Declaration of Mr Ruppin dated 04.08.2020
 - D24a: Report "Olfactive evaluation of amine catalysts", by Odournet France from 20.09.2016.

D26: Olfasense, experimental report
1434-2021-00 from 19.05.2021,
"Determination of the "Hedonic Curve
according to VDI 3882-2 of three
Odorous Substances:
• Dimethylethylamine
• Dimethylpropylamine
• Mixture"

- IV. The opposition division concluded that
- the ground for opposition under Article 100(b) EPC did not prejudice maintenance of the patent
 - the subject-matter of claim 1 as granted lacked novelty over any of the following documents: D5-D7, D12, D13 and D19
 - the subject-matter of claim 1 of auxiliary request 1 is not novel over D6 and D19
 - the subject-matter of claim 1 of auxiliary request 2 lacks novelty over D6
 - the subject-matter of claim 1 of auxiliary request 3 was an obvious alternative in view of D6
 - double patenting was not an issue

In its interlocutory decision, the opposition division decided that the claims according to auxiliary request 4 then on file met the requirements of the EPC.

- V. The interlocutory decision was appealed by all three parties. Therefore, for simplicity's sake, the Board will refer to the parties as the patent proprietor and opponents.

VI. Initial requests

The patent proprietor requested that the decision under appeal be set aside and that the patent be maintained as granted (main request). In the alternative, it requested that the patent be maintained in amended form on the basis of one of auxiliary requests 1 to 11 as submitted with the reply.

Auxiliary request 6 corresponds to auxiliary request 4 as filed in the opposition proceedings and which the opposition division has found to comply with the requirements of the EPC.

Both opponents requested that the decision under appeal be set aside and the patent be revoked.

VII. The following documents were filed for the first time in the appeal proceedings with opponent 2's reply to appeal:

- D27: Olfasense, experimental report 1638-2022-01 from 22.06.2022,
"Determination of Hedonic Tone and Level of Annoyance of three odorous Substances:
• Dimethylethylamine (DMEA)
• Dimethylpropylamine (DMPA)
• Mixture of 20% DMEA and 80% DMPA"
- D28: Pocket Guide Foundry 2015, page 144
(published after the filing date of the patent)
- D29: P.R. Carey, J. Archibald "Sand Binder Systems", Technical paper, ASK Chemicals
(unknown publication date)

VIII. With the summons to oral proceedings, the Board sent a communication pursuant to Article 15(1) RPBA indicating to the parties its preliminary, non-binding opinion of the case that none of the claim requests submitted by the patent proprietor during the appeal proceedings was allowable.

IX. With a letter dated 28 August 2023, opponent 2 filed

D30: Declaration by Mr Christophe Ruppin dated 14
May 2019

D30 reports further experimental data obtained by the patent proprietor which had been submitted in parallel proceedings in the US.

X. With a letter dated 14 February 2024, the patent proprietor withdrew its appeal and declared its intention not to attend the oral proceedings.

As a consequence of the withdrawal of the patent proprietor's appeal, the main request and auxiliary requests 1 to 5 no longer form part of the appeal proceedings. The numbering of the remaining requests to be discussed in this decision is kept unchanged for the sake of consistency with the parties' written submissions.

XI. Opponent 1 also withdrew its appeal with its letter dated 5 March 2024 and declared its intention not to attend the oral proceedings.

XII. Consequently, the summons to oral proceedings was cancelled.

XIII. Wording of the independent claims of the requests at issue in this decision

(a) Auxiliary request 6

This request corresponds to auxiliary request 4 as filed in the opposition proceedings and which the opposition division has found to comply with the EPC.

Claim 1 reads:

"Process for preparing a foundry shape by the cold box process, which process comprises the following steps:

- (a) forming a foundry mix with the binder and an aggregate, preferably sand,
- (b) forming a foundry shape by introducing the foundry mix obtained from step (a) into a pattern,
- (c) contacting the shaped foundry mix with a curing catalyst system consisting essentially of a blend of at least two tertiary amines displaying curing reactivity and/or odor difference, in a liquid or preferably in a gaseous form, optionally carried out with an inert carrier,
- (d) hardening the aggregate-resins mix into a hard, solid, cured shape,
- (e) removing the hardened foundry shape of step (d) from the pattern,

the blend of at least two tertiary amines being:

- DMEA-DMIPA containing from 10 to 30 parts by weight of DMEA to the total of the amine blend,
- DMEA-DEMA containing from 10 to 50 parts by weight of DMEA to the total of the amine blend and
- DMEA-TEA containing from 10 to 50 parts by weight of DMEA to the total of the amine blend,

DMEA being dimethylethylamine, DMIPA being dimethylisopropylamine, DEMA being diethylmethylamine and TEA being triethylamine."

(b) Auxiliary request 7

Claim 1 corresponds to claim 1 of auxiliary request 6, the alternative "DMEA-TEA" having been deleted.

(c) Auxiliary request 8

Claim 1 corresponds to claim 1 of auxiliary request 6, the term "at least" having been deleted in step c) and in the definition of the blend following step e).

(d) Auxiliary request 9

Claim 1 corresponds to claim 1 of auxiliary request 8, the alternative "DMEA-TEA" having been deleted.

(e) Auxiliary request 10

Claim 1 corresponds to claim 1 of auxiliary request 8, the following feature having been added:

"the binder system comprising at least one phenolic resin component and at least an isocyanate component."

(f) Auxiliary request 11

Claim 1 corresponds to claim 1 of auxiliary request 10, the alternative "DMEA-TEA" having been deleted.

XIV. The arguments of opponent 2 as the sole remaining appellant can be summarised as follows.

(a) Admittance of D24a and D26

D24a had been filed at a late stage of the opposition proceedings. The opposition division ought not to have admitted D24a due to its late filing.

The opposition division admitted D26 by exercising its discretion in an appropriate manner.

(b) Admittance of D27, D28, D29 and D30

Documents D27 to D29 had been filed in response to the events during the opposition proceedings and should thus be admitted into the appeal proceedings.

D30 was a declaration by an employee of the patent proprietor and reported the experiments referred to in D24 in combination with further experimental evidence obtained by the patent proprietor itself. D30 had been filed in response to the arguments presented by the patent proprietor in the appeal proceedings.

(c) Auxiliary requests 6 to 11 - inventive step

D6 proposed the use of amine blends as curing agents for binder compositions in the polyurethane cold box process. D6 therefore belonged to the same technical field as the patent and was a suitable starting point for the assessment of inventive step.

The experimental evidence as reported in the patent and in D24, D24a and D30 demonstrated that the use of a blend of tertiary amines did not achieve a synergistic effect in terms of curing and olfactory properties.

It was customary for the skilled person to use arbitrary amounts of selected amines in order to provide an alternative catalyst for curing a composite resin composition.

(d) Auxiliary requests 10 to 11 - admittance

Auxiliary requests 10 and 11 did not address the objections raised by opponent 2 and hence did not comply with the requirements of Rule 80 EPC.

XV. The patent proprietor's arguments in response to the objections raised by opponent 2 can be summarised as follows.

(a) Admittance of D24a and D26

D26 had been filed at a late stage of the opposition proceedings. The opposition division ought not to have admitted D26 due to its late filing. The opposition division admitted D24a by exercising its discretion in an appropriate manner.

(b) Admittance of D27, D28 and D29

These documents could and should have been submitted during the opposition proceedings.

(c) Auxiliary requests 6 to 11 - inventive step

D6 was not a suitable starting point since it did not relate to the same specific purpose as the patent. Only D14 should be considered to be the closest prior art since it addressed the problems associated with the odour of the amines usually used in the cold box

process and the speed of hardening of the shape, see D14, page 2, line 31 - page 3, line 1.

The experimental evidence in D24 and D24a demonstrated that the use of a blend of tertiary amines achieved a synergistic effect in terms of curing and olfactory properties.

This was not derivable from the cited prior art.

Reasons for the Decision

1. Decision in written proceedings

Both the patent proprietor and opponent 1 withdrew their appeals and declared their intention not to attend the oral proceedings. Such a declaration is considered to constitute withdrawal of a request for oral proceedings (see Case Law of the Boards of Appeal, 10th edition, 2022, Chapter III.C.4.3.2).

Opponent 2's request for oral proceedings was conditional on the Board not revoking the patent.

Therefore, as the Board has decided to revoke the patent, written proceedings suffice for this decision, in accordance with Article 12(8) RPBA 2020 and Articles 113 and 116 EPC, taken on the basis of the contested decision to be reviewed and the parties' written submissions.

2. Admittance of D24a and D26 by the opposition division

Documents D24a and D26 had been filed after the end of the respective periods under Article 99(1) EPC and Rule 79(1) EPC. Their admittance was within the discretion of the opposition division (see T 1776/18, Reasons 4.6.4).

When exercising its discretion, the opposition division took account of the *prima facie* relevance of the late-filed documents. It follows that the opposition division applied the correct criteria when exercising its discretion.

Therefore, the Board sees no reason to interfere with the way in which the opposition division exercised its discretion (G 7/93 point 2.6 of the reasons).

3. Admittance of D27, D28, D29 and D30

3.1 Documents D27 to D29 were filed by opponent 2 for the first time with their reply. For the following reasons, the Board takes the view that these documents are a justified response to procedural events which occurred during the opposition proceedings.

D27 can be regarded as a justified response to the late filing of D24a during the opposition proceedings.

D28 and D29 illustrate common general knowledge regarding the physical properties of tertiary amines. The filing of these documents can be seen as a justified response to the patent proprietor's argument that the experimental results in D10 are not credible.

Since the physical properties of tertiary amines are not dependent on a publication date, the Board does not consider it appropriate to disregard D28 and D29, despite D28 having been published after the filing date of the patent and the publication date of D29 being unknown.

The Board has therefore decided to admit documents D27 to D29 into the appeal proceedings under Article 12(4) RPBA.

- 3.2 Document D30 was filed by opponent 2 shortly after receipt of the Board's communication under Article 15(1) RPBA.

D30 supplements opponent 2's main line of argument, presented throughout the entire appeal proceedings, i.e. that the experimental evidence does not show a synergistic effect for the curing efficiency of amine blends according to claim 1. Hence, D30 does not change the topics to be discussed and its admittance is not detrimental to procedural economy. It also *prima facie* confirms the preliminary conclusions presented by the Board in its communication under Article 15(1) RPBA that the experimental evidence presented by the patent proprietor does not sufficiently prove the presence of a synergistic effect.

Furthermore, D30 is a declaration which had been filed by the patent proprietor itself during parallel US proceedings. It was prepared by Mr Ruppin, an employee of the patent proprietor, who was the originator of the comparative tests in D24 as filed by the patent proprietor. In fact, D30 encompasses the experimental evidence reported by D24 as well as containing further

experimental evidence which had not been reported in D24.

Therefore, D30 cannot be expected to contain any information that would be a surprise to the patent proprietor.

3.3 The Board further notes that the patent proprietor did not provide any arguments on D30 - neither in regard to its admittance nor in regard to its substance - but withdrew its appeal and declared its intention not to attend the oral proceedings some months after D30 had been filed by opponent 2.

3.4 In an overall assessment, the Board considers the above circumstances to constitute exceptional circumstances justifying the admittance of document D30 into the appeal proceedings under Article 13(2) RPBA.

4. Auxiliary request 6 - inventive step

4.1 Choice of closest prior art

4.1.1 The opponents and the opposition division concluded that D6 was a suitable starting point for the evaluation of inventive step.

The Board sees no reason to deviate from this assessment since D6 explicitly relates to the use of amine blends as curing agents for binder compositions in the polyurethane cold box process (D6, point 1), which is exactly the technical field of the present invention (see [0001] and [0002] of the impugned patent).

4.1.2 The patent proprietor argues that D6 is not a suitable starting point, since it does not relate to the same specific purpose. In their view, D14 should be considered the closest prior art, since it addresses the problems associated with the odour of the amines usually used in the cold box process and the speed of hardening of the shape, see D14, page 2, line 31 - page 3, line 1.

This argument is not convincing.

4.1.3 Although D14, contrary to D6, explicitly mentions the odour problems associated with the amines used in the cold box process, this problem (ammonia or fishy odour of short chain alkylamines) is nevertheless well known in the art, since it is an inherent property of this type of compound.

Moreover, it is also inherently reflected in D6 since the latter explains that the development of an odour should be reported immediately (see page 3, left column, 6th paragraph) and that strict limits for the amount of gas in the air must be respected, see point 6.3.

4.1.4 In view of the above, the Board concludes that D6 is a realistic starting point for the evaluation of inventive step.

4.2 Disclosure of D6

Sections 1 and 2.1 of D6 disclose the cold box process in general terms and section 3.1.3 discloses that

- triethylamine (TEA)
- dimethylethylamine (DMEA)
- dimethylisopropylamine (DMIA)

or mixtures thereof can be used as catalysts.

4.3 Distinguishing features

Starting from D6, the subject-matter of claim 1 differs undisputedly in that the catalyst of the cold box process is a blend of at least two tertiary amines, this being:

- DMEA-DMIPA containing from 10 to 30 parts by weight of DMEA to the total of the amine blend,
- DMEA-DEMA containing from 10 to 50 parts by weight of DMEA to the total of the amine blend and
- DMEA-TEA containing from 10 to 50 parts by weight of DMEA to the total of the amine blend.

4.4 Alleged synergistic effect in terms of curing

4.4.1 The patent proprietor argues that a combination of tertiary amines provides a synergistic effect in terms of curing and that the objective technical problem can be seen as providing a binder system having improved curing properties.

This argument is not convincing.

4.4.2 Experimental results in the patent

Concerning the experimental results in tables 1 and 2 of the patent, it is undisputed that the experimental data in tables 1 and 2 of the patent itself are not suitable for demonstrating a synergistic effect, since the theoretical mass of the blend required for 100%

curing as referred to in tables 1 and 2 has been wrongly determined.

In response to this objection, the patent proprietor filed D24 during the opposition proceedings.

4.4.3 Experimental results in D24

The annex of D24 contains a modified version of table 2 of the patent which has been supplemented by further columns:

Mixture DMEA/TEA 20/80									
Amine	Experimental mass (g) of DMEA required for 100% curing	Experimental mass (g) of TEA required for 100% curing	Expected mass (g) of 20/80 DMEA/TEA = 0.2 x Mass (g) of DMEA required for 100% curing + 0.8 x Mass (g) of TEA required for 100% curing, if no mutual influence of each amine on the other	Experimental mass (g) of 20/80 DMEA/TEA blend required for 100% curing	Mass of DMEA in experimental mass (g) of 20/80 DMEA/TEA blend = 0.2 x global experimental mass(g) of 20/80 DMEA/TEA	Mass of TEA in experimental mass (g) of 20/80 DMEA/TEA blend = 0.8 x global experimental mass(g) of 20/80 DMEA/TEA	Ratio of expected curing with this experimental mass of DMEA = (mass of DMEA in experimental mass (g) of 20/80 DMEA/TEA blend) / (experimental mass (g) of DMEA required for 100% curing)	Ratio of expected curing with this experimental mass of TEA = (mass of DMEA in experimental mass (g) of 20/80 DMEA/TEA blend) / (experimental mass (g) of TEA required for 100% curing)	Ratio of total expected curing with this experimental mass of 20/80 DMEA/TEA blend
Resin									
Avecure 373/673	0,3729	0,9464	0,8317	0,612	0,122	0,490	32,8%	51,7%	84,6%
Avecure 353/653	0,3051	1,4560	1,2258	0,936	0,187	0,749	61,4%	51,4%	112,8%
Avecure 333/633	0,3051	1,4560	1,2258	0,792	0,158	0,634	51,9%	43,5%	95,4%
Avecure 331/631	0,3390	1,4560	1,2326	0,936	0,187	0,749	55,2%	51,4%	106,6%
Avecure 363/663	0,2034	0,9464	0,7978	0,360	0,072	0,288	35,4%	30,4%	65,8%

and further experimental results for the following blends of tertiary amines

- 50/50 DMEA/DEMA
- 20/80 DMEA/DEMA
- 10/90 DMEA/DEMA
- 20/80 DMEA/DMIPA
- 20/80 DMEA/DMPA.

According to the patent proprietor, the alleged synergistic effect is apparent from the column "Ratio of total expected curing with this experimental mass ...". A ratio of 100% reflects curing as expected.

A ratio of less than 100% is a sign of a synergistic effect.

For the following reasons, the Board agrees with the opposition division's conclusion that the effects demonstrated in D24 do not render it credible that the synergistic effects with respect to reactivity are achievable over the whole scope of the claim.

A) Doubts generated by D24

The experimental results reported in D24 demonstrate that the choice of amine and also the respective amounts thereof (ratio of amines) have a great impact on the curing properties.

D24 confirms that it is not even possible to achieve a synergistic effect for the same tertiary amine blend (e.g. DMEA/DMPA 20/80) for different products (Avecure xxx/yyy) of the same binder system (the Avecure system):

The last table on page 6 of D24 indeed confirms that, for Avecure 373/673, the "ratio of total expected curing with this experimental mass of 20/80 DMEA/DMPA blend" is clearly below 100% and therefore could be regarded as a sign of a synergistic effect. However, for Avecure 331/631, the same ratio is 102.5%, suggesting a worsening of the curing properties obtained by the blend.

A similar observation can be made for the results for the DMEA/TEA 20/80 blend (first table on page 5). It follows that the results reported in the tables on pages 5 and 6 of D24 vary to a great extent from one resin to the other.

Therefore, D24 supports the Board's understanding that a surprising synergistic effect observed for a specific combination of active ingredients cannot be generalised.

In addition to the experimental results obtained for the "ratio of total expected curing with this experimental mass" which are clearly above and below 100%, the table on page 5 of D24 also reports results which are relatively close to 100%, such as 98.2% (Avecure 363/663, Mixture DMEA/DEMA 20/80).

As argued by opponent 2, it is questionable whether results very close to 100% support the presence of a synergistic effect since the error margin for the experiments is relatively high because the amines are added in 50 µl portions.

The patent proprietor confirms, with reference to paragraph [0057] of the patent, that depending on the reactivity of the amines used as catalyst, the quantity of amines can range from 0.2 ml to 1.5 ml and that the syringe used to inject the amine mixture into the furnace has a volume of 50 µl.

Hence, the error margin for charging a syringe is multiplied by the number of portions required to achieve 100% curing. Moreover, it follows from the fact that the last portion comprises 50 µl that a certain error margin has to be taken into account. The influence of the volume of the portions on the error margin is also confirmed by the table on page 9 of the patent proprietor's reply to appeal. In this table, the patent proprietor presents an overview of the opponent 2's calculated results with addition in 50 µl

portions according to D24 and the corresponding results including an error margin for experiments using a syringe having a volume of only 10 µl.

	Résultats D24	Résultats Opposant O2 50µL	Résultats Titulaire 10µL
	%	%	%
DMEA : DEMA 50 : 50			
336/633	96,2	87,4-106,2	94,4-98,0
331/631	88,1	80,8-96,2	86,6-89,6
363/663	83,8	69,8-98,1	81,0-86,3
DMEA : DEMA 20 : 80			
336/633	79,9	72,7-86,7	78,5-81,2
331/631	96,6	91,0-103,5	95,4-97,9
363/663	98,2	86,0-112,5	95,8-100,8
DMEA : DEMA 10 : 90			
336/633	87,9	81,2-94,7	86,6-89,2
331/631	92,2	87,1-97,8	91,1-93,2
363/663	93,6	81,9-106,3	91,3-95,9
DMEA : TEA 20 : 80			
373/673	84,6	79,6-89,9	83,6-85,6
353/653	112,8	108,5-121,8	111,9-114,4
336/633	95,4	91,1-103,0	94,6-96,8
331/631	106,6	102,6-114,1	105,8-108,0
363/663	65,8	59,3-74,1	64,5-67,2
DMEA : DMIA 20 : 80			
373/673	88,3	80,4-96,1	86,7-89,8
331/631	97,2	91,2-104,3	96,0-98,6
363/663	91,7	80,3-104,3	89,4-93,9
DMEA : DMPA 20 : 80			
373/673	95,8	87,8-104,1	94,2-97,3
331/631	102,5	95-110,0	101,3-103,9
363/663	98,0	85,8-112,4	95,6-100,6

This table confirms that, in the absence of a statistically significant error margin, even examples resulting in a "ratio of total expected curing with this experimental mass" of e.g. 98.2% or higher cannot be considered to show a synergistic effect, since the alleged improvement is considerably smaller than the error margin.

In view of the above, the Board concludes that the further experimental results reported in D24 do not render it credible, for the selected amines used in the experiments, that a blend of tertiary amines in any ratio in any type of resin achieves a synergistic effect in terms of curing.

B) Doubts confirmed by D30

The doubts generated by D24 are further confirmed by D30.

D30 is a declaration by the author of D24. D30 discloses in rows 1, 4 and 5 of table C, the experimental results of D24 regarding the DMEA/DMPA 20/80 blend, see last table on page 6 of D24. However, table C of D30 additionally reports in rows 2 (binder system Avecure 353/653) and 3 (binder system Avecure 333/633) the results of further experiments in relation to a DMEA/DMPA 20/80 blend,

see D24, page 6, last table:

Mixture DMEA/DMPA 20/80									
Amine	Experimental mass (g) of DMEA required for 100% curing	Experimental mass (g) of DMPA required for 100% curing	Expected mass (g) of 20/80 DMEA/DMPA = 0.2 x Mass (g) of DMEA required for 100% curing + 0.8 x Mass (g) of DMPA required for 100% curing, if no mutual influence of each amine on the other	Experimental mass (g) of 20/80 DMEA/DMPA blend required for 100% curing	Mass of DMEA in experimental mass (g) of 20/80 DMEA/DMPA blend = 0.2 x global experimental mass(g) of 20/80 DMEA/DMPA	Mass of DMPA in experimental mass (g) of 20/80 DMEA/DMPA blend = 0.8 x global experimental mass(g) of 20/80 DMEA/DMPA	Ratio of expected curing with this experimental mass of DMEA = (mass of DMEA in experimental mass (g) of 20/80 DMEA/DMPA blend) / (experimental mass (g) of DMEA required for 100% curing)	Ratio of expected curing with this experimental mass of DMPA = (mass of DMPA in experimental mass (g) of 20/80 DMEA/DMPA blend) / (experimental mass (g) of TEA required for 100% curing)	Ratio of total expected curing with this experimental mass of 20/80 DMEA/DMPA blend
Resin									
Avecure 373/673	0,3729	0,4570	0,4402	0,4188	0,0838	0,3350	22,5%	73,3%	95,8%
Avecure 331/631	0,3390	0,7030	0,6302	0,5933	0,1187	0,4746	35,0%	67,5%	102,5%
Avecure 363/663	0,2034	0,3164	0,2938	0,2792	0,0558	0,2234	27,5%	70,6%	98,0%

and D30, page 4, table C:

Table C

20 DMEA / 80 DMPA							
Resin	Optimized required volume of DMEA for 100% curing	Mass of DMEA required for 100% curing = Vopt. x dDMEA = 0,678	Optimized volume of DMPA for 100% curing = Vopt.	Mass of DMPA required for 100% curing = Vopt. x dDMPA = 0.703	Optimized required volume of 20/80 DMEA/DMPA experimental	Experimental mass of 20/80 DMEA/DMPA = Vopt.20/80 x d (d = 0.898 theoretical blend density)	Theoretical mass of 20/80 DMEA/DMPA = 0.2 x mass of DMEA required for 100% curing + 0.8 x mass of DMPA required for 100% curing
373 / 673	0.55	0.3729	0.65	0.4570	0.60	0.4188	0.4402
363 / 663	0.45	0.3051	0.80	0.5624	0.70	0.4886	0.5109
333 / 633	0.45	0.3051	0.80	0.6327	0.80	0.5504	0.5672
331 / 631	0.50	0.3390	1.00	0.7030	0.85	0.5933	0.6302
363 / 663	0.30	0.2034	0.45	0.3164	0.40	0.2792	0.2938

The ratio of total expected curing with this experimental mass of 20/80 DMEA/DMPA blend can also be calculated in a similar manner to D24 (including the error margins as discussed above) for the additional experiments reported in D30, see point [10] of opponent 2's submission dated 28 August 2023.

For the binder system Avecure 353/653, the ratio is 101.5% and for the binder system Avecure 333/633, the ratio is 107.2%.

Mixture DMEA/DMPA 20/80									
Amine	Experimental mass (g) of DMEA required for 100% curing	Experimental mass (g) of DMPA required for 100% curing	Expected mass (g) of 20/80 DMEA/DMPA = 0.2 x Mass (g) of DMEA required for 100% curing + 0.8 x Mass (g) of DMPA required for 100% curing, if no mutual influence of each amine on the other	Experimental mass (g) of 20/80 DMEA/DMPA blend required for 100% curing	Mass of DMEA in experimental mass (g) of 20/80 DMEA/DMPA blend = 0,2 x global experimental mass(g) of 20/80 DMEA/DMPA	Mass of DMPA in experimental mass (g) of 20/80 DMEA/DMPA blend = 0.8 x global experimental mass(g) of 20/80 DMEA/DMPA	Ratio of expected curing with this experimental mass of DMEA = (mass of DMEA in experimental mass (g) of 20/80 DMEA/DMPA blend) / (experimental mass (g) of DMEA required for 100% curing)	Ratio of expected curing with this experimental mass of DMPA = (mass of DMPA in experimental mass (g) of 20/80 DMEA/DMPA blend) / (experimental mass (g) of TEA required for 100% curing)	Ratio of total expected curing with this experimental mass of 20/80 DMEA/DMPA blend
Resin									
353/653	0,3051	0,5656	0,4914	0,09828	0,39312	32,2	69,5	101,7	94,5 - 110,4
325/625	0,2034	0,7777	0,4914	0,09828	0,39312	48,3	50,5	98,9	91,8 - 110,9

The ratio of total expected curing with this experimental mass can be calculated as 101.7% for Avecure 353/653 and 98.9% for Avecure 325/625.

Since a ratio of total expected curing with an experimental mass of about 100% or above indicates the expected or indeed worse curing results, the further experimental results obtained by the patent proprietor itself and submitted by opponent 2 as D30 further confirm, in addition to D24, that a synergistic effect regarding curing cannot be obtained over the claimed scope even for the preferred amine blends (DMEA/DMPA, DMEA/DEMA) in the preferred ratio (20/80).

4.5 Alleged synergy regarding the olfactory properties

4.5.1 The patent proprietor argues that a combination of tertiary amines provides a synergistic effect regarding olfactory properties and that the objective technical problem to be solved can be seen as the provision of a binder system having a less unpleasant odour. In support of this argument, the patent proprietor refers to the olfactory analysis reported on pages 3 and 4 of D24 and the further experimental evidence presented in D24a.

For the reasons set out below, this argument is not convincing. The Board agrees with the opposition division's conclusion that the effects demonstrated in D24 and D24a do not make it credible that the synergistic effect regarding the olfactory properties is achievable over the whole scope of protection.

- 4.5.2 D24 and D24a evaluate the intensity of the odour and the hedonic tone according to VDI 3882 (parts 1 and 2).

These documents demonstrate that an improvement in the olfactory properties can be achieved for a specific amine blend (30/70 DMEA/DMPA blend).

However, the Board is convinced that the perception of odour and the interaction of different odours varies from blend to blend. Even if a specific combination of amines in a specific ratio can be observed to have synergistically improved olfactory properties, the same effect cannot be expected for all combinations of amines and for all ratios thereof, since the interaction of odour molecules cannot generally be extrapolated.

This assessment is confirmed by D26 and D27, which report for a 20/80 DMEA/DMPA blend, hence a blend of the same amines as used for D24 and D24a but in a different ratio, that no synergistic improvement of the odour perception can be observed, see e.g. D27, diagrams on pages 7 and 8 and summary.

The Board therefore concludes that the experimental evidence presented by the patent proprietor does not render it credible that a synergistic effect regarding the olfactory properties can be achieved over the whole scope of the claim.

4.6 Obviousness in view of D6

Since no synergistic effect over the whole scope of the claims has been made credible by the experimental data on file (see discussion above), the objective technical problem in view of D6 has to be formulated in a less ambitious way, namely as the provision of an alternative.

Starting from the teaching in D6 according to which a mixture of tertiary amines is used, the skilled person has to use the amines in a certain amount.

Selecting amines in an arbitrary amount as defined in claim 1 does not require inventive skill but rather falls within the experimental routine of the skilled person.

4.7 Therefore, the subject-matter of claim 1 of auxiliary request 6 is obvious when starting from D6 and does not fulfil the requirements of Article 56 EPC.

5. Auxiliary requests 7 to 11 - inventive step

5.1 The subject-matter of the independent claims according to auxiliary requests 7 to 11 has been tailored, in various levels of generality, to blends of tertiary amines which have been tested in D24 and D24a and D30.

However, as discussed above in point 2.4, no synergy in terms of curing has been demonstrated for the specific blends tested in D24, D24a and D30 (see e.g. 20/80 DMEA/DMPA blend in combination with AVECURE 331/631, AVECURE 353/653, AVECURE 333/633) and is hence not credible for the whole scope of the claim.

The same applies for the synergy in terms of olfactory properties which is not considered to be achievable over the whole scope of protection as demonstrated by D27, see point 2.5 above.

It follows that the subject-matter of claim 1 as defined in auxiliary requests 7 to 11 can be regarded as solving the same objective technical problem as claim 1 of auxiliary request 6.

Hence, the same arguments apply to the subject-matter of auxiliary requests 7 to 11 as to auxiliary request 6.

5.2 Therefore, the subject-matter of claim 1 of each of auxiliary requests 7 to 11 is obvious when starting from D6 and does not fulfil the requirements of Article 56 EPC.

5.3 It follows that the question as to whether auxiliary requests 10 to 11 should be admitted into the appeal proceedings does not need to be addressed.

Order

For these reasons it is decided that:

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

The Registrar:

The Chairman:



C. Spira

C. Herberhold

Decision electronically authenticated