BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

| A | | B | | C | X |
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File Number: T 131/91 - 3.3.2

Application No.: 84 902 135.7

Publication No.: 0 140 969

Title of invention: Laminated safety glass

Classification: B32B 17/06

# D E C I S I O N
of 9 March 1993

Applicant: BOLTON, Nelson P., et al

Headword: Laminated safety glass/BOLTON

EPC 56, 111(1)

Keyword: "Inventive step of Claim 1 (yes) - non-obvious solution" - Remittal of the case for further prosecution"

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number : T 131/91 - 3.3.2

# D E C I S I O N
## of the Technical Board of Appeal 3.3.2
## of 9 March 1993

**Appellant :** BOLTON, Nelson P.
R.D. no. 1
Quakertown, PA 18951 (US)

**Representative :** Bauer, Wulf, Dr.
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**Decision under appeal :** **Decision of the Examining Division of the European Patent Office dated 11 September 1990 refusing European patent application No. 84 902 135.7 pursuant to Article 97(1) EPC.**

**Composition of the Board :**

**Chairman :** P.A.M. Lançon
**Members :** A.J. Nuss
S.C. Perryman

**Summary of Facts and Submissions**

I. European patent application No. 84 902 135.7 (international publication No. PCT/US 84/00669) was filed on 3 May 1984 (priority date 3 May 1983) and published under No. 0 140 969 ( international publication No. WO 84/04277).

II. The Examining Division refused the application under Article 97(1) EPC. The decision was based on 10 claims, filed 19 August 1989. Claim 1 reads as follows:

"1. A transparent laminated safety glass comprising: a first lamina consisting of an ionomer resin film (14, 24, 34, 44, 56, 65, 66, 74, 84, 94, 98, 102) in the form of a metal cross-linked ethylene-methacrylic acid polymer and one sheet (12, 22, 32, 42, 52, 68, 72, 82, 96) of primed or unprimed glass laminated to said ionomer resin film (14, 24, 34, 44, 56, 65, 66, 74, 84, 94, 98, 102), characterized in that the ionomer resin film (14, 24, 34, 44, 56, 65, 66, 74, 84, 94, 98, 102) further contains organic diamines or triamines in an amount of about 0.5 to about 7%, by weight, based on the weight of the resin."

III. The ground for the refusal was that the subject-matter of Claim 1 lacked inventive step in the light of the disclosure of document (1) US-A-3 344 014 from which a transparent laminated article comprising a layer of an ionomer resin laminated to a layer of glass was known. According to this document at least 10% of the acid groups of the copolymer are neutralised with one or more metal ions or with an organic polyamine. Having regard to the fact that none of the examples of the application explicitly mentioned the presence of an organic amine and in the absence of any proof of the Appellant's statement that according to the invention there was no need for

monitoring the degree of neutralisation, it was in the Examining Division's opinion prima facie obvious to a skilled person that a material in which the carboxyl groups of the copolymer are neutralised by both a metal ion and a polyamine was also suitable as a safety glass.

IV. The Appellant lodged an appeal against this decision. The Appellant's arguments set out in the statement of appeal may be summarised as follows:

(i) Document (1) represented the closest state of the art.

The application differed from the teaching of (1) in that:

- ethylene/methacrylic acid copolymer is selected;
- neutralisation is effected by metal ions and by an organic polyamine, namely organic diamines or triamines;
- and these organic di- or triamines are present in an amount of 0.5 to 7 weight-%, based on the weight of the resin.

(ii) The restriction to polyamines in the claimed percentage range alone made the teaching of the application unobvious.

(iii) Although the 0.5 to 7 weight-% range was discussed in view of its value for the inventive step, the Examining Division did not refer to this feature.

(iv) Having regard to neutralisation tests using acidic copolymers according to (1), the known SURLYN 8920 showed optical distortions with increasing thickness of the material; at values below 0.5% and above 7%

of added polyamine haze was also remarkable whereas the optimum amount was found to be about 3.2% . However, the product now claimed showed improved clarity even up to 200 mm; there was no need to control the amount of neutralisation as in (1).

V. The Appellant requested that the decision under Appeal be set aside.

**Reasons for the Decision**

1. The appeal is admissible.

2. Claim 1 represents a combination of Claim 1 originally filed and the description, page 2, lines 2 to 7; page 4, lines 1 to 4; page 6, first paragraph and page 8, lines 8 to 15 and 33 to 38. The Board is satisfied that by this claim no combination of features is created which could not be directly or unambiguously derived from the whole content of the original disclosure. The requirements of Article 123(2) EPC are accordingly met.

3. The application concerns a transparent laminated safety glass comprising a lamina consisting of an ionomer resin film.

3.1 The closest state of the art is document (1) which describes safety glasses according to the precharacterizing portion of present Claim 1. In this prior document it is stated that in order to achieve the requisite characteristics for the safety glass interlayer the acidic copolymers - ethylene/methacrylic acid copolymers are explicitly mentioned among others - must be neutralised either with a compound of a mono-, di- or trivalent metal ion or with an organic polyamine

containing at least two carbon atoms and having a dissociation constant of at least $10^{-8}$. The reaction mechanism involved in the formation of the ionic copolymers is not entirely understood but according to infrared analysis crosslinked polymers having ionized carboxyl groups are formed regardless of which of the neutralising agents are employed. Suitable crosslinking metal ions are selected from the group consisting of Groups I, II, III, IV-A, and VIII of the Periodic Table of Elements. The preferred metals are the alkali metals and zinc. On the basis of theoretical considerations that the reaction of the polyamine with the acidic copolymer is intramolecular rather than intermolecular for copolymers having a high concentration of carboxylic groups, short chain polyamines are proposed as more efficient while in the case of copolymers having a low carboxylic acid content, long chain polyamines are preferred. Moreover, document (1) contains as a general teaching that independently of whether a compound of a metal ion or an organic polyamine is employed, at least 10% of the acid groups of the copolymeric base resin must be neutralised. It is furthermore indicated there that in the case of an optical safety glass, it is desirable to achieve a balance between the number of carboxylic acid groups which are neutralised and the number which remain unneutralised. (cf. Claim 1; col. 2, lines 61 to 63; col. 3, line 32 up to col. 4, line 46; col. 4, lines 63 to 72 and col. 5, line 57 up to col. 6, line 5). According to the eight working examples metal cations (i.e. $Na^{+}$, $Li^{+}$, $Sr^{++}$, $Mg^{++}$, $Zn^{++}$ and $Al^{+++}$) and hexamethylene diamine are used to form an ionomer resin. None of these working examples comprises a combination of a compound of a metal ion and an organic polyamine as a neutralising agent.

In the statement setting out the grounds of appeal, the Appellant has referred to experimental results showing

that the clarity and optical distortion of half neutralised SURLYN 8920 (i.e. a copolymer material according to document (1)) become greater with thickness.

3.2 In relation to the above prior art (1), the problem to be solved was thus to provide a transparent laminated safety glass showing improved clarity at a considerable thickness of the material. The solution according to the application is a safety glass according to present Claim 1 (see point II above).

In view of the Appellant's comments made in connection with the aforementioned experimental results, it would appear that a further neutralisation of carboxyl groups with a polyamine within the claimed percent by weight range, but without a control of the amount of neutralisation as suggested in (1), results in an improved clarity even up to 200 mm thickness of the material. Since the Board has no reason to query the experimental results relied upon by the Appellant, one has to accept that the above stated problem has been plausibly solved by the safety glass as now claimed.

4. Neither the documents cited in the International Search Report, nor any document cited in the Supplementary European Search Report disclose the specific combination of an ionomer resin film and a glass as defined in Claim 1. Novelty of the subject-matter can accordingly be acknowledged. Since the Examining Division did not dispute novelty, it is not necessary to consider this matter any further.

5. It remains to be examined whether or not the subject-matter of Claim 1 involves an inventive step.

As set out above under point 3.1, document (1) describes two distinct possibilities to neutralise the acidic

copolymers forming the base resin of a safety glass interlayer, namely the use of certain compounds of a metal ion or an organic polyamine. Although (1) describes some differences between the crosslinking reaction mechanisms involved, in the light of the disclosure of this prior art document as a whole, in particular the working examples, the skilled person would expect that both neutralising agents, when individually reacting under proper conditions with unneutralised carboxylic acid groups of the copolymeric base resin, show an equivalent effect on the overall performance of an ionomer resin film produced thereof. Since this disclosure describes no more than two alternative ways for neutralising the acidic copolymers, there is thus clearly no suggestion there to use both possibilities in combination.

The argument that a skilled person aware of the said disclosure could have formed an ionomer resin film for a transparent laminated safety glass of present Claim 1 by crosslinking an ethylene-methacrylic acid polymer with a metal ion and an organic polyamine is specious and must be rejected for the reason that, when assessing inventive step the relevant question is not whether the skilled man could have prepared an ionomer resin film containing said metal ions and a polyamine but whether he would have done so in expectation of some improvement or advantage of the resulting product (T 2/83, OJ EPO 1984, page 265, in particular point 7 of the reasons for the decision). However, in the absence of the slightest hint in document (1), whether taken alone or in combination with the teaching of the other documents cited in the search reports, that a combination of the said neutralising agents might influence the clarity of a safety glass of considerable thickness, the subject-matter of present Claim 1 must be considered to involve an inventive step.

6. Although the Board has found Claim 1 to be patentable, a European patent cannot be granted yet for the reason

that the Board could not establish from the file whether or not the question of formal admissibility of present Claims 4 and 10 had been finally settled before the first instance. In a communication dated 27 January 1989, the Examining Division raised an objection under Article 123(2) EPC against the said claims, but refused the application for lack of inventive step without expressing any opinion about formal aspects of the present set of dependent claims. Incidentally, the impugned decision was not based on the most recent set of description pages submitted by the Appellant. Under these circumstances, the Board considers it appropriate not to deprive the Appellant of the possibility to have any subsequent findings concerning these matters revised by a second instance and to remit the case to the Examining Division under Article 111(1) EPC for completion of the examination procedure.

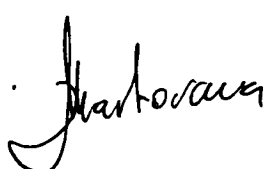
**Order**

**For these reasons, it is decided that:**

1. The decision of the Examining Division is set aside.

2. The case is remitted to the Examining Division for further prosecution.

The Registrar: The Chairman:



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