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Datasheet for the decision of 26 April 2018

Case Number: T 0376/16 - 3.3.05

Application Number: 07744395.0

Publication Number: 2025651

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Language of the proceedings: EN

Title of invention:
INTERLAYER FOR LAMINATED GLASS AND LAMINATED GLASS

Patent Proprietor:
Sekisui Chemical Co., Ltd.

Opponent:
Kuraray Europe GmbH

Headword:
Interlayer for laminated glass/Sekisui

Relevant legal provisions:
EPC Art. 100(a), 54, 56

Keyword:
Novelty - (yes)
Inventive step - (yes)

Decisions cited:

Catchword:

Europäisches Patentamt
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Beschwerdekammern

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Case Number: T 0376/16 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 26 April 2018

Appellant: (Opponent)	Kuraray Europe GmbH Phillip-Reis-Strasse 4 65795 Hattersheim (DE)
Representative:	Kisters, Michael Marcus Kuraray Europe GmbH Patents and Trademarks Mülheimer Strasse 26 53840 Troisdorf (DE)
Respondent: (Patent Proprietor)	Sekisui Chemical Co., Ltd. 4-4, Nishitemma 2-chome, Kita-ku Osaka-shi Osaka 530-8565 (JP)
Representative:	Ter Meer Steinmeister & Partner Patentanwälte mbB Nymphenburger Straße 4 80335 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 15 December 2015 rejecting the opposition filed against European patent No. 2025651 pursuant to Article 101(2) EPC**

Composition of the Board:

Chairman	E. Bendl
Members:	G. Glod
	O. Loizou

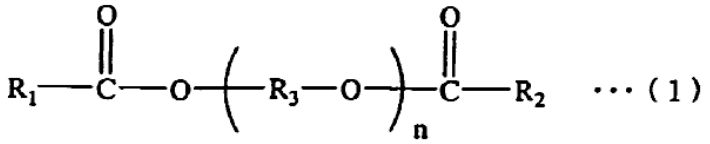
Summary of Facts and Submissions

I. The appeal lies from the decision of the opposition division to reject the opposition against European patent EP-B1-2 025 651.

Claim 1 of the patent in suit reads as follows:

"*1. A laminated glass, wherein an interlayer film for a laminated glass comprising 100 parts by weight of a polyvinyl acetal resin and 60 to 100 parts by weight of a plasticizer, wherein 50 to 100 % by weight of the plasticizer is a diester compound represented by the formula (1) below:*

[formula 1]



$$R_1—C(=O)—O—\left(R_3—O\right)_n—C(=O)—R_2 \quad \cdots(1)$$

wherein R_1 and R_2 are each an organic group of 5 to 10 carbon atoms, R_3 is $-CH_2-CH_2-$, $-CH_2-CH(CH_3)-$, $-CH_2-CH_2-CH_2-$ or $-CH_2-CH_2-CH_2-CH_2-$, and n is an integer of 4 to 10 is adhered between at least two of transparent glass sheets."

Claims 2 and 3 depend directly or indirectly on claim 1.

The following documents were cited in the impugned decision:

D1: US 6 903 152 B2

D2: DE 199 38 159 A1
D3: US 5 618 863 A
D4: US 4 297 262 A

II. By letter of 14 March 2018, the respondent (patent proprietor) submitted seven auxiliary requests.

III. Oral proceedings took place on 26 April 2018.

IV. The **appellant (opponent)** essentially argued as follows:

D1 and D3 anticipated the novelty of the subject-matter of claim 1. D1 concerned not only an interlayer film made of several layers, but also interlayer films made of one film only with the claimed plasticiser (column 7, lines 11 to 15 and 40 to 45). D3 explicitly disclosed tetraethyleneglycol diheptanoate as plasticiser in an amount overlapping with the range of claim 1.
It was known that the amount of plasticiser depended on compatibility with the polyvinyl acetal resin and on the desired mechanical properties of the interlayer film. There was no reason to limit the disclosure of D1 and D3 to the specific examples or embodiments with specific combinations of features. The skilled person had a motivation, taking the production costs into consideration, to determine mixtures with a high concentration of plasticiser. This could be done by routine experimentation.

D3 could be considered the closest prior art. The problem to be solved was how to select useful plasticisers from the prior art. This was already taught in D3, and the proper amount was known from D1. Mixtures with a high amount of plasticiser were advantageous, since plasticisers were cheaper than

polyvinyl acetal. To choose a plasticiser according to claim 1 was a simple matter of routine experimentation, especially since one of the plasticisers according to the formula of claim 1 was known from D3 and also disclosed in D1.

V. The relevant arguments of the **respondent (patent proprietor)** may be summarised as follows:

"Interlayer film" had a specific meaning and could be made either of several layers or of one layer. It was evident from the description that in the case at hand the interlayer film was only made of one layer that was adhered to - meaning in direct contact with - the glass sheets. The specific combination of features of the claims was not directly and unambiguously derivable from the prior art. In particular, in D1, layer (B) was not adhered between two transparent glass sheets, but sandwiched between two outer layers and was as such not an interlayer film, but just a part thereof. Furthermore, with respect to the one-layer film, several choices had to be made in D1 to arrive at the claimed subject-matter. D3 did not specify whether tetraethyleneglycol diheptanoate was used independently or in combination with other plasticisers in the required amount. It was even not unambiguous from D3 that two glass sheets were used.

Starting from D1, the problem to be solved was how to provide a glass laminate that had a high transparency even when manufactured without autoclave treatment. None of D1 to D4 dealt with said problem, so they did not provide any teaching towards the proposed solution.

VI. The appellant (opponent) requests that the impugned decision be set aside and that the patent be revoked.

The respondent (patent proprietor) requests that the appeal be dismissed (main request) or, in the alternative, that the patent be maintained in amended form on the basis of one of auxiliary requests 1 to 7, submitted with the letter dated 14 March 2018.

Reasons for the Decision

Main request - patent as granted

1. Article 100(a) in conjunction with Article 54 EPC

1.1 Claim 1 relates to a laminated glass, wherein an interlayer film comprises 100 parts by weight of a polyvinyl acetal resin and 60 to 100 parts by weight of a plasticiser, wherein 50 to 100 % by weight of the plasticiser is a diester compound represented by formula (1) and is adhered between at least two transparent glass sheets.

The term "interlayer film" present in claim 1 is understood to be a film that can be composed of different layers and that is adhered to the glass sheets. This means that the complete film is sandwiched between the glass sheets and is in direct contact with the at least two glass sheets. This is in line with the disclosure of the description, especially in paragraphs [0023] and [0054], and with the terminology used in the prior art (e.g. see D1, column 21, line 62: "three-layer interlayer film").

1.2 The subject-matter of claim 1 is novel over D1 for the following reasons:

1.2.1 D1 in a first aspect discloses an interlayer film for a laminated glass comprising a poly(vinyl acetal) resin (C), which is a blend of a poly(vinyl acetal) resin (A) and a poly(vinyl acetal) resin (B), and a plasticiser (column 3, lines 42 to 46). The plasticiser includes organic ester plasticisers, such as monobasic acid esters and polybasic acid esters, and phosphoric acid plasticisers, such as organic phosphates and organic phosphites.

The preferred plasticisers are triethylene glycol di-2-ethylbutyrate (3GH), triethylene glycol di-2-ethylhexanoate (3GO), triethylene glycol di-n-heptanoate (3G7), triethylene glycol dicaprylate, triethylene glycol di-n-octanoate, tetraethylene glycol di-2-ethylbutyrate, tetraethylene glycol di-n-heptanoate (4G7), dihexyl adipate, dibenzyl phthalate, and so forth. The more preferred are 3GH, 3GO and 3G7. These plasticisers may be used independently or in a combination of two or more species (column 7, lines 26 to 35). It is preferable to use at least one member selected from the group consisting of 3GH, 3GO and 3G7 as the plasticiser (column 7, lines 36 to 42). The plasticiser is used preferably in a proportion of 30 to 70 weight parts based on 100 weight parts of the poly(vinyl acetal) resin (C) (column 7, lines 43 to 47).

Among the preferred plasticisers two out of nine, namely tetraethylene glycol di-2-ethylbutyrate and tetraethylene glycol di-n-heptanoate, are according to formula (1) of claim 1 of the patent, while the most preferred ones are not. To arrive at the plasticiser according to claim 1, the skilled person would first have to choose one or two specific not-most-preferred plasticisers and then mix them such that 60 to 100

parts by weight of the plasticiser is present with respect to 100 parts poly(vinyl acetal) resin (C), and 50 to 100 % by weight of the plasticiser is tetraethylene glycol di-2-ethylbutyrate and/or tetraethylene glycol di-n-heptanoate. There is no clear guidance as to the second choice of specific amounts for specific individual components, since D1 explicitly allows the plasticisers to be used independently or in combinations of two or more species, which leads to many choices.

Therefore the combination of tetraethylene glycol di-2-ethylbutyrate and/or tetraethylene glycol di-n-heptanoate with the claimed amount of poly(vinyl acetal) resin is not directly and unambiguously derivable from the first aspect of D1.

1.2.2 D1 in a second aspect as illustrated in example 10 discloses an interlayer film composed of the layer(A)/layer(B)/layer(A) arrangement (column 21, lines 60 to 62).

According to example 14, layer (A) was prepared by adding 40 weight parts of tetraethylene glycol di-2-ethylhexanoate (4GO) as plasticiser to 100 weight parts of a PVB resin. Layer (B) was prepared by adding 60 weight parts of 4GO as plasticiser to a PVB resin. The final interlayer film had the same structure as in example 10 (layer(A)/layer(B)/layer(A)), which means that the plasticiser is not present in the amount of 60 to 100 parts by weight of the total interlayer film.

According to example 15, layer (A) was prepared by adding 40 weight parts of tetraethylene glycol di-n-heptanoate (4G7) as plasticiser to 100 weight parts of a PVB resin. Layer B was a mixture of 100 parts PVB

resin blend with 60 weight parts of 4G7 as plasticiser, so in this case too the interlayer film (layer(A)/ layer(B)/layer(A)) did not contain the plasticiser in the amount of 60 to 100 parts by weight.

1.3 The subject-matter of claim 1 is also novel over D3 for the following reasons:

D3 relates to a PVB sheet used with glass in safety laminates. The PVB resin of the sheet is typically plasticised with about 20 to 80 and more commonly 25 to 45 parts plasticiser per hundred parts of resin. Plasticisers commonly employed include, among others, tetraethyleneglycol diheptanoate (column 2, lines 46 and 47). However, it is not disclosed whether the indicated plasticisers are used individually or in mixtures, the preferred amount is not within the claimed range, and the presence of at least two glass sheets is not mandatory. As a consequence, the subject-matter of claim 1 cannot be considered directly and unambiguously derivable from D3.

1.4 In the written procedure the appellant also considered the subject-matter of D2 and D4 to be novelty-destroying. However, as already pointed out in the board's preliminary opinion, the combination of the amount of plasticiser with a diester according to formula (1) as claimed cannot be directly and unambiguously derived from D2. Furthermore, D4 does not disclose the amount of plasticiser as being 60 to 100 parts per hundred parts of PVB.

1.5 The ground for opposition under Article 100(a) EPC in conjunction with Article 54 EPC is not prejudicial to the maintenance of the patent.

2. Article 100(a) in conjunction with Article 56 EPC

2.1 The invention relates to an interlayer film for a laminated glass.

2.2 D1 is considered to be the closest prior art, since it explicitly discloses in example 1 a laminated glass, wherein an interlayer film comprising 100 parts by weight of poly(vinyl butyral)resin and 60 parts by weight of triethylene glycol di-2-ethylhexanoate (3GO) (a diester plasticiser) is sandwiched between two glass sheets (column 15, lines 58 to 67).

As D2 and D4 refer to much lower plasticiser content, they are also regarded as being more remote than D1.

D3 seems to be a less suitable starting point, since it does not disclose a laminated glass with an interlayer film comprising a diester plasticiser.

2.3 The problem to be solved is how to provide laminated glass that is excellent in transparency (paragraph [0014]).

2.4 The problem is solved by a laminated glass according to claim 1 characterised in that the interlayer film contains as plasticiser a diester compound represented by formula (1).

2.5 It is accepted that the problem is successfully solved, since examples 1 to 11 (according to the invention) show better transparency than comparative example 2 which is representative of example 1 of D1 (see patent: Table 1 and paragraphs [0075] to [0078]). There is no evidence that would cast doubt on this conclusion.

2.6 The solution to the posed problem is not obvious for the following reasons:

D1 relates to sound insulation performance (column 3, lines 20 to 24). As indicated above (point 1.2.1), 3GO is presented as more preferred than tetraethylene glycol di-2-ethylbutyrate and tetraethylene glycol di-n-heptanoate, which are according to formula (1) of claim 1 of the patent. D1 neither relates to improvement of transparency nor teaches the diesters according to formula (1) of the patent as preferred. Therefore, the skilled person has no incentive to replace 3GO by a compound of formula (1).

D2 also relates to sound insulation performance (page 2, lines 50 to 54). It teaches 3G7 as most preferred (page 3, lines 52 and 53). Again there is no incentive to replace the 3GO used in D1 with a compound of formula (1) of claim 1.

D3 deals with UV stability in PVB sheet. 3GO and 4G7 are listed as plasticisers commonly employed (column 2, lines 45 to 47). D3 is silent about transparency and does not indicate that 4G7 would have any advantage as compared to 3GO in that respect. The skilled person does not receive any teaching towards the solution proposed by the patent in suit.

D4 describes a polyvinyl butyral composition comprising 4G7 as plasticiser. It has been found that the composition provides sheeting with excellent dimensional stability, tensile strength and stiffness at plasticiser concentrations which are lower than those required, for example using triethyleneglycol di-2-ethylbutyrate (3GH) (column 3, lines 23 to 30). D4 is silent about transparency and only teaches an amount

of the plasticiser of 20 to 55 parts per hundred of polyvinyl butyral (see claim 1). The skilled person trying to solve the posed problem is given no indication towards the solution proposed by the patent in suit.

2.7 The ground for opposition under Article 100(a) EPC in conjunction with Article 56 EPC is not prejudicial to the maintenance of the patent.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

C. Vodz E. Bendl

Decision electronically authenticated