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**Datasheet for the decision
of 14 September 2018**

Case Number: T 1237/15 - 3.3.09

Application Number: 07810197.9

Publication Number: 2046909

IPC: C09J201/10

Language of the proceedings: EN

Title of invention:

Silane functional adhesive composition and method of bonding a window to a substrate without a primer

Patent Proprietor:

Dow Global Technologies LLC

Opponent:

Sika Technology AG

Headword:

Relevant legal provisions:

EPC Art. 54, 56

Keyword:

Late-filed documents - admitted (yes)

Novelty - (yes)

Inventive step - (yes)

Decisions cited:

Catchword:



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Case Number: T 1237/15 - 3.3.09

D E C I S I O N
of Technical Board of Appeal 3.3.09
of 14 September 2018

Appellant: Sika Technology AG
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Representative: Sika Technology AG
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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 10 April 2015
rejecting the opposition filed against European
patent No. 2046909 pursuant to Article 101(2)
EPC**

Composition of the Board:

Chairman W. Sieber
Members: J. Jardón Álvarez
D. Prietzel-Funk

Summary of Facts and Submissions

- I. This decision concerns the appeal filed by the opponent against the decision of the opposition division to reject the opposition filed against European patent No. 2 046 909.
- II. The opponent had requested revocation of the patent in its entirety on the grounds that the claimed subject-matter was neither novel nor inventive (Article 100(a) EPC).

The documents cited during the opposition proceedings included:

D1: WO 03/000775 A2;

D2: US 2002/0100550 A1;

D6:I. Hasegawa *et al.*, "Polymerization of Hydrolysis Products of Methyltriethoxysilane in Aqueous Solutions", *Nippon Seramikkusu Kyokai Gakujutsu Ronbunshi* 98 [7] 1990, pages 647 to 652; and

D7:Repetition of the preparation of Oligomer 11 in **D1** (4 pages, filed by the opponent with letter of 24 February 2015 as "Annex I" and renumbered by the board as D7).

- III. The granted patent included fourteen claims. Independent claims 1, 10 and 14 read as follows:

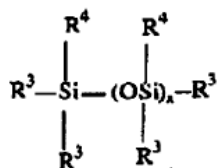
"1. An adhesive composition comprising

one or more polymers having a flexible backbone and silane moieties capable of silanol condensation;

one or more hydrophobic silanes having one or more hydrocarbyloxy groups and one or more hydrocarbyl groups, and

one or more catalysts for the reaction of silane moieties [sic] with active hydrogen containing compounds;

wherein the hydrophobic silane corresponds to the formula.



wherein

R³ is separately in each occurrence a hydrocarbyl or hydrocarboxy group;

R⁴ is separately in each occurrence a hydrocarbyl group; and

x is separately in each [sic] occurrence [sic] an integer of about 1 to about 9."

"10. A method of bonding glass to a painted substrate which comprises

- A) applying an adhesive composition according to any one of Claims 1 to 9 to either of glass or the unprimed painted substrate;
- B) contacting the glass and the unprimed painted substrate such that the adhesive is disposed between the painted substrate and the glass: and
- C) allowing the adhesive to cure to bond the glass to the painted substrate."

"14. A window structure comprising a window bonded to a frame or a flange adapted to hold the window in place by means of an adhesive wherein the adhesive used to

bond the window to the flange or frame corresponds to the adhesive composition of any one of Claims 1 to 9."

The remaining claims were dependent claims.

IV. The reasoning of the opposition division may be summarised as follows:

- The late-filed documents D6 and D7 filed with letter of 24 February 2015 were not admitted into the proceedings. The opponent had failed to show that D7 (and D6 used for interpreting ²⁹Si-NMR data) were *prima facie* relevant for the outcome of the proceedings.
- Neither sealant 6 in D1, nor examples 55 to 57 of D2 were novelty-destroying for the subject-matter of claim 1.
- The claimed subject-matter involved an inventive step starting from D2 as the closest prior art. The technical problem to be solved was "to provide further adhesives and sealants prone to bond glass substrates to coated substrates, while maintaining good mechanical strength and avoiding the use of primers in assembly operations, which maintain their good adhesion properties also under more severe conditions". The skilled person would not have arrived at a composition as claimed, because D2 was silent about oligomeric silane adhesion promoters.

V. This decision was appealed by the opponent (in the following: the appellant). With the statement setting out its grounds of appeal filed on 7 August 2015, the appellant requested that the decision under appeal be

set aside and that the patent be revoked in its entirety. It also re-filed document D7 and the following document:

D8: High resolution GC-MS spectrum of oligomer 11 from D1 (2 pages, filed by the appellant as D6 and renumbered by the board).

- VI. With its reply dated 10 December 2015, the patent proprietor (in the following: the respondent) requested that the appeal be dismissed.
- VII. A further submission of the appellant was filed on 25 January 2016.
- VIII. In a communication dated 21 March 2018, the board indicated the points to be discussed during the oral proceedings.
- IX. Both parties replied to the communication of the board. The respondent's letter of 3 August 2018 included an auxiliary request.
- X. Oral proceedings before the board were held on 14 September 2018.
- XI. The appellant's relevant arguments may be summarised as follows:
 - D7 and D8 should be admitted into the proceedings due to their relevance. D7 and D8 demonstrated that oligomer 11 of D1 was a hydrophobic silane as claimed in claim 1 of the patent.
 - The subject-matter of claim 1 as granted lacked novelty over the disclosure of D1, in particular

sealant 6 containing oligomer 11. D7 and D8 showed that the repetition of the preparation of oligomer 11 of D1 produced a hydrophobic silane so that sealant 6 of D1 contained all features of claim 1 of the patent. The experiment had been made following exactly the reaction conditions of D1. This was evident from D7 itself and from the further identification of the product by gas-chromatography and mass spectrometry according to D8.

- The claimed subject-matter lacked inventive step in view of the combined teaching of D2 and D1. Starting from D2 as the closest prior-art document, the appellant saw the problem to be solved by the patent in the provision of adhesive compositions having improved adhesive strength. The claimed solution was obvious in view of D1 that already indicated that improved adhesion properties were achieved when using hydrophobic silanes. Even if one admitted that the oligomers used in D1 were not those now claimed, the skilled person would understand the teaching of D1 as not being limited to the specific oligomers disclosed but as embracing other, structurally close, silane oligomers. In fact, there was no experimental evidence on file showing that the oligomers used in the patent had improved adhesion when compared to those of D1. They were therefore an obvious alternative.

XII. The respondent's arguments, in so far as they are relevant for the present decision, may be summarised as follows:

- D6 to D8 were late-filed and should not be admitted into the proceedings. The appellant's attempt to repeat the preparation of oligomer 11 of D1 was flawed in view of the lack of information in D1 concerning the exact reaction conditions (time, temperature, removal of ethanol). These parameters would have a significant effect on the reaction kinetics and the kind of products produced. Moreover, D1 was silent about the structure of oligomer 11 and did not characterise the product. In any case, none of D6 to D8 supported the appellant's argument that oligomer 11 of D1 was a hydrophobic silane in accordance with claim 1 of the patent.

- The disclosure of D1 was not novelty-destroying for the subject-matter of claim 1 because the oligomers therein disclosed mandatorily had an organosilyl "B group". This substituent did not fall within the scope of claim 1 of the patent. Additionally, in the preparation of oligomer 11 a substoichiometric quantity of ethanol was produced indicating that the reaction had not gone to completion and therefore that the tetramer had not been formed.

- The respondent agreed with the appellant that D2 represented the closest prior-art document and that the subject-matter of claim 1 differed from D2 in that it required a hydrophobic oligomeric silane. It defined the objective technical problem to be solved as the provision of adhesive compositions which had improved mechanical strength and improved weatherability and could be used to bond to both glass substrates and paint coated substrates without the need for primers. The solution according to claim 1 was neither obvious from D2

alone nor from D2 in combination with D1. By combining the disclosures of D2 and D1 the skilled person would not even arrive at the adhesive compositions of the present invention because D1 did not disclose hydrophobic silane oligomers in accordance with claim 1. The argument of the appellant that the skilled person would further modify the oligomers of D1 was clearly made with knowledge of the invention. Actually, there were many modifications of the oligomers of D1 possible and the skilled person would not eliminate the organosilyl B group as this group was said to be essential for the oligomers of D1.

XIII. The appellant requested that the decision under appeal be set aside, and that European patent No. 2 046 909 be revoked in its entirety.

The respondent requested that the appeal be dismissed (main request), or alternatively that the patent be maintained in amended form on the basis of claims 1 to 12 of auxiliary request I filed by letter dated 3 August 2018.

Reasons for the Decision

1. Admissibility of D6 to D8

1.1 D6 and D7 were filed by the appellant shortly before the oral proceedings before the opposition division and were not admitted into the proceedings because they were late-filed and not *prima facie* relevant. D7 is an experimental report of the appellant's repetition of the preparation of oligomer 11 of D1 and includes NMR data purporting to show that oligomer 11 is a

hydrophobic silane according to claim 1 of the opposed patent. D6 was filed as an aid to interpret the NMR spectra in D7.

D8 was filed by the appellant with its statement of grounds of appeal and shows the GC-MS spectrum of the product produced in D7.

1.2 The respondent requested that these three documents not be admitted into the proceedings because they were late-filed and not *prima facie* relevant.

1.3 Concerning D7 and D8, the board disagrees with the respondent. D7 was filed by the appellant during the opposition proceedings to support its lack of novelty attack based on D1, namely to show that oligomer 11 of D1 represented a hydrophobic silane according to claim 1 of the patent. D8 was filed as a direct reaction to the finding in the appealed decision that D7 was not enough evidence to show that the teaching of D1 was not novelty-destroying for the subject-matter of claim 1.

However, these two documents help the board and the parties to understand the teaching of D1 concerning the preparation of oligomer 11, and are *prima facie* relevant (see points 2.7 to 2.9 below). The board thus reverses the opposition division's decision not to admit D7 into the proceedings and further admits D8 into the proceedings.

1.4 D6 has not been used by the appellant during the appeal proceedings and there is no need for the board to decide on its admissibility.

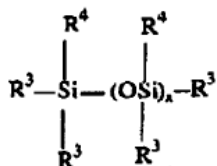
MAIN REQUEST (granted claims)

2. Novelty

2.1 Claim 1 of the main request is directed to an adhesive composition comprising:

(a) one or more polymers having a flexible backbone and silane moieties capable of silanol condensation;

(b) one or more hydrophobic silanes having one or more hydrocarbyloxy groups and one or more hydrocarbyl groups of the formula



wherein R³, R⁴ and x are as defined in the claim; and

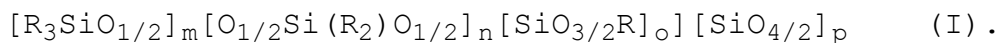
(c) one or more catalysts.

2.2 The appellant argued that the subject-matter of claim 1 lacked novelty over D1, in particular sealant 6 which comprised oligomer 11 (page 37, lines 15 to 17).

2.3 D1 discloses in claim 1 compositions comprising:

(A) a moisture-curable polymer selected from the group of silylated polyurethanes, silylated polyethers, and mixtures thereof; and

(B) a silicone oligomer of the formula (I)



The compositions of D1 may be used for either high modulus sealants in automotive applications or low viscosity formulations for coatings, adhesives and sealants (abstract and page 1, lines 14 to 17).

- 2.4 Sealant 6 is prepared from silylated polyurethane prepolymer 1 and oligomer 11 in the presence of *inter alia* dibutyltin dilaurate (DBTDL).
- 2.5 It was undisputed that silylated polyurethane prepolymer 1 is a polymer according to feature (a) of claim 1 and that dibutyltin dilaurate is a catalyst as required by feature (c) of claim 1.
- 2.6 It was a matter of dispute whether silicone oligomer 11 is a hydrophobic silane according to feature (b) of claim 1.
 - 2.6.1 The silicone oligomer of the formula (I) of D1 requires *inter alia* that "each R is independently selected from the group consisting of B, R¹, -OR², R³, and R⁴" (claim 1, page 44, line 7), wherein "B is an organosilyl functional group bridged to the Si atom of the siloxane oligomer backbone by a Si-C bond" (claim 1, page 44, lines 8 and 9) with the proviso "**that at least one R is B**" (claim 1, page 44, line 20, emphasis by the board).

The silicone oligomers used in D1 are defined in several passages in the document (cf. page 7, line 17, to page 8, line 15; page 9, line 9, to page 10, line 7; page 10, line 12, to page 11, line 11; page 11, line 14, to page 12, line 13; and in particular in the chapter "Oligomer Structure" on page 13, line 12, to page 19, line 10). In all these definitions of the

oligomer the presence of at least one B group, i.e. an organosilyl functional group bridged to the Si atom of the siloxane oligomer backbone by a Si-C bond, is mandatory.

- 2.6.2 However, R^3 and R^4 in the formula of the hydrophobic silane according to feature (b) of claim 1 cannot have an organosilyl B group. Consequently, the subject-matter of claim 1 of the patent differs from the disclosure of D1 in the structure of the hydrophobic silane used.
- 2.7 Notwithstanding the above teaching of D1, the appellant maintained that sealant 6 of D1 anticipated the subject-matter of claim 1 because the experimental evidence submitted (cf. D7 and D8) showed, in its view, that oligomer 11 was indeed a hydrophobic silane according to feature (b) of claim 1 as granted.
- 2.8 The question whether oligomer 11 represents a hydrophobic silane according to claim 1 was a matter of debate between the parties. While the appellant, relying on its own repetition of the preparation of oligomer 11, maintained that this was indeed the case, the respondent argued that D1 did not provide the skilled person with sufficient information to accurately repeat the preparation of oligomer 11.
- 2.8.1 D1 is silent about the structure of oligomer 11 but it is the clear teaching of D1 that this oligomer represents an oligomer according to the invention of D1. As not disputed by the appellant, sealant 6 in table 7 is an example according to the invention of D1 and not a comparative sealant (see also page 43, lines 7 to 8, wherein it is stated that excellent peel strength was observed using, for instance,

oligomer 11). A comparative sealant in D1 was made without silicone oligomer. The skilled person would assume from the reading of D1 that the structure of oligomer 11 is according to formula (I) of claim 1 and thus has an organosilyl functional group B bridged to the Si atom of the siloxane oligomer backbone by a Si-C bond.

2.8.2 Contrary to this teaching, D7, which concerns repetition of the preparation of oligomer 11, appears to suggest that an oligomer according to claim 1 of D1 is not obtained but a different oligomer, namely a tetramer according to claim 1 of the patent in suit. Moreover, D8 seems to confirm the understanding of the appellant that oligomer 11 of D1 would actually be a mixture of dimers, trimers and tetramers of vinyltriethoxysilane.

2.8.3 Thus, the skilled person repeating the preparation of oligomer 11 of D1 would be confronted with the situation where the disclosure of the preparation example in D1 could be seen as incomplete because it did not result in a product according to the invention of D1. He would then, for instance, try to modify the reaction conditions to obtain an oligomer according to D1 to be used in an adhesive sealant.

Alternatively, the skilled person could also assume that the oligomer product obtained in D7 was the product obtained as oligomer 11 in D1 and that it has a structure different from the inventive structure claimed in D1.

2.8.4 In any case, the skilled person has no means to establish the true structure of oligomer 11 as disclosed in D1 because the document is entirely silent

about its structure. The product therein obtained is merely defined as an "oligomeric product" (page 32, last two lines) and it is not characterised at all. Furthermore, the board agrees with the respondent that the description for the preparation of oligomer 11 in D1 leaves at least some room for filling missing experimental details (reaction time, temperature, removal of ethanol).

- 2.9 According to the established case law, for an invention to lack novelty its subject-matter must be clearly and directly derivable from the prior art. It is thus a prerequisite for the acceptance of lack of novelty that the claimed subject-matter is "directly and unambiguously derivable from the prior art".

It is, however, evident from the discussion above that this is not the case for oligomer 11 of D1. The lack of information in D1 concerning the structure of the oligomer and the different possibilities of interpretation of the example does not at all amount to a direct and unambiguous disclosure of an embodiment according to claim 1 of the patent.

- 2.10 For these reasons the subject-matter of claim 1 is novel over the disclosure of D1.

3. *Inventive step*

- 3.1 The invention is directed towards providing adhesive compositions that adhere well both to unprimed glass and painted substrates, and more specifically for use in window installations for vehicle manufacturing (paragraphs [0001] to [0003]). The invention aims to provide an adhesive that can undergo rapid cure, in

addition to having good stability and term durability (paragraph [0005]).

3.2 Closest prior art

3.2.1 Document D2 was agreed to represent the closest prior art. Like the patent, D2 relates to the provision of adhesive compositions for bonding glass to substrates without the need for priming the surface of the substrate and/or the surface of the window to which it is bonded (paragraph [0011]).

3.2.2 The adhesive composition of D2 contains a functional polymer having a flexible backbone and silane moieties capable of silanol condensation (paragraph [0012] and claim 1) corresponding to feature (a) of claim 1; a dialkyltin carboxylate or alcoholate catalyst (paragraph [0042] and claim 1) corresponding to feature (c) of claim 1 and a primary or secondary amino straight chain alkyl trialkoxysilane as adhesion promoter (paragraph [0055] and following; claim 1). The only silanes disclosed in D2 are monomeric silanes, namely vinyltrimethoxysilane which is used in examples 55 to 57 in very small amounts as a stabiliser.

3.2.3 Thus, the subject-matter of claim 1 of the patent differs from the disclosure of D2 in that it requires the mandatory presence of a linear hydrophobic silane of the formula given in granted claim 1 (feature (b) of claim 1).

3.3 Problem to be solved and its solution

3.3.1 According to the respondent the objective technical problem to be solved by the invention is the provision

of adhesive compositions that have improved mechanical strength and improved weatherability, and can be used to bond to both glass substrates and paint-coated substrates without the need for primers (page 6 of the reply to the appeal, penultimate paragraph).

- 3.3.2 This problem is solved by the adhesive compositions of claim 1 comprising the linear hydrophobic silane according to feature (b).
- 3.3.3 It can be seen by comparing the data in the patent and in D2 that the adhesive compositions of the invention have superior adhesive properties. Notably table 4 of the patent shows that excellent adhesion was obtained when lap shear samples prepared using adhesive 3 of the invention and cured under severe conditions of seven days at 23°C and 50% relative humidity and then exposed to weatherometer conditions for 2 000 hours (condition 3). On the contrary, examples 55 to 57 of D2 only show acceptable performance for adhesion to painted substrates under milder conditions (table 6). The adhesive compositions of D2 were not subjected to the harsher test conditions of the adhesive compositions of the invention.
- 3.3.4 In view of this experimental evidence showing that for more rigorous conditions the presence of the linear hydrophobic silane is essential to achieve good adhesion both to unprimed glass and painted coated substrates, the board is satisfied that the above problem has been credibly solved by the measures taken.
- 3.3.5 This finding was not contested by the appellant, which also defined the problem underlying the invention as to provide adhesive compositions having improved adhesive strength.

3.4 Obviousness

3.4.1 It remains to be decided whether, in view of the available prior art, it would have been obvious for the skilled person to solve this technical problem by the means claimed.

3.4.2 In the appellant's view this would indeed be the case from the combined teaching of D2 and D1.

The appellant argued in essence that the teaching of D1 was the use of silicone oligomers in general in order to improve adhesive compositions. From a comparison of the adhesive compositions containing silicone oligomers of the formula (I) of D1 with the adhesive compositions without oligomers, the appellant concluded that the adhesive failure of the sealants without silicone oligomers suggested that there was no bonding or only a weak bonding between the substrates and the polymers (page 43, lines 5 to 8). The skilled person would conclude from this information in D1 that the gist of the invention of D1 was the use of a silicone oligomer in general, and not necessarily the specific ones therein claimed.

Furthermore, the appellant pointed out that there was no information on file showing that the use of the claimed silicone oligomers resulted in any advantage over the use of those silicone oligomers known from D1.

3.4.3 The board is not persuaded for the following reasons:

- As discussed in detail above in relation to novelty, the silicone oligomers used in the adhesive compositions of D1 always include an

organosilyl functional group bridged to the Si atom of the siloxane oligomer by an Si-C bond. Thus, if the skilled person combined the teaching of D1 with the teaching of D2 he would end up with a composition not according to claim 1, due to the presence of the organosilyl functional group B in the silicone oligomer. The combined teaching of D2 with D1 does not result in an embodiment as claimed.

- The board furthermore cannot accept the argument of the appellant that the skilled person would interpret D1 in a rather broad manner suggesting the use of silicone oligomers in general. There is no support in D1 for such an interpretation. D1 teaches the use of specific silicone oligomers and gives no hint in relation to any other silicone oligomers. Moreover, even if it were assumed that the skilled person would modify the silicone oligomers of D1, he would not automatically arrive at the oligomers required in present claim 1. As pointed out by the respondent during the oral proceedings, there are many possibilities for modifying the silicone oligomer of D1, and the skilled person would certainly not consider eliminating an essential feature of the invention of D1, namely the organosilyl functional group B. This argument is clearly made with knowledge of the invention and must fail.

- In view of the above, there is also no need for the respondent to show any improvement of the claimed adhesive compositions over adhesive compositions resulting from the use of the silicone oligomers of D1 in the compositions of D2. The respondent has already shown an improvement over the adhesive

compositions of the closest prior art, D2, and there is no need to show any further improvement over other adhesive compositions not disclosed in the prior art.

3.4.4 In summary, there is no incentive in the prior art for the skilled person to modify the adhesive compositions of D2 by adding a hydrophobic silane according to feature (b) of claim 1.

3.4.5 For these reasons, the subject-matter of claim 1 involves an inventive step. This conclusion also applies to the subject-matter of claim 10 which is directed to a method of bonding glass to a painted substrate using the adhesive compositions of claim 1, to the window structure of claim 14 using the adhesive composition of claim 1 and, for the same reasons, to the preferred embodiments defined in dependent claims 2 to 8 and 11 to 13.

AUXILIARY REQUEST I

Since the main request of the respondent is allowable, there is no need for the board to deal with this request.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



M. Cañueto Carbajo

W. Sieber

Decision electronically authenticated