BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

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File Number: T 0891/91 - 3.4.2

Application No.: 83 305 160.0

Publication No.: 0 102 847

Title of invention: Method for coating ophthalmic devices

Classification: G02B 1/10, G02B 1/12

D E C I S I O N
of 16 March 1993

Applicant: Signet Armorlite, Inc.

Opponent: Essilor International (Comp. Générale d'Optique)

Headword:

EPC Article 56

Keyword: "Main and auxiliary requests: inventive step (no)"

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number : T 0891/91 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 16 March 1993

Appellant : (Proprietor of the patent)
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Decision under appeal :
Decision of the Opposition Division of the European Patent Office dated 26 June 1991, posted on 16 September 1991 **revoking European patent No.** 0 102 847 **pursuant to Article 102(1) EPC.**

Composition of the Board :

Chairman : E. Turrini
Members : R. Zottmann
L.C. Mancini

Summary of Facts and Submissions

I. European patent No. 0 102 847 (application No. 83 305 160.0) was revoked by decision of the Opposition Division, having regard to documents

(D1) US-A-2 479 935 and
(D2) US-A-2 997 745.

II. The appellant (proprietor of the patent) lodged an appeal against this decision.

III. In a communication pursuant to Article 11(2) of the Rules of Procedure of the Boards of Appeal, the Board expressed its provisional opinion that, inter alia, the requirements of Article 56 EPC were not met, having regard to the following prior art:

(D1) and
(D5) US-A-3 364 291.

IV. Oral proceedings were held.

The appellant requested that the appealed decision be set aside and the patent be maintained on the basis of the following documents:

main request:
- patent documents as granted,

first auxiliary request:
- Claim 1 as filed during the oral proceedings,
- Claims 2 to 14 as granted,
- description as granted,

second auxiliary request:
- Claim 1 as filed during the oral proceedings,
- Claims 2 to 14 as granted,
- description as granted,

third auxiliary request:
- Claims 1 to 13 as filed during the oral proceedings,
- description as filed.

The respondent (opponent) requested that the appeal be dismissed.

V. Claim 1 according to the main request reads as follows:

"A method of providing a thin, optically clear coating to at least one optical surface of an ophthalmic lens comprising the steps of:

(i) applying a layer of a composition comprising a material containing reactive ethylenically unsaturated groups to at least a first face of a mold used to manufacture said ophthalmic lens, wherein said face imparts a desired optical configuration to a first optical surface of said ophthalmic lens;

(ii reacting said composition to a degree that said composition forms a film that is dry, non-abrasion resistant, at least weakly adhered to said first face, and exactly replicates said first face in an aberration-free manner such that said composition exhibits a degree of unsaturation in the range of 40% to 90% of the unsaturation it possessed prior to reaction;

(iii) filling said mold with an organic liquid material capable of hardening to a solid, room temperature-stable state; and

(iv) hardening said organic liquid material so as to form said ophthalmic lens, intimately bond said film to the hardened organic material, and adhere said film to said optical surface of said hardened organic material more firmly than it adheres to said face, and

(v) post reacting said composition after said organic liquid has hardened to harden said composition."

Claim 1 according to the first auxiliary request differs from Claim 1 according to the main request in that:

- "aberration-free" is inserted between "a method of providing a thin, optically clear" and "coating to at least one ...",
- in step (ii), "forms a film that" is deleted between "said composition" and "is dry, non-abrasion ...",

- in step (iv), "to a solid, room temperature-stable state" is inserted between "organic liquid material" and "so as to form ...",

- in step (v), "to harden it to an S.E.B. abrasion resistance of at least 137.9 kPa (20 psi)" replaces the expression after "post reacting said composition".

Claim 1 according to the **second auxiliary request** differs from Claim 1 according to the first auxiliary request in that:

- in step (i), "uniform" is inserted between "applying a" and "layer of ...",

- in step (ii), "forms a layer of thickness of 0.5 to 50 µm and" is inserted between "composition" and "is dry, ..." (deletion of the indeterminate article "a" between "is" and "dry" has been made by the Board).

Claim 1 according to the **third auxiliary request** differs from Claim 1 according to the main request in that:

- in step (iv), "to a solid, room temperature-stable state" is inserted between "organic liquid material" and "so as to form ...",

- step (v) reads "removing the lens from the mould and post reacting said composition to harden said composition".

VI. In support of the allowability of his request, the appellant essentially submitted that Claim 1 according to any of the requests was not anticipated by D1, representing the closest state of the art, because this document teaches neither the step of pre-curing the coating such that it exhibited a degree of unsaturation in the claimed range, nor the step of post-curing the coating. Combining D1 with D5 would not render obvious the subject-matter of Claim 1, because D5 did not relate to the same field of ophthalmic lenses as D1, did not disclose the claimed range of the unsaturation degree while pre-curing the coating and did not teach a post-curing step. Moreover, the comparative tests previously filed showed that a coating prepared according to D5 would be unsuitable for use on an ophthalmic lens.

VII. The respondent essentially argued that a combination of D1 and D5 was, indeed, possible. Although ophthalmic lenses were not mentioned in D5, this document should be considered as belonging to a closely neighbouring field. The step of pre-curing the coating, known from D5, could be applied to the method of D1, whereby, with regard to the claimed range of the unsaturation degree, the lower limit could be experimentally determined and the upper limit was speculative. Post-curing of the coating was

part of the technical knowledge of a skilled person. The results of the tests performed by the appellant were doubtful.

Reasons for the Decision

1. The appeal is admissible.

2. The claims according to the various requests neither contain subject-matter extending beyond the content of the application as filed (Article 123(2) EPC), nor have been amended in such a way as to extend the protection conferred (Article 123(3) EPC). This fact is not contested by the respondent.

3. The novelty of Claim 1 according to any of the requests has not been contested by the respondent.

4. Inventive step

4.1 Main request

4.1.1 Both the appellant and the respondent agree that D1 should be considered as the closest prior art. This document (see, in particular, column 1, lines 1 to 18 and column 3, lines 52 to 57) relates to a method of providing a thin, transparent coating to an optical surface of a lens comprising the steps of:

- applying a layer of a composition consisting of a polymerisable material, in particular partially polymerised allyl methacrylate, to a face of a mould used to manufacture said lens, said face imparting a desired optical configuration to an optical surface of said lens, wherein said layer is at least weakly adhered to said

face and exactly replicates said face in an aberration-free manner (see column 2, lines 20 to 25),

- filling said mould with a different polymerisable material in liquid form, in particular partially polymerised methyl methacrylate monomer, capable of hardening to a solid, room temperature-stable state (see column 2, lines 25 to 32), and

- polymerising simultaneously said methyl methacrylate and allyl methacrylate so as to form said lens, bond said layer to the hardened substrate material, and adhere said layer to said optical surface of said hardened substrate material more firmly than it adheres to said face (see column 2, lines 33 to 49).

According to step (i) of the method of Claim 1, the material of the coating contains reactive ethylenically unsaturated groups. As a particular example thereof, the group of methacrylates is mentioned in the contested patent (see page 5, lines 53 and 54). The allyl methacrylate used in D1 for the coating layer is, therefore, regarded as a specific example falling within the general class of materials containing reactive ethylenically unsaturated groups mentioned in Claim 1.

With regard to the last step (v) of the method of Claim 1, the composition of the coating layer is post reacted after the material of the substrate has hardened. Although the word "composition" is used in Claim 1 only with reference to the coating layer, a selective post reaction of the coating alone, without affecting the hardening state of the substrate, does not appear to be possible. For this reason, said step (v) of Claim 1 is considered to be comprised in the last polymerising step of the method according to D1. Indeed, according to the Example of D1 (see, in particular, column 3, lines 22 to

28), the polymerisation is effected by placing the mould in an oven kept at 50°C for 12 hours; the temperature is then raised to 125°C for 1 hour and subsequently allowed to cool to 50°C. One might thus consider that the operation at 125°C represents a post reaction within the meaning of step (v) of Claim 1.

The optical elements, in particular lenses, produced according to D1 have shock resisting cores and abrasion resistant surfaces of a material other than that of the core (see column 1, lines 17 and 18). The IMC (in mould coating) process of D1, the optically accurate moulds (see column 1, line 22) and the used polymerisable materials that, when polymerised, are transparent (see Claim 1), have the effect that the produced objects are aberration-free and optically clear within the meanings given to these terms by the contested patent (see page 4, lines 14 to 17).

The method of Claim 1, therefore, differs from the method known from D1 only in that, prior to filling the mould with the liquid polymerisable material forming the core of the lens, the layer applied to a face of the mould is reacted so as to achieve a coating that is dry, non-abrasion resistant and at least weakly adhered to said first face, said coating, moreover, exhibiting a degree of unsaturation in the range of 40% to 90% of the unsaturation it possessed prior to reaction (see step (ii) of Claim 1).

4.1.2 Using the terminology of the contested patent, the coated lenses according to D1 are optical clear (see the adjective "transparent" in column 1, line 3), shock resistant (see column 1, line 17), aberration-free (as a consequence of the IMC process) and have abrasion resisting surfaces (see column 1, line 18). Moreover, the

coating is "thin" (see column 1, line 23) and "even" (see column 2, line 24).

Starting from this document, the objective problem underlying the contested patent can be seen in the further improvement of the surface characteristics of the lens, in particular as regards the adhesion of the coating on the substrate, the abrasion resistance being thereby not impaired.

According to Claim 1 of the contested patent, this problem is solved by the above mentioned step (ii) of partially reacting the coating layer; in particular, the formed film is dry and exhibits a given degree of unsaturation. The limits within which the coating is partially reacted, depend from the characteristics to be achieved, like adhesion, abrasion resistance and prevention of haziness (see page 4, lines 53 to 55). It is, in particular, stated on page 5, lines 23 to 28 that the particularly good adhesion obtained is the consequence of the formation of an intimate bond between the partially polymerised coating and the substrate, as the material of the substrate hardens. Moreover, as the substrate hardens, the coating is further reacted so that, once hardening of the substrate is completed, the coating has been rendered abrasion-resistant.

4.1.3 According to D1, a layer of a partially polymerised material, possibly dissolved in a solvent, is applied to a face of a mould by the known spin coating technique (see column 2, lines 23 to 25); moreover, the applied layer must be dry before following steps are carried out, otherwise curved surfaces of the mould, as shown in Figure 1 (see also column 1, lines 10, 11), could not be provided with an "even" coating layer (see column 2, line 24).

In the contested patent, on the contrary, a coating is first made on the face of the mould, which coating is then partially reacted to a given extent.

The solution of partially reacting the coating, once it is applied to the mould, is known from D5. This document (see Claim 1) refers to a process for imparting a hard, mar-resistant, cross-linked unsaturated polyester resin composition surface to a sheet of poly(methyl methacrylate), comprising:

- coating a glass plate with a thin layer of a blend of an unsaturated polyester resin and a glycol polyacrylate,

- partially curing the composition to an intermediate non-tacky gel,

- forming a cell (mould) with said glass plate as one side thereof with the coated side positioned internally,

- filling said cell with methyl methacrylate,

- polymerizing said methyl methacrylate under conditions such that the polyester gel is fully cured and becomes bonded to the resultant poly(methyl methacrylate) sheet, and

- removing the surfaced sheet from the cell.

It is stated in column 2, line 67 to column 3, line 19 of D5 that the conversion of the unsaturated, thermosetting polyester resin composition to a hard, thermoset, mar-resistant state is accomplished in two steps. An intermediate non-tacky gel having "heat softening properties" is first obtained by the application of heat with catalysis, whereby by "heat softening properties" is meant that, although some cross-linking of the glycol

polyacrylate and unsaturated polyester resin takes place on heating, a further and additional measure of cross-linking is still available before the total composition is converted to the thermoset state. The resin in this intermediate state is still thermosetting and capable of further cross-linking and conversion to the thermoset state. Thereafter, the intermediate, non-tacky, thermosetting material is converted to the thermoset state by further use of heat and catalysts.

As explained in column 3, line 75 to column 4, line 6 of D5, once a thin layer of the resinous blend has been applied onto the glass plate of the cell (mould), the layer is heat treated so as to obtain the intermediate, non-tacky gel having "heat softening properties", which gel does not reticulate and does not crack or peel when exposed to the methyl methacrylate monomer or syrup. This treatment, indeed, corresponds to step (ii) of Claim 1, according to which the coating composition applied to a surface of the mould is partially reacted. It is furthermore stated in column 4, lines 7 to 14, of D5 that the chemical mechanism involved in the ultimate sheet-forming step is believed to be the inter-reaction between the reactive unsaturated polyester resin composition in the intermediate non-tacky gel layer with the polymerisable methyl methacrylate, a cross-linked bond being thereby formed. Therefore, D5 draws the attention of the skilled person to the fact that, as the methyl methacrylate of the substrate hardens, a bond is formed between the substrate and the coating composition, this bond having an influence on the achieved mar-resistance, which clearly depends on the adhesion of the coating to the substrate. The described mechanism thus corresponds to the explanation given in the contested patent, on page 5, lines 23 to 26, according to which the formation of an "intimate bond" is responsible for the good adhesion obtained.

Therefore, the skilled person starting from the method according to D1 will consider the possibility of replacing the step of applying a layer of partially polymerised material to a face of the mould by the steps, taught by D5, of coating the mould with a polymerisable material and then partially curing it, till an intermediate, dry, non-tacky gel is obtained. It should be noted that the coating material used in D1, i.e. partially polymerised allyl methacrylate, and that used in D5, i.e. a blend of an unsaturated polyester resin and glycol polyacrylate, contain reactive ethylenically unsaturated groups - within the meaning given to this expression on page 4, lines 18 and 19 of the contested patent - before complete polymerisation takes place; thus, they correspond to the material mentioned in step (i) of Claim 1. For this reason, the appellant's argument that, according to column 2, lines 9 to 14 of D5, the fumaric acid is a necessary component in the polyester resin used in D5, whereas it is not at all mentioned in the patent in suit, is irrelevant.

By modifying the method of D1 according to the teaching of D5, as above mentioned, the skilled person solves the problem underlying the contested patent, concerning the adhesion to the substrate; indeed, the improvement in this respect is the consequence of the bond, referred to above, formed during the polymerisation step. Moreover, in Examples 1 to 4 of D5, the result is explicitly stressed that excellent surface characteristics are achieved, as regards mar-resistance and hardness. It can, therefore, be concluded that, by said combination of D1 and D5, not only the adhesion has been improved, but also the abrasion resistance obtained is at least as good as that achieved by the method of D1.

4.1.4 The question remains to be considered, within which limits the composition applied - according to D5 - to the substrate has to be reacted. An indication thereof is given in Claim 1 by the unsaturation range to be achieved (see step (ii)). It is stated on page 4, lines 62 to 64 of the contested patent that underreaction may provide haziness and poor abrasion resistance, whereas overreaction may cause unacceptable adhesion. It is thus clear that the determination of the claimed lower and upper value lies within the limits of the normal experience of the skilled person, who will have to carry out experimental tests without undue burden.

4.1.5 The appellant submitted that D5 did not lie in the same technical field as the present invention, namely ophthalmic lenses. It referred to the more general field of coated flat plastic sheets and, therefore, there was no reason for the skilled person to consult this document in the expectation of providing improved coated ophthalmic lenses.

According to various decisions of the Technical Boards of Appeal (see, for instance, T 176/84, OJ EPO 1986, 050; T 560/89, OJ EPO 1992, 725; T 195/84, OJ EPO 1986, 121), it is reasonable to expect a skilled person to refer to the state of the art in neighbouring fields and in a non-specific general field of technology in which the same problems or problems similar to those in the special field of the application or the patent in suit arise and of which the skilled person must be expected to be aware.

In the present case, the skilled person in the field of lenses for ophthalmic use, who is confronted with the technical problems of adhesion and abrasion resistance of a coating made on a surface of the lens, would also refer to the state of the art in the more general field of coated plastic sheets, in which the same problems of

adhesion and abrasion resistance of the coating arise and of which he is aware. In other words, it is reasonable to expect that the skilled person starting from D1 in the field of coated optical lenses would look for a solution to the stated problems also in the field of coated acrylic sheets (see D5). It should be noted in this respect that the substrate material in both documents is the same, i.e. methyl methacrylate.

4.1.6 The appellant, furthermore, carried out comparative tests, the results of which were submitted with fax of 5 February 1993. These tests, representing a comparison between the patent in suit and Example 6 of D5, aimed at examining the feasibility of using the coating described in D5 on ophthalmic lenses. In the opinion of the appellant, they demonstrate that the method of D5 was not suitable for coating ophthalmic lenses and, therefore, the teaching of D5 would not be considered by a skilled person.

The purpose of the tests is, in other words, to show that the skilled person starting from the method of D1 would not have any reason to modify this known method according to the teaching of D5, this being an indication of inventive step of the claimed method.

On the one hand, the tests purporting to be according to the patent in suit were carried out under conditions, most of which were not disclosed in contested Claim 1, some not even in the description, e.g. the concentrations of the material components (see point 2.10 of the test report and Example 5 of the contested patent). It seems, therefore, that said conditions correspond to a further development of the method disclosed in the patent, which means that the person skilled in the art, when starting

from the teaching of Claim 1, has to invest a lot of work, if not inventive skill, to arrive at said test conditions.

On the other hand, the tests referring to D5 were carried out under quite different conditions not exhaustively defined in an example or elsewhere in D5 (e.g., the conditions for preparing the coating solution according to points 2.8 and 2.9 of the test report). Certain conditions of the example referred to were varied (e.g., the sequence of addition of the components of the coating material). The properties of the obtained article were very unsatisfactory, even if a flat surface was coated (see point 5.2 of the test report). This means that, since the plastic sheet to be coated of D5 preferably has also a flat surface, the result obtained by the tests of the appellant according to D5 is even unsatisfactory for the purposes of D5 and is in conflict with the good results set out in D5.

In the opinion of the Board, it is very doubtful whether the tests furnish evidence that the results of D5 are generally wrong and whether the method according to Example 6 or to other examples or to the general teaching of D5 is inappropriate for coating plastic sheets or ophthalmic lenses. The tests do not refute that, if only the skilled person tries to choose suitable conditions (different from those chosen by the appellant), possibly after having carried out some more test series or using another example, the properties of the obtained coated sheets and, respectively, lenses would be satisfactory. To obtain suitable conditions for producing such a coated article having acceptable properties, it seems that the work load is at least as high if the skilled person starts from the method as defined in contested Claim 1, as if he starts from D5.

Valid comparative tests should be carried out under the most similar conditions, however within the framework of the disclosure of the contested claim and the prior art document to be compared with said claim. Since all essential features of contested Claim 1, except for the kind of the body to be coated, are disclosed in D5, the test conditions should differ only in the kind of the body to be coated (ophthalmic lens body with a curved surface consisting of poly(methyl methacrylate) and a poly(methyl methacrylate) sheet with a flat surface).

4.1.7 In view of the foregoing, the method of Claim 1 results from a modification of the method known from D1 according to the teaching of D5, which modification is regarded by a skilled person as an obvious measure for solving the problem stated.

The subject-matter of Claim 1 according to the main request, therefore, does not involve an inventive step (Article 56 EPC) and Claim 1 is not allowable (Article 52(1) EPC).

4.2 **First auxiliary request**

4.2.1 Claim 1 according to the first auxiliary request essentially differs from that according to the main request in that

- the coating is **aberration-free,**

- the liquid material of the substrate hardens to a **solid, room temperature-stable state,** and

- an **S.E.B. abrasion resistance of at least 137.9 kPa (20 psi)** is mentioned.

The first feature is an obvious characteristic of an optical lens and is, therefore, part of the implicit disclosure of D1 (see column 3, lines 53 to 58).

The second feature is trivial, considering that the object of the contested patent is the manufacture of ophthalmic lenses.

As to the mention of a range for the abrasion resistance, it represents a result to be achieved, which is not surprising and cannot alone support the presence of an inventive step.

4.2.2 Therefore, the subject-matter of Claim 1 according to the first auxiliary request does not involve an inventive step (Article 56 EPC) and Claim 1 is not allowable (Article 52(1) EPC).

4.3 **Second auxiliary request**

4.3.1 Claim 1 according to the second auxiliary request essentially differs from that according to the first auxiliary request in that

- the coating layer is **uniform,** and
- a **layer thickness of 0.5 to 50 µm** is mentioned.

The feature that the coating layer is uniform is known from D1 (see column 2, line 24, in particular "even").

As to the thickness of the coating layer, a range of 1 to 2 mils, which corresponds to 25.4 to 50.8 µm, is disclosed in D5 (see column 3, lines 50 to 54).

4.3.2 Therefore, the subject-matter of Claim 1 according to the second auxiliary request does not involve an inventive step (Article 56 EPC) and Claim 1 is not allowable (Article 52(1) EPC).

4.4 **Third auxiliary request**

4.4.1 Claim 1 according to the third auxiliary request essentially differs from that according to the main request in that

- the liquid material of the substrate hardens to a **solid, room temperature-stable state,** and

- step (v) reads "removing the lens from the mould and post reacting said composition to harden said composition".

As to the first feature, the same conclusion, that it is trivial, applies, which was drawn with regard to this feature in Claim 1 of the first auxiliary request.

The new step (v) is obvious, considering that, depending on the specific technique used to completely polymerise the materials of the lens, it might be necessary to remove the lens from the mould. Reference is here made, in particular, to exposition to ultraviolet radiation.

4.4.2 Therefore, the subject-matter of Claim 1 according to the third auxiliary request does not involve an inventive step (Article 56 EPC) and Claim 1 is not allowable (Article 52(1) EPC).

5. None of the remaining claims of each request forms the subject of a separate request. Therefore, they fall together with the respective Claims 1.

6. Thus, the grounds for opposition mentioned in Article 100(a) EPC prejudice the maintenance of the patent.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

P. Martorana E. Turrini