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Datasheet for the decision of 7 June 2024

Case Number: T 2133/21 - 3.3.03

Application Number: 08846432.6

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Language of the proceedings: EN

Title of invention:
POLYURETHANE ADHESIVE COMPOSITIONS HAVING HIGH FILLER LEVELS

Patent Proprietor:
Dow Global Technologies LLC

Opponent:
Sika Technology AG

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

Keyword:
Inventive step (no) - alleged improvement not supported by appropriate evidence - obvious modification (main request and auxiliary requests 1 to 13)
Auxiliary request 14 admitted (no) - reasons for submitting in appeal proceedings (no)

Decisions cited:

T 0035/85, T 0197/86, T 0939/92, T 0234/03, T 0378/03, T 0568/11, T 1457/13, T 1521/13, T 1401/14

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Case Number: T 2133/21 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 7 June 2024

Appellant: (Patent Proprietor)	Dow Global Technologies LLC 2040 Dow Center Midland, MI 48674 (US)
Representative:	Schaad, Balass, Menzl & Partner AG Bellerivestrasse 20 Postfach 8034 Zürich (CH)
Appellant: (Opponent)	Sika Technology AG Zugerstrasse 50 6340 Baar (CH)
Representative:	Sika Patent Attorneys C/o Sika Technology AG Corp. IP Dept. Tüffenwies 16 8048 Zürich (CH)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 2 November 2021 concerning maintenance of the European Patent No. 2207830 in amended form.**

Composition of the Board:

Chairman	D. Semino
Members:	F. Rousseau
	R. Cramer

Summary of Facts and Submissions

I. The appeals lie from the interlocutory decision of the opposition division according to which European patent No. 2 207 830 as amended according to the claims of auxiliary request 3 submitted during the oral proceedings on 14 September 2021 and a description adapted thereto met the requirements of the EPC. The contested decision was also based on the patent as granted as the main request, and auxiliary requests 1 and 2 filed with letter of 1 September 2020.

II. The following documentary evidence was among others submitted before the opposition division:

E4: US 2004/0143055 A1
E5: B. Müller, W. Rath, Formulierung von Kleb- und Dichtstoffen, 1st Edition (2004), Vincentz Network, pages 138-143 and 246-251
E7: Affidavit of Mr. Zhu dated 8 July 2021.

III. According to the reasons for the contested decision which are pertinent for the appeal proceedings:

Main request (patent as granted)

(a) A suitable starting point for assessing inventive step was represented by the composition described in example 1 of E4. Taking into account paragraphs [0012], [0022] and [0038] of the granted patent, the feature *"urethane prepolymers having isocyanate moieties"* of granted claim 1 meant a reaction product of an isocyanate-reactive compound with polyisocyanate, excluding the presence of

additives. On that basis, the composition according to granted claim 1 differed from that of example 1 of E4 in that the amounts used for each of (i) the one or more polyurethane prepolymers having isocyanate moieties, (ii) the one or more compounds containing one or more tertiary amine groups and (iii) the untreated calcium carbonate were higher.

Considering the meaning to be attributed to the feature *"urethane prepolymers having isocyanate moieties"* none of the examples mentioned in the specification was in accordance with granted claim 1. For this reason, an assessment of the suitability of the comparative examples to demonstrate a technical effect was not required and the problem successfully solved over the composition of example 1 of E4 was to be formulated as the provision of an alternative solution to E4.

The amount of one or more urethane prepolymers having isocyanate moieties defined in granted claim 1 overlapped with the amount generally taught in E4. In addition, the amount of one or more compounds containing one or more tertiary amine groups and the amount of untreated calcium carbonate defined in granted claim 1 were within the corresponding amounts generally taught in E4.

The selection of amounts for these three compounds was arbitrary as not resulting in any technical effect and for this reason obvious to the skilled person. Claim 1 of the patent as granted therefore lacked an inventive step.

Auxiliary request 1 (filed with letter of 1 September 2020)

(b) Auxiliary request 1 defined that the one or more urethane prepolymers was prepared by using a mixture of diols and triols as polyols. This amendment did not overcome the finding of lack of inventive step over E4. Even if the effects addressed in declaration E7, i.e. elasticity and rigidity were considered, those were neither mentioned in the patent in suit, nor supported by any experimental evidence, so that the formulation of the problem remained the same. Moreover, the common general knowledge shown in E5 suggested not only the use of a mixture of diols and triols for adhesives and sealants, but also that adhesive sealants for windows needed to be elastic, which could be achieved by using a mixture of diols and triols. Accordingly, claim 1 of auxiliary request 1 was also found to lack an inventive step over E4.

Auxiliary request 2 (filed with letter of 1 September 2020)

(c) Compared to the main request, the insertion in claim 1 that the prepolymers demonstrated a viscosity of 30,000 cP or less led to a lack of clarity, since the measurement method for this parameter was missing.

Auxiliary request 3 (filed during the oral proceedings)

(d) The subject-matter of auxiliary request 3, which corresponded to that of auxiliary request 2 in which the measuring method for the viscosity had been specified, was found to be inventive, since neither E4 nor E5 suggested that limitation of viscosity for the urethane prepolymers.

IV. An appeal was filed by both the patent proprietor and the opponent.

V. With their statement of grounds of appeal, the patent proprietor filed eleven sets of claim requests labelled auxiliary requests 1 to 11 and the following additional documents:

E8: US 2005/0256288 Al
E9: WO 2015/088756 Al.

VI. With their statement of grounds of appeal the opponent filed the following document:

E10: Sames Kremlin, High Viscosity REXON start range, Catalog 03/2017.

VII. With letter dated 22 September 2022, the patent proprietor submitted fourteen sets of claims as auxiliary requests 1 to 14. Auxiliary requests 1 to 4, 6 to 10, 13 and 14 were indicated to correspond to auxiliary requests 1 to 4, 5 to 9, 10 and 11 filed with the statement of grounds of appeal, respectively.

VIII. In preparation of the oral proceedings, a communication pursuant to Article 15(1) RPBA conveying the Board's provisional opinion was issued.

IX. Oral proceedings before the Board were held on 7 June 2024 by videoconference with the participation of both parties.

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

- The patent proprietor requested that the decision under appeal be set aside and the patent be maintained as granted, or alternatively be maintained in amended form on the basis of the claims of one of auxiliary requests 1 to 14 filed with letter of 22 September 2022.

- The opponent requested that the decision under appeal be set aside and that the patent be revoked.

XI. Claim 1 of the main request (patent as granted) reads as follows:

"1. A composition comprising:

(A) from 40 parts to 70 parts by weight based on the weight of the composition of one or more urethane prepolymers having isocyanate moieties;
(B) a catalytic amount of from 0.15 parts by weight to 2.0 parts by weight based on the weight of the composition of one or more compounds containing one or more tertiary amine groups;
(C) from 10 to 35 parts by weight of carbon black; and
(D) untreated calcium carbonate in an amount of 30 to 50 percent by weight based on the total weight of the composition".

XII. Auxiliary requests 1 to 14 differ from the main request in that claim 1 of each of these requests contains a different definition of the urethane prepolymers having isocyanate moieties, inserted at the end of the claim. Those definitions read as follows:

Auxiliary request 1

", the one or more urethane prepolymers being prepared by using a mixture of diols and triols as polyols"

Auxiliary request 2

", the prepolymers demonstrating a viscosity of 30'000 centipoise or less"

Auxiliary request 3

", the prepolymers as prepared demonstrating a viscosity of 30'000 centipoise or less, when measured by the Brookfield Viscometer, Model DV-E with a RV spindle #5 at a speed of 5 revolutions per second and at a temperature of 25°C"

Auxiliary request 4

", the prepolymers demonstrating a viscosity of from 6'000 to 30'000 centipoise"

Auxiliary request 5

", the prepolymers demonstrating a viscosity of from 6'000 to 30'000 centipoise, when measured by the Brookfield Viscometer, Model DV-E with a RV spindle #5 at a speed of 5 revolutions per second and at a temperature of 25°C"

Auxiliary request 6

", the urethane prepolymer having an average isocyanate functionality of at least 2.0"

Auxiliary request 7

", the urethane prepolymer having an average isocyanate functionality of at least 2.0 and a weight average molecular weight of at least about 2'000"

Auxiliary request 8

", the urethane prepolymer having an average isocyanate functionality of from 2.0 to 4.0"

Auxiliary request 9

", the urethane prepolymer having an average isocyanate functionality of from 2.2 to 4.0"

Auxiliary request 10

", the urethane prepolymer having an average isocyanate functionality of from 2.2 to 3.0"

Auxiliary request 11

", the urethane prepolymer having an average isocyanate functionality of from 2.2 to 4.0 and a weight average molecular weight of at least about 2'000"

Auxiliary request 12

", the urethane prepolymer having an average isocyanate functionality of from 2.2 to 3.0 and a weight average molecular weight of at least about 2'000"

Auxiliary request 13

", the polyisocyanates used in preparing the prepolymer having an equivalent weight of at least 80"

Auxiliary request 14

", the one or more urethane prepolymers being prepared by using a mixture of diols and triols as polyols, the polyols being present in an amount of about 75 parts by weight or less based on the weight of the prepolymer".

XIII. The parties' submissions, in so far as they are pertinent to the present decision, may be derived from the reasons for the decision below. The contentious point essentially concerned the question whether the claimed composition was inventive over the composition described in example 1 of E4, in particular having regard to the question whether the compositions designated as examples 4 and 5 in the patent in suit were in accordance with claim 1 of the granted patent.

Reasons for the Decision

Admittance of E8, E9 and E10

1. The submission of documents E8 and E9, which have been submitted by the patent proprietor with their statement of grounds of appeal, and that of document E10 submitted by the opponent with their statement of grounds of appeal, are to be regarded as an amendment to the parties' appeal case within the meaning of Article 12(4) RPBA. Their admittance to the proceedings

is subject to the discretionary power of the Board in accordance with Article 12, paragraphs (4) to (6) RPBA.

1.1 Regarding E8 and E9, these documents have been submitted in order to address the meaning of the term "*urethane prepolymers having isocyanate moieties*" which was at the core of the Reasons for the contested decision, according to which examples 4 and 5 of the patent in suit were not examples in accordance with the invention as defined in granted claim 1 and therefore did not support the patent proprietor's definition of the problem solved over the closest prior art.

Considering that the question of whether examples 4 and 5 of the patent in suit were examples of the claimed invention was undisputedly brought forward for the first time during the oral proceedings before the opposition division, the filing of E8 and E9 by the patent proprietor with their statement of grounds of appeal represents a legitimate and timely reaction of that party. This was not disputed by the opponent acknowledging at the oral proceedings that they had no objections to the admission of documents E8 and E9.

Under these circumstances, the Board exercised its discretion under Article 12(4) RPBA by admitting documents E8 and E9 into the proceedings.

1.2 As regards E10, this document was submitted in response to the introduction into auxiliary request 3 underlying the contested decision of a maximum viscosity value of 30 000 cP for the prepolymers and the argument that it allows the composition to be pumped (statement of grounds of appeal of the opponent, page 6, 5th paragraph). This limitation was already present in auxiliary request 2 filed before the opposition

division on 1 September 2020. Explanations in respect of the relevance of that feature for the assessment of inventive step over example 1 of E4 were also provided in the letter of 1 September 2020 (page 7, last paragraph), further submissions in this respect being made by the patent proprietor with an additional letter of 13 July 2021 (page 7, last two paragraphs). Under these circumstances, there is no valid reason why the opponent should have waited until the appeal proceedings to file E10, but should have submitted this document for discussion before the oral proceedings before the opposition division on 14 September 2021. On that basis, the Board exercised its discretion under Article 12(4) and 12(6) RPBA by not admitting document E10 into the proceedings.

Main request (patent as granted)

2. The only substantive issue to be addressed for the main request is inventive step.

Closest prior art

3. The present invention relates to polyurethane sealant compositions to bond glass, in particular windows, into structures (patent in suit, paragraph [0001]). According to paragraph [0007] of the granted patent, it was an objective of the present invention to provide a composition which contains high levels of fillers and which provides a bonded structure with lap shear strengths, which meets industry standards and which allows for durable adhesion of the composition to the substrate surfaces.

E4 relates to moisture-curing one-pack urethane adhesive compositions used for bonding and sealing, in

particular for bonding automotive window glasses (paragraphs [0002] and [0046]). It is undisputed that the moisture-curing one-pack urethane adhesive composition of example 1 of E4 described in its paragraphs [0030] and [0031] is an appropriate starting point for assessing inventive step of the subject-matter of operative claim 1.

For the sake of conciseness, in what follows the compounds listed under features (A) to (D) of operative claim 1 are referred to as compounds (A) to (D). Example 1 of E4 concerns a composition comprising:

- 37.2 parts by weight based on the total weight of the composition (pbw) of a reaction product of a polyoxypropylene triol with 4,4'-diphenylmethane diisocyanate (MDI) to obtain an isocyanate group-terminated urethane prepolymer having a viscosity of 50 000 mPas,
- 18.6 pbw of diisononyl phthalate (a plasticizer; see paragraph [0037] of the patent in suit)
- 0.093 pbw 2,2'-dimorpholinodiethyl ether (i.e. a component (B) according to operative claim 1; see operative claim 6),
- 27.9 pbw of carbon black (component (C) in operative claim 1) and
- 14.0 pbw of untreated calcium carbonate (component (D) in operative claim 1).

Meaning to be attributed to the wording "urethane prepolymers having isocyanate moieties"

4. A pivotal point in the reasons for the contested decision was that contrary to the patent proprietor's opinion, the feature "*one or more polyurethane prepolymers having isocyanate moieties*" (component (A))

whose amount in operative claim 1 is defined to be from 40 to 70 pbw would not designate a mixture comprising plasticizers in addition to the one or more urethane prepolymers as such. On that basis, the compositions of examples 4 and 5 of the granted patent which do not contain an amount of one or more urethane prepolymers *per se* within said range, but only a total amount of plasticizer and urethane prepolymers within that range would not represent compositions in accordance with claim 1 as granted.

4.1 The patent proprietor brought forward that granted claim 1 does not define component (A) as a "*prepolymer*", but as a "*composition of one or more urethane prepolymers (…)*". In their opinion, component (A) within the meaning of claim 1 should be understood to designate a composition containing one or more urethane prepolymers, which could include in addition to the oligomers formed, also non-reacted monomers, catalysts, stabilizers, as well as components required for improving the processability of the composition, such as plasticizers (statement of grounds of appeal, page 5, section 2.2.1). As a result, the compositions marked as examples 4 and 5 in the specification would be in accordance with the invention defined in granted claim 1, the amount of component (A) being within the range specified in granted claim 1. This interpretation of the term "prepolymer" would not only be supported by the understanding of that term in the present technical field, reference being made to documents E8 and E9, but also by paragraphs [0028] and [0039] of the specification (statement of grounds of appeal, page 5, sections 2.2.2 and 2.2.1, respectively).

This is contested by the opponent. In their opinion, the amount of component (A) of from 40 to 70 pbw refers

to the amount of polymers having isocyanate groups, but not to a reaction mixture comprising said polymers and possibly, additional components. According to the opponent, plasticizers such as diisononyl phthalate are neither urethane prepolymers nor do they have isocyanate moieties (rejoinder, page 4, first to fourth full paragraphs).

4.2 According to the legal approach to claim construction, it is a well-established principle laid down by Board of Appeal case law that a non-specific definition in a claim, here "*prepolymer*", must be given its broadest technical sensible meaning taking into account the context in which it appears, which also includes linguistic considerations.

In the present case, it is as a preliminary remark noted that the patent proprietor's argument referring to component (A) being a "*composition of one or more urethane prepolymers (…)*" is based on a truncated definition of component (A) given in operational claim 1, i.e. an incorrect grammatical analysis of the wording of that claim. The word "*composition*" refers to the composition comprising components (A) to (D). It belongs to the definition of the amount of component (A) "*from 40 parts to 70 parts by weight based on the weight of the composition*". It does not define the nature of the "*one or more urethane prepolymers having isocyanate moieties*".

While it can be agreed with the patent proprietor that technical reality has to be taken into account when reading the term "*prepolymer*" used in granted claim 1, such reading, nevertheless, has to be based on the technical definition given in that claim. In this respect, neither component (A) itself, nor claim 1 is

defined in terms of process features. Claim 1 merely defines a composition in terms of its constituents and their amounts.

On that basis, there is no reason to read into claim 1 that component (A) relates to the product obtained when preparing *the urethane prepolymers having isocyanate moieties prepolymer,* which method could possibly involve the presence of plasticizer.

In the Board's judgment the term "*prepolymer*" is for the skilled person self-explaining, it defines a polymer or oligomer whose molecules are able to undergo further polymerization.

4.3 The patent proprietor's interpretation of the term "*prepolymer*" is also not supported by the technical literature on file. It is referred to the common general knowledge in the present field reflected in the textbook, extracts of which are shown in E5 (see section "*Formulierung*" on pages 138 and 139). In the second full paragraph on page 139, a clear distinction is made between the prepolymer and the typical additives which include plasticizers and stabilizers (10th and 11th lines of the second full paragraph).

E8 cited by the patent proprietor to represent the common general knowledge, which is not the case as E8 is a single patent application, does not support the patent proprietor's position either. While paragraph [0015] of E8 with the use of the wording "*Use of plasticizers in polyurethane prepolymers*", to which the patent proprietor refers, might give the impression that the plasticizer is part of the polyurethane, the subsequent paragraphs [0016] to [0018] make it unambiguous that it is added to the prepolymer, meaning

that the term prepolymer cannot equate with a composition comprising the prepolymer and the plasticizer.

Example 1 of E9, which has been cited in order to show that a small amount of stabilizer could be considered to be part of the prepolymer, is not relevant to answer the question whether the term "*prepolymer*" can designate a composition comprising a mixture of prepolymer as such and a significant amount of plasticizer, as used in the compositions of the patent in suit designated as examples 4 and 5.

4.4 Moreover, the specification taken as a whole does not give grounds for considering the term "prepolymer" to include plasticizers required for improving the processability of the composition, as argued by the patent proprietor.

Firstly, claims 4, 5 and 7 which are dependent on claim 1 define the type of polyol or the type of isocyanate from which the prepolymer is derived, while dependent claim 8 defines "*a composition according to any one of claims 1 to 7 wherein the composition further comprises one or more plasticizers*", which implies that the "*one or more plasticizers*" defined in claim 8 are additional components to components (A) to (D) defined in claims 1 to 7.

This is also confirmed by the structure of the description of the patent in suit in which the prepolymer itself, which is defined preferably to be a reaction product of an isocyanate-reactive compound containing at least two isocyanate-reactive, active hydrogen containing groups with an excess over stoichiometry of a polyisocyanate under reaction

conditions sufficient to form the corresponding prepolymer, is described in paragraphs [0012] to [0022]. The amount of prepolymer is defined in paragraph [0023], including the lower and upper limits defined in granted claim 1, paragraphs [0024] to [0026] defining additional components (B) to (D). Moreover, the prepolymer is defined in paragraph [0012] of the specification to have an average isocyanate functionality of at least 2.0 and a molecular weight (weight average) of at least 2000. Those features are attributes of the prepolymer as such, but not of a mixture of that product with a plasticizer.

The presence of a plasticizer is first defined in paragraph [0028] of the specification, which the patent proprietor sees as supporting their interpretation of the wording "*prepolymer*". Its use in an amount of 0 to 35 pbw is merely defined to be preferable, in accordance with the first occurrence of the feature "plasticizer" in the claims in dependent claim 8. In addition, paragraph [0028] describes that the plasticizer should be compatible with the prepolymer, i.e. it implicitly defines that the plasticizer is not part of the prepolymer. The fact that it can be "*preferably added to the reaction mixtures for preparing the prepolymer*" (third sentence of paragraph [0028]), as noted by the patent proprietor, does not imply that the admixture of prepolymer *per se* and plasticizer will be understood by the skilled person as a prepolymer. This is all the more true since according to the the same sentence the plasticizer can be also added "*to the mixture for preparing the final adhesive composition*".

4.5 The patent proprietor argued in addition at the oral proceedings that the viscosity of the prepolymer

(11160 cP) prepared in the experimental part of the specification (paragraph [0038]), its isocyanate percentage (1.49 pbw), as well as the amount of polyol based on the amount of prepolymer, would be all in the middle of the corresponding ranges defined for these parameters in paragraphs [0017], [0018] and [0020], respectively. This would support the patent proprietor's interpretation of the term prepolymer to refer to the mixture of prepolymer *per se* and plasticizer.

This, in the Board's opinion, is at least questionable for the following reason. Paragraph [0038] describes in its first part the various ingredients used for the preparation of the prepolymer. The last part of that paragraph reads as follows (relevant part underlined by the Board): "*Then, 0.08 g of stannous octoate was added dropwise and slowly. The reaction exothermed and after the reaction temperature peaked, the reaction is held between 80°C and 85°C for 30 minutes. Then, the temperature set point on heating unit is set at 60°C. Thereafter, 501.20 grams of diisononyl phthalate and 15.36 grams of diethyl malonate are added. The mixture is agitated for 60 minutes. Thereafter, the resulting prepolymer is packaged in an air tight container. The prepolymer has a viscosity of 11160 centipoise (25°C) and an isocyanate percentage in the prepolymer is 1.49 percent by weight.*"

The above passage reproduced in italics does not directly and unambiguously describes that the viscosity and the isocyanate percentage obtained were measured on the mixture of prepolymer *per se* and plasticizers. The fact that the term "reaction" is only mentioned in the part underlined by the Board, which is merely followed by the indication that the mixture is agitated for 60

minutes, appears to suggest or at least leaves open the possibility that the prepolymer as such is already obtained before addition of the plasticizers and that the values reported for the viscosity of the prepolymer and its isocyanate percentage have been already measured at that stage.

Accordingly, even if the term "*prepolymer*" as used in the experimental part of the patent in suit, namely in paragraph [0038] ("*the resulting prepolymer is packaged in an air tight container*"), in paragraph [0039] ("*the stated amount of prepolymer*") and in Table 1 is used to designate the mixture of prepolymer as such and plasticizers, the skilled person, in view of the common general knowledge and the other passages of the specification, would be in no doubt that the use of this term is technically inappropriate.

Accordingly, based on the specification as a whole there is no reason to interpret the term "*prepolymer*" as designating the mixture of prepolymer *per se* and plasticizer, if a plasticizer is used for the synthesis of the prepolymer.

4.6 Finally, the interpretation of granted claim 1 sought by the patent proprietor would amount to a rewording of that claim which would be incompatible with a reasonable degree of legal certainty for third parties. Having regard to the unambiguous and technical sensible meaning of a urethane prepolymer indicated in point 4.2 above, the interpretation proposed by the patent proprietor would completely change the object for which protection is sought, as understood not only on its face value, but also taking into account the specification as a whole. It would for example allow the presence of an indefinite proportion of urethane

prepolymer in component (A), i.e. amounts well below the minimum level of prepolymer set out in granted claim 1.

4.7 On that basis, the Board has no reason to deviate from the opposition division's finding according to which the skilled person would read the wording "*urethane prepolymers having isocyanate moieties*" as a reaction product of an isocyanate-reactive compound with polyisocyanates only, i.e. the urethane prepolymers having isocyanate moieties *per se*, excluding any additives such as plasticizers.

Distinguishing features

5. Based on the above meaning of the terminology "*urethane prepolymers having isocyanate moieties*", the parties agreed that the composition of operative claim 1 differs from that of example 1 of E4 in that:

- the one or more urethane prepolymer having isocyanate moieties (component A) is used in a higher amount in the range of 40 to 70 pbw
- the one or more compounds containing one or more tertiary amine groups (component B) is used in a higher amount in the range of 0.15 to 2.0 pbw and
- the untreated calcium carbonate (component D) is used in a higher amount in the range of 30 to 50 pbw.

Problem successfully solved

6. Having regard to the closest prior art, the patent proprietor and the opponent took differing positions as to which problem can be considered to be successfully solved by the subject-matter of granted claim 1.

Relying on the experimental results described in the patent in suit, the patent proprietor argues that the technical problem solved by the subject-matter of claim 1 with respect to the closest prior art is the provision of a composition for a polyurethane adhesive system which can be prepared at relatively low cost and which allows lap shear strengths to be achieved that meet industry standards and provide durable bonds exhibiting a 100% cohesive failure on a broad variety of different substrates, even after exposing it to harsh conditions (statement of grounds of appeal, page 9, second full paragraph and page 16, third full paragraph). Relying on the same experimental results contained in the specification, the patent proprietor submitted at the oral proceedings that the compositions of operative claim 1 exhibited in comparison to that of the closest prior art an improved lap shear strength and an improved degree of adhesion, as characterized by a higher degree of cohesive failure, while being produced at lower cost, due to the use of a higher amount of calcium carbonate (see also statement of grounds of appeal, page 3, last paragraph of section 1.2.1).

The opponent contests that the experimental data of the patent in suit are suitable to demonstrate the purported effects, since they do not relate to compositions falling within the ambit of granted claim 1. It is submitted that the problem solved by the claimed subject-matter is the provision of an alternative adhesive composition (rejoinder, page 3, lines 1 and 2).

6.1 The formulation of the objective problem by the patent proprietor is seemingly defined in absolute terms, i.e. "*which allows lap shear strengths to be achieved that*

meet industry standards and provide durable bonds exhibiting a 100% cohesive failure on a broad variety of different substrates, even after exposing it to harsh conditions". Considering that the question to be answered concerns the problem that is solved over or in comparison with the closest prior art, that formulation of the problem is, as a preliminary remark, questionable. In any event, it follows from the conclusion in point 4.6 above about the meaning to be attributed to the feature "*one or more polyurethane prepolymers having isocyanate moieties*" that the sole experimental evidence relied upon by the patent proprietor, i.e. the compositions described in the experimental part of the specification (reference examples 1 to 3 and examples 4 and 5) does not concern adhesive compositions within the ambit of operative claim 1. Whereas the compositions of reference of examples 1 to 3 do not, for example, comprise calcium carbonate in the amount required by claim 1, those of examples 4 and 5 comprise at most 34 wt% of prepolymer (Reasons for the decision, point 23.1.4). Moreover, it is undisputed that none of the compositions marked as reference examples 1 to 3 in the experimental part of the specification represents a repetition of example 1 of E4.

On that basis, the patent proprietor did not submit direct evidence that the adhesive compositions defined in operative claim 1 successfully solve the problem formulated by the patent proprietor, be it defined in absolute terms or by comparison with the closest prior art.

6.2 Furthermore, the fact that the reference examples are not a repetition of example 1 of E4 itself does not necessarily invalidate the comparative tests offered by

the patent proprietor, since the possibility of using a comparison made with a variant of the closest prior art has been recognized by the Boards of Appeal as early as in T 35/85. According to point 4 of the Reasons for said decision the patentee may discharge his onus of proof by voluntarily submitting comparative tests with newly prepared variants of the closest state of the art making identical the features common with the invention in order to have a variant lying closer to the invention, so that the advantageous effect attributable to the distinguishing features of the invention is thereby more clearly demonstrated. The same principle was applied in the decisions cited by the patent proprietor on page 14 of their statement of grounds of appeal (T 197/86, OJ EPO 1989, 371; T 234/03; T 378/03; T 568/11; T 1457/13; T 1521/13 and T 1401/14).

Even if none of reference examples 1 to 3 represents a repetition of the closest prior art and none of the compositions marked as examples 4 and 5 are within the scope of operative claim 1, this does not in principle mean that the comparison offered by the patent proprietor is not suitable to demonstrate the advantages allegedly obtained with the claimed subject-matter vis-à-vis the closest prior art. There are situations in which a causal link established between a technical effect and a feature distinguishing the claimed subject-matter from the closest prior art on the basis of two embodiments which lie outside of the claimed subject-matter, none of them being a repetition of the closest prior art either, may well be evidence that said distinguishing feature (or modification) applied to the closest prior art and leading to the claimed subject-matter would result in said technical effect.

This, however, requires as an additional condition that the result demonstrated on the basis of such test can be reasonably extrapolated to a modification of the closest prior art which leads to the claimed subject-matter. This would mean in the present case to modifications which lead at the same time not only to an amount of untreated calcium carbonate as defined in operative claim 1, but also an amount of one or more urethane prepolymers having isocyanate moieties and an amount of one or more compounds containing one or more tertiary amine groups both in accordance with the ranges defined in operative claim 1.

6.3 Concerning the case at hand, it is apparent that a comparison of "example 5" with any of reference examples 1 to 3 cannot demonstrate the combined effect of all three above mentioned distinguishing features, since an increase of the proportion of calcium carbonate between the reference examples and example 5 is accompanied by a decrease of the proportion of prepolymer (within the meaning indicated in point 4.6 above) and a decrease of the amount of JEFFCAT^{TM} DMDEE (compound containing more than one tertiary amine group). The same is valid for a comparison of reference example 1 or 2 with "example 4".

Concerning a comparison of "example 4" with reference example 3, the amounts of prepolymer and carbon black remain about the same while an increase of the amount of calcium carbonate is accompanied by a decrease of the amount of plasticizer, i.e. the addition of calcium carbonate is compensated by a corresponding diminution of the amount of plasticizer. The amount of compound containing more than one tertiary amine group is, however, significantly decreased.

Accordingly, none of the comparisons offered by the patent proprietor is suitable to demonstrate the effect resulting from the combined three distinguishing features identified above. Under these circumstances, it is not necessary to consider whether such effect could be reasonably extrapolated to a modification of the closest prior art leading to the claimed subject-matter, i.e. also to a concomitant increase of the amount of one or more urethane prepolymers having isocyanate moieties and of the amount of one or more compounds containing one or more tertiary amine groups.

6.4 The patent proprietor argues that none of the decisions cited in point 6.2 above requires an effect to be shown for each and every distinguishing feature, as long as it is shown for one distinguishing feature. This argument is in the Board's opinion not convincing for the following reasons:

- Firstly, the patent proprietor has not explained why the situation underlying the decisions cited is similar to the present case in which several variables are changed vis-à-vis the closest prior art, in particular when the influence of the additional distinguishing features on the alleged technical benefit has not been determined.

- Secondly, in the present case multiple variables were changed simultaneously, but not in the direction leading to the claimed subject-matter, as indicated above.

- Thirdly, no general rule exists according to which showing an effect for only one distinguishing feature is sufficient. This might be valid in a situation in which a technical effect exerted by one distinguishing

feature is not influenced by the additional distinguishing features. In such a case, it could indeed be accepted that despite the additional modifications made to the closest prior art to achieve the claimed subject-matter, said technical effect is obtained. This presupposes, however, that it is credible that the additional modifications operated vis-à-vis the closest prior art, i.e. the other distinguishing features, do not exert an adverse outcome, as far as the same technical result is concerned. In the present case, however, no submissions were made as to whether a simultaneous increase of the amount of prepolymer and of the amount of compound containing one or more than one tertiary amine group up to the levels defined in operative claim 1 would not impair the technical effect allegedly resulting from the addition of calcium carbonate.

- Moreover, whereas it is known that replacing a part of carbon black by untreated calcium carbonate will reduce the cost of the adhesive (E5, page 250, passage immediately following the table), there are no explanations as to why increasing at the same time the proportion of urethane prepolymer having isocyanate moieties and that of the one or more compounds containing one or more tertiary amine groups to the levels defined in operative claim 1 would necessarily reduce the costs of the adhesive.

6.5 The patent proprietor argued at the oral proceedings that an increase of the amount of calcium carbonate would necessarily need to be compensated by a decrease of the amount of another component of the composition to be tested, which would make it impossible to submit adequate tests showing the alleged improvement. This

would be requiring from the patent proprietor to square the circle.

This is not convincing. The influence of an increase of the amount of calcium carbonate alone could well be established by keeping constant the proportion between the other components, i.e. by decreasing the amount of the other components in proportion to their amounts in the reference composition. The patent proprietor was under no obligation to submit tests of the type similar to those contained in the patent in suit. As another possibility to empirically demonstrate the benefits alleged by the patent proprietor, it would have been possible to submit a number of adhesive compositions falling slightly outside or within the ambit of granted claim 1.

6.6 According to the established case law of the boards of appeal, alleged advantages to which the patent proprietor merely refers, without offering sufficient evidence to support the comparison with the closest prior art, cannot be taken into consideration in determining the problem underlying the invention and therefore in assessing inventive step (Case Law of the Boards of Appeal of the European Patent Office, 10th edition, 2022, I.D.4.3.1).

On that basis, the problem successfully solved by the subject-matter of claim 1 over the closest prior art is to be formulated as the provision of a further adhesive composition, in line with the finding of the opposition division.

Obviousness of the solution

7. It remains to be decided whether the skilled person desiring to solve the problem identified above would, in view of the disclosure of E4, possibly in combination with other prior art documents or with common general knowledge, have modified the adhesive composition of the closest prior art in such a way as to arrive at the adhesive composition of operative claim 1.

7.1 As pointed out in point 23.7 of the reasons for the contested decision the amounts defined in operative claim 1 for the prepolymer, the one or more compounds containing one or more tertiary amine groups and the untreated calcium carbonate, are all within the amounts taught in E4, i.e. in its paragraphs [0013], [0021] and [0024], respectively.

It follows from the above analysis that for the prepolymer, the one or more compounds containing one or more tertiary amine groups and the untreated calcium carbonate, the selection of the respective amount defined in operative claim 1 from the amounts respectively suggested in E4, is arbitrary in the sense that it not critical for solving the problem underlying the patent in suit. On this basis, starting from the adhesive composition of E4, the use of a different amount for the prepolymer, the one or more compounds containing one or more tertiary amine groups and the untreated calcium carbonate, as defined in operative claim 1, which are selected from the general teaching of E4, is an obvious measure for the skilled person faced with the problem of providing a further adhesive composition.

7.2 The patent proprietor submitted in section 3.2.1 of their statement of grounds of appeal that there is nothing in the passages of E4 relied upon by the opponent that would encourage the skilled person to use only carbon black and calcium carbonate as fillers. It is also submitted that the skilled person starting from example 1 of E4 would have been cautious of adding high amounts of fillers, since according to the general doctrine this could compromise the initial strength and the long-term adhesion to the substrate, contrary to the goals set out. In the patent proprietor's opinion, even if the skilled person had considered increasing the amount of fillers, there would have been no reason to change the weight ratio of carbon black to calcium carbonate. Moreover, the skilled person would have found no motivation in the prior art to adapt in addition the amount of urethane prepolymer and catalyst (i.e. the one or more compounds containing one or more tertiary amine groups) to fall within the ranges defined in operative claim 1. In the patent proprietor's view, there would be no suggestion that a composition could be obtained, which has a high filler content but nevertheless exhibits favourable adhesion and structural properties.

These arguments are also not convincing. According to the case law of the boards of appeal, the answer to the question what a skilled person would have done in the light of the state of the art depends to a large extent on the technical result he/she has set out to achieve (see T 0939/92, reasons 2.4.2 and 2.5.3). Confronted with the problem identified in above point 6.6, i.e. providing a further adhesive composition, regardless of whether it exhibits or not both an improved lap shear strength and an improved degree of adhesion, the skilled person would have considered any measure taught

in E4. Thus, the act of choosing arbitrary amounts such as those defined in operative claim 1 from the broader ranges defined in E4, which requires no more than routine experimentation, was an obvious measure for the skilled person. Regarding the combined use of carbon black and calcium carbonate as fillers, such combination is already used in the closest prior art, and therefore already suggested in that document.

7.3 Consequently, the skilled person starting from the adhesive composition of example 1 of E4 and wishing to provide a further adhesive composition, would have been guided by the available prior art to adhesive compositions that fall within the ambit of operative claim 1. Thus, present claim 1 contains embodiments that are obvious in view of the prior art.

8. As a result, the patent proprietor's main request is not allowable for lack of inventive step pursuant to Article 56 EPC and the ground for opposition under Article 100(a) EPC prejudices maintenance of the patent as granted.

Auxiliary request 1

9. The subject-matter of claim 1 of auxiliary request 1 differs from that of claim 1 of the main request in that the one or more urethane prepolymers are defined to be prepared by using a mixture of diols and triols as polyols. It is undisputed that this amendment introduces an additional feature over the closest prior art in which the polyol used for preparing the prepolymer is a triol.

Problem successfully solved

10. Based on declaration E7 the patent proprietor submitted that the additional use of diols for the preparation of the prepolymer would result in an increased elasticity of the final (i.e. cured) product, while simultaneously the triols used in the closest prior art would provide increased strength and rigidity owing to the higher cross-linking density achieved in the final product. This technical effect would be plausible and linked to a technical explanation, which would be readily understood and accepted by the skilled person (statement of grounds of appeal, page 20, section 4.1, second paragraph).

In addition, also based on declaration E7 the patent proprietor submitted that the viscosity of an adhesive composition containing a prepolymer obtained by using a mixture of diols and triols is lower than for a corresponding composition in which the prepolymer is replaced by one prepared using only a triol as polyol. This would also be shown by a comparison between the viscosity value of 50 000 mPas (cP) for the prepolymer in example 1 of E4 and that of 11000 cP for the working examples of the present invention (statement of grounds of appeal, paragraph bridging pages 20 and 21).

The problem alleged to be solved by the adhesive of operative claim 1 over closest prior art is indicated by the patent proprietor on page 21 of the statement of grounds of appeal, third full paragraph, this formulation being supplemented by the indication at the oral proceedings that the strength and rigidity of the cured adhesive composition was not increased by the addition of diols in the formation of the prepolymer, but sufficiently maintained.

On that basis, the patent proprietor submits in essence that the problem solved over the closest prior art by the adhesive composition of operative claim 1 would reside in the provision of an adhesive composition which is more easily pumped by conventional techniques and leads to a cured adhesive composition having improved elasticity and sufficient strength maintained.

10.1 As a preliminary remark, it is noted that the need to produce a cured product having a certain degree of elasticity is part of the technical teaching of the patent in suit, as is shown in table 2 in which the physical properties of the cured compositions of reference examples 1 to 3 and "examples" 4 and 5 have been indicated, including tensile strength and elongation, i.e. properties characterizing the elasticity of a material. Accordingly, contrary to the position of the opponent (rejoinder, page 5, third paragraph of section 2), the Board concludes that the elastic behaviour of the cured product can be taken into account for assessing inventive step of the subject-matter defined in auxiliary request 1.

Moreover, the increased elasticity resulting from the addition of diols to triols relied upon by the patent proprietor belongs to the common general knowledge. In the Board's opinion, it is common general knowledge in the field of polymers that an increase of the crosslinking density results in a stiffer material (i.e. an increased strength and rigidity), or inversely concerning the case at hand that a reduction of the crosslinking density leads to a more elastic material.

This is in particular described for the present technical field in E5 which comprises excerpts of a

text book about polyurethane formulations for adhesives and sealants, in particular for car windows (page 246, section 1.3; page 247, second paragraph and page 138, section 2.2.1.4.2, second paragraph). The last full paragraph of section 1.3 on page 246 makes it unambiguous that elastic adhesives with a sealing function are necessary for car windows in view of the different thermal expansions of steel and glass. The common general knowledge concerning the use of a mixture of diols and triols to control the crosslinking density of polyurethane adhesive compositions is reflected in E5 (page 138, section 2.2.1.4.2, second paragraph; page 247, second full paragraph), i.e. the use of diols is expected to decrease the crosslinking density and therefore the elasticity of the cured adhesive.

However, in the absence of any limit concerning the proportion of diols and triols used for the preparation of the prepolymers, it cannot be expected that the sufficient strength will be maintained by addition of diols, contrary to the patent proprietor's allegation.

10.2 Concerning the viscosity of the adhesive composition, while in some cases a replacement of the triol component by a diol component to prepare the urethane a prepolymer might lead to a decrease of the viscosity of the product obtained, no explanation has been provided as to why this should be generally the case. In this respect, no evidence has been provided that all things being equal, the substitution of some of the triol used in the closest prior art by a diol necessarily results in a decrease of the viscosity of the urethane prepolymer prepared. Known general principles on which this declaration is based have not been indicated by the patent proprietor, let alone supporting evidence

submitted in this respect. In particular, taking into account the principle underlying the decisions cited in point 6.2 above, the comparison of the viscosity for the prepolymer of example 1 of E4 and those of the working examples of the specification, which has been offered as evidence by the patent proprietor, has not been shown to be adequate to demonstrate a causal link between the presence of a diol and a reduction of the viscosity. Accordingly, in the absence of corroborating evidence, the decrease of viscosity of the urethane prepolymer allegedly brought about by the use of a diol for its synthesis is a mere speculation which cannot be taken into account for the formulation of the problem successfully solved over the closest prior art (Case Law, supra, I.D.4.3.1).

10.3 On that basis, taking into account the additional distinguishing feature over the closest prior art, the problem successfully solved by the composition of auxiliary request 1 claim 1 resides in the provision of a cured adhesive material which has higher elasticity.

Obviousness of the solution

11. The common general knowledge supporting the formulation of the problem identified in section 10.1 above, according to which the elastic character of adhesive sealants for car windows can be controlled by the crosslinking density of the cured polyurethane adhesive composition, which is achieved in using a combination of diol(s) and triol(s), would have prompted the skilled person faced with said problem to further modify the adhesive composition of the closest prior art by using a diol in addition to the triol employed for the preparation of the urethane prepolymer. Thereby, one skilled in the art starting from the

closest prior art would have arrived in an obvious way at an adhesive composition defined in operative claim 1.

12. The subject-matter of claim 1 of auxiliary request 1 does therefore not involve an inventive step within the meaning of Article 56 EPC with the consequence that this request is not allowable either.

Auxiliary requests 2 and 3

13. The subject-matter of claim 1 of auxiliary requests 2 and 3 differs from that of claim 1 of the main request in that the prepolymer is defined to have a viscosity of 30000 cP or less. Compared to auxiliary request 2, auxiliary request 3 defines in addition the method for determining the viscosity, i.e. by the Brookfield Viscometer, Model DV-E with a RV spindle #5 at a speed of 5 revolutions per second and at a temperature of 25°C.

It is also undisputed that this amendment introduces an additional differentiating feature over the closest prior art in which the prepolymer has a viscosity of 50000 cP.

13.1 The patent proprietor submits in essence that this maximum limit for the viscosity of the prepolymer would allow the composition to be pumped and to be applied using conventional techniques, which would not be the case for the prepolymer prepared according to example 1 of E4 having a higher viscosity. The patent proprietor additionally argued at the oral proceedings that the claimed composition would have improved shelf life.

13.2 While it is not disputed that the prepolymer in accordance with operative claim 1 has a lower viscosity than that used in example 1 of E4, it has to be taken into account that the viscosity of the adhesive composition does not only depend on that of the prepolymer, but also on the other components, including an optional plasticizer whose use is not excluded by the wording of claim 1, and their amount relative to the amount of the prepolymer. This is self-evident for the skilled person. There is furthermore no evidence on file showing that the maximum limit of viscosity of 30000 cP defined for the urethane prepolymer of present claim 1 is critical for the ability to pump and apply the adhesive composition using conventional techniques or for its shelf life. There is therefore no reason to consider that the additional features contained in auxiliary requests 2 and 3 result in a different formulation of the problem solved over the composition described in example 1 of E4.

Accordingly, the upper limit for the viscosity value of the prepolymer defined in claim 1 of auxiliary requests 2 and 3 whose selection is arbitrary cannot render the claimed composition inventive. In any event, it would be obvious for a skilled person to reduce the viscosity of one of the components of a composition, should the viscosity of the overall composition be considered to be too high for handling it.

Accordingly, the subject-matter of claim 1 of auxiliary requests 2 and 3 is not inventive, contrary to the requirements of Article 56 EPC.

Auxiliary request 4

14. Auxiliary request 4 corresponds to auxiliary request 2 in which the viscosity of the prepolymer is additionally defined by a minimum value of 6000 cP. The patent proprietor submits that this minimum value of the viscosity allows the composition to have sufficient integrity, allowing the adhesive composition to be utilized in desired applications, in which sagging of the material must be avoided.

However, as noted by the opponent, no evidence has been provided that this minimum value of the viscosity for the prepolymer is critical for this alleged technical benefit. On that basis, the patent proprietor's contention with respect to the criticality of the minimum value of the viscosity of the prepolymer remains speculative and cannot be taken into consideration in determining the problem successfully solved over the closest prior art (Case Law, supra, I.D.4.3.1). The threshold of viscosity of the prepolymer required in operative claim 1 is therefore deemed to be an arbitrary limit which cannot confer to the composition defined in said claim an inventive character.

In view of the above, auxiliary request 4 whose claim 1 does not meet the requirements of Article 56 EPC is not allowable.

Auxiliary request 5

15. Auxiliary request 5 corresponds to auxiliary request 4 in which the method to measure the viscosity has been introduced. It was undisputed that this amendment only aims at overcoming a clarity objection and has no

impact on the assessment of inventive step given in respect of auxiliary request 4. Accordingly, auxiliary request 5 is not allowable either.

Auxiliary requests 6 and 7

16. Auxiliary request 6 differs from the main request in that the urethane prepolymer is defined to have an average isocyanate functionality of at least 2.0. Auxiliary request 7 corresponds to auxiliary request 6 with the additional requirement that the urethane prepolymer has a weight average molecular weight of at least about 2000.

16.1 Based on the indication of a hydroxyl number of 25.0 for the triol used in example 1 of E4, it is undisputed that said triol has a molecular weight of 6733 g/mol (rejoinder of the opponent, page 10/14, section 7, fourth paragraph). As a result, the isocyanate group-terminated urethane prepolymer obtained in example 1 of E4, which is the reaction product of that triol with MDI, exhibits a weight average molecular weight in accordance with operative claim 1.

16.2 Concerning the isocyanate functionality of the urethane prepolymer obtained in example 1 of E4, the opponent submits that said prepolymer is obtained using an excess of MDI. This is undisputed, in line with the teaching in paragraph [0010] of E4. As a result, it is undisputed that the average isocyanate functionality of the prepolymer must be at least 2.0. Accordingly, the patent proprietor's argument that a urethane prepolymer having an average isocyanate functionality of at least 2.0 is nowhere disclosed or suggested in the state of the art cited (statement of grounds of appeal, page 26, section 4.6, second paragraph) is not persuasive, all

the more since according to declaration E7 submitted by the patent proprietor the isocyanate functionality of the prepolymer of example 1 of E4 would most likely be far higher than 3.0 (see point 17 below).

16.3 Accordingly, the definition of a weight average molecular weight of at least about 2000 and of an average isocyanate functionality of at least 2.0 do not represent further distinguishing features over the closest prior art with the consequence that these amendments have no impact on the reasoning given for claim 1 of the main request. On that basis the subject-matter of claim 1 of both auxiliary requests 6 and 7 is not inventive either. Those auxiliary requests are therefore not allowable.

Auxiliary requests 8, 9 and 10

17. Auxiliary requests 8, 9 and 10 differ from the main request in that the urethane prepolymer is defined to have an average isocyanate functionality of from 2.0 to 4.0, 2.2 to 4.0 and 2.2 to 3.0, respectively.

17.1 At the oral proceedings, based on declaration E7 the patent proprietor contented that the urethane prepolymer defined in operative claim 1 of any of auxiliary requests 8 to 10 would have a lower isocyanate functionality than the prepolymer obtained in example 1 of E4. This would constitute a further distinguishing feature vis-à-vis the closest prior art. According to declaration E7, the isocyanate functionality of the urethane prepolymer of example 1 of E4 would most likely be far higher than 3.0 owing to the fact that in reality a part of the MDI molecules capping the hydroxyl group of the triol molecules would by their free terminal isocyanate group react with

further triol molecules, leading to triol dimers, or even trimers. This was contested by the opponent arguing that triol molecules which had already reacted with MDI were bulkier and therefore less likely to react with other triol molecules when a excess of MDI is used.

17.2 As agreed by the parties during the oral proceedings, such triol dimers and trimers would have an isocyanate functionality of 4 and 5, respectively. Whereas an average isocyanate functionality of the prepolymer higher than 3.0 would already be obtained with fully reacted triol monomers and a small proportion of dimers, an average isocyanate functionality of the prepolymer higher than 4.0 would actually mean that the vast majority of the prepolymer molecules are dimers or trimers. The Board notes that E7 does not indicate that prepolymers having a degree of polymerization higher than 3 (tetramers and higher) are obtained in example 1 of E4 or that an average isocyanate functionality of the prepolymer higher than 4.0 is obtained. This is in the Board's opinion rather doubtful.

17.3 Even if to the benefit of the patent proprietor, it were considered that an average isocyanate functionality of the prepolymer within the ranges defined in claim 1 of any of auxiliary requests 8 to 10, i.e. from 2.0 to 4.0, 2.2 to 4.0 or 2.2 to 3.0, constitutes a further distinguishing feature over the closest prior art, such distinguishing feature would not be associated with an inventive activity, as explained below.

17.3.1 It is at this juncture useful to address the relationship between the functionality of the polyol used for the synthesis of the prepolymer and the

average isocyanate functionality of the obtained prepolymer, taking into account that the prepolymer is prepared both in the patent in suit (paragraph [0012]) and in E4 (paragraph [0010] and example 1) by reacting a compound having isocyanate-reactive, active hydrogen containing groups with an excess over stoichiometry of a polyisocyanate compound.

In such a context of an excess of a polyisocyanate compound used for the preparation of the prepolymer, the replacement of part of the triol used for the preparation of the prepolymer like in example 1 of E4 by a diol results in a decrease of the average isocyanate functionality of the urethane prepolymer, as was correctly pointed out by the opponent during the oral proceedings. It is also correct, as indicated by the opponent, that the use of the sole diol in the context of an excess of diisocyanate leads to an average isocyanate functionality of the prepolymer of 2.0. This means that the replacement of part of the triol by the diol in preparing the urethane prepolymer leads in the context of an excess of diisocyanate to an average isocyanate functionality of the prepolymer which is below that obtained in example 1 of E4 (only triol), but above 2.0.

Accordingly, starting from example 1 of E4 and partially replacing the triol used for the preparation of the urethane prepolymer by a diol, the ranges defined for the average isocyanate functionality of the prepolymer from 2.0 to 4.0, 2.2 to 4.0 or 2.2 to 3.0 correspond to different ranges for the ratio of the amounts of triol(s) and diol(s).

17.3.2 The patent proprietor submits in relation to auxiliary request 8 that by defining the upper limit of the

average isocyanate functionality to 4.0, an adhesive too viscous to handle and unwanted brittleness can be avoided (statement of grounds of appeal, page 26, section 4.6, third paragraph). These are the same effects invoked in relation to auxiliary request 1 which is alleged to be caused by the replacement in example 1 of E4 of some of the triol used for the preparation of the urethane prepolymer by a diol, namely a decrease of the viscosity of the adhesive and an increase of the elasticity. It is in this respect noted that an increase of the crosslinking degree results in a reduction of the elasticity (see point 10.1 above) and therefore an increase of brittleness.

17.3.3 Accordingly, the reduction of the average isocyanate functionality of the urethane prepolymer vis-à-vis the closest prior art would not only correspond to a reduction of the functionality of the polyol by replacing part of the triol by a diol, as defined in claim 1 of auxiliary request 1, but is also alleged by the patent proprietor to produce the same effects as those invoked in relation to auxiliary request 1. It follows that the analysis given in respect of claim 1 of auxiliary request 1 applies *mutatis mutandis* to claim 1 of auxiliary requests 8 to 10. In view of the obvious relationship for the skilled person between the average isocyanate functionality of the urethane prepolymer and the functionality of the polyol used for the preparation of the urethane prepolymer, as shown in point 17.3.1 above, the additional selection of a range of the average isocyanate functionality of the urethane prepolymer as defined in claim 1 of any of auxiliary requests 8 to 10 in order to provide a certain degree of brittleness or elasticity is deemed an obvious measure for the skilled person.

17.4 Consequently, the subject-matter of claim 1 of any of auxiliary requests 8 to 10 also lacks an inventive step and these requests are not allowable.

Auxiliary requests 11 and 12

18. Auxiliary requests 11 and 12 correspond to auxiliary requests 9 and 10 found to lack an inventive step, wherein in addition the urethane prepolymer is defined to have a weight average molecular weight of at least about 2000. As indicated in point 16.3 above, the definition of a weight average molecular weight of at least about 2000 for the urethane prepolymer does not represent a distinguishing feature over the closest prior art with the consequence that this amendment has no influence on the reasoning given for claim 1 of auxiliary requests 9 and 10. The subject-matter of claim 1 of both auxiliary requests 11 and 12 is therefore not inventive either and these auxiliary requests are consequently not allowable.

Auxiliary request 13

19. Auxiliary request 13 differs from the main request in that claim 1 defines that the polyisocyanates used in preparing the prepolymer have an equivalent weight of at least 80. The opponent's objection that MDI used as polyisocyanate for the preparation of the prepolymer in example 1 of E4 has an equivalent weight of 125, i.e. within the range of at least 80 defined in auxiliary 13, was not disputed by the patent proprietor. Therefore the added feature is not a further distinguishing feature vis-à-vis the closest prior art. Accordingly, the reasoning given for claim 1 of the main request, including its conclusion, equally applies

to claim 1 of auxiliary request 13 which is thus not allowable.

Auxiliary request 14

20. Auxiliary request 14 submitted with the statement of grounds of appeal of the patent proprietor as auxiliary request 11 corresponds to auxiliary request 1 submitted with letter of 1 September 2020 (corresponding to the claims as granted with the additional feature that the one or more urethane prepolymers are prepared by using a mixture of diols and triols as polyols, i.e. a first amendment), supplemented by the feature that the polyols are present in an amount of about 75 parts by weight or less based on the weight of the prepolymer, i.e. a second amendment. The filing of auxiliary request 14 is seen by the patent proprietor as a response to the new point raised during the oral proceedings that examples 4 and 5 did not fall under claim 1 as granted.

20.1 The reasons for examples 4 and 5 being not in accordance with claim 1 as granted concerned the definition of the prepolymer, i.e. whether or not it included the plasticizer used for its preparation. The second amendment mentioned above, however, is not designed to have examples 4 and 5 falling within the definition of the claims, but to add a further distinguishing feature over the prior art, like the first amendment defining a mixture of diols and triols as polyols, which was already present in former auxiliary request 1, or any of the other amendments of the definition of the urethane prepolymer such as its average isocyanate functionality already introduced before the opposition division.

20.2 On that basis, the Board finds that the only argument provided by the patent proprietor to justify admittance of auxiliary request 14 does not hold and therefore that there is no justification for filing a further auxiliary request with a further amendment not converging with the previous ones only at the appeal stage. Under these circumstances, the Board exercises its discretion under Article 12(4) and 12(6) RPBA by not admitting auxiliary requests 14 into the proceedings.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

D. Hampe D. Semino

Decision electronically authenticated