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**D E C I S I O N**  
**of 23 November 2004**

**Case Number:** T 1025/01 - 3.3.3

**Application Number:** 94906554.4

**Publication Number:** 0680492

**IPC:** C08G 18/08

**Language of the proceedings:** EN

**Title of invention:**

Process for improving impact resistance of coated plastic substrates

**Patentee:**

SDC COATINGS, INC.

**Opponent:**

Essilor International (Comp. Générale d'Optique)

**Headword:**

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**Relevant legal provisions:**

EPC Art. 56  
EPC R. 64(a)

**Keyword:**

"Form of opponent's appeal - admissible (yes)"  
"Inventive step (main request) - yes (exclusion of hindsight)"

**Decisions cited:**

T 0002/83, T 0229/85, T 0613/91

**Catchword:**

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Case Number: T 1025/01 - 3.3.3

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.3  
of 23 November 2004

**Appellant 01:** Essilor International (Comp. Générale  
(Opponent) d'Optique)  
147, rue de Paris  
F-94227 Charenton Cedex (FR)

**Representative:** Catherine, Alain  
Cabinet Harlé & Phélip  
7, rue de Madrid  
F-75008 Paris (FR)

**Appellant 02:** SDC COATINGS, INC.  
(Proprietor of the patent) 1911 Wright Circle  
Anaheim, CA 92806 (US)

**Representative:** Howden, Christopher Andrew  
FORRESTER & BOEHMERT  
Pettenkoferstrasse 20-22  
D-80336 München (DE)

**Decision under appeal:** Interlocutory decision of the Opposition  
Division of the European Patent Office posted  
dated 5 July 2001 and posted 20 July 2001  
concerning maintenance of European patent  
No. 0680492 in amended form.

**Composition of the Board:**

**Chairman:** R. Young  
**Members:** W. Sieber  
H. Preglau

## Summary of Facts and Submissions

I. The mention of the grant of European patent No. 0 680 492, in respect of European patent application no. 94 906 554.4, based on International application no. PCT/US94/00249, filed on 7 January 1994 and claiming a US priority of 21 January 1993 (US 6633), was published on 16 April 1997 (Bulletin 1997/16). The granted patent contained 11 claims, whereby Claim 1 read as follows:

"A process for improving the impact resistance of a coated plastic substrate, comprising applying to at least one surface of the substrate a thermosetting polyurethane layer, and an abrasion coating characterised in that the polyurethane is provided by:

applying an aqueous polyurethane dispersion having a pH in the range of 7 to 9, a solids content in the range of 5% to 40%, and a particle size in the range of 10 to 100 nanometers, to said surface of the plastic substrate, the polyurethane being formed by condensation of a multi-functional isocyanate with an anionic diol and a polyether diol or polyester diol;  
at least partially curing the aqueous polyurethane dispersion by air drying at ambient temperature to form a primer layer; and subsequently applying, over the polyurethane primer layer, a coating composition consisting of a silicon-based resin or an acrylic-based resin, and curing the abrasion resistant coating composition to form said abrasion resistant coating."

Claims 2 to 11 were dependent claims directed to elaborations of the process according to Claim 1.

II. A notice of opposition was filed on 16 January 1998 by Essilor International Compagnie Générale d'Optique, requesting revocation of the patent in its entirety on the grounds of Article 100(a) EPC, ie lack of inventive step. The opposition was supported *inter alia* by the following documents:

D1: EP-A-0 404 111;

D2: "Waterborne Polyurethanes" (from *K.C. Frisch and D. Klempner*, "Advances in Urethane Science and Technology", Vol. 10, 1987, pages 1 to 35); and

D3: Brochure of "Witcobond W-240" published by Witco Corporation.

III. By an interlocutory decision which was announced orally on 5 July 2001 and issued in writing on 20 July 2001, the opposition division decided that the patent could be maintained in amended form based on the auxiliary request (Claims 1 to 10) filed by the proprietor on 23 June 1998.

(a) The proprietor's main request (rejection of the opposition and maintenance of the patent as granted) was refused because the subject-matter of Claim 1 was found to lack an inventive step in view of D1 and D3. D1 disclosed a process for producing plastic lenses similar to the process of Claim 1 where, instead of an aqueous polyurethane composition, a solvent-based coating composition

comprising polyisocyanate and diol was used to form a polyurethane primer layer. Compared with the disclosure of D1 the problem to be solved by the claimed method had to be seen in the provision of a further process for the production of plastic lenses having good impact and abrasive resistance, whereby the use of a solvent-based primer composition and a heat curing step in the coating process of the primer layer should be avoided. Faced with this problem, the person skilled in the art would have regarded it as a normal measure to investigate the applicability of Witcobond W-240, a water based polyurethane known from D3, in the process of D1. Hence, the subject-matter of granted Claim 1 was considered obvious in view of D1 and D3 (Article 56 EPC).

- (b) Claim 1 of the auxiliary request was a combination of Claims 1 and 5 as granted so that the step referring to the curing of the aqueous polyurethane dispersion in Claim 1 read as follows (amendment in bold):

"...; at least partially curing the aqueous polyurethane dispersion by air drying at ambient temperature **for less than an hour** to form a primer layer; ...".

Claims 2 to 10 corresponded to granted Claims 2 to 4 and 6 to 11, respectively.

According to the decision, the problem to be solved by the subject-matter of the auxiliary request, compared with the disclosure of D1, had

to be seen in the provision of a further good process for the production of plastic lenses having good impact and abrasive resistance, whereby the use of a solvent-based primer composition and a heat curing step in the coating process of the primer layer should be avoided and the primer layer should be cured by air drying for less than one hour. Although the polyurethane of D3 achieved a dry to touch state already after 15 minutes of drying at room temperature, it was not apparent from D3 that a primer layer based on the polyurethane of D3 would be sufficiently solvent resistant after less than one hour of drying at room temperature so that a silicon- or acrylic-based resin hard coat could be applied. As a result, a person skilled in the art would not combine the teaching of D1 and D3 in order to solve the posed problem. Consequently, the subject-matter of the auxiliary request was based on an inventive step (Article 56 EPC).

IV. Notices of appeal against the above decision were filed by the opponent (appellant 01) on 14 September 2001 and by the proprietor (appellant 02) on 1 October 2001, the required fee being paid on the respective same day.

(a) In the statement of grounds of appeal, filed together with the notice of appeal, the opponent (appellant 01) agreed with the decision under appeal that D1 represented the closest prior art and that the objective problem had to be seen in the provision of a further good process for the production of plastic lenses having good impact and abrasive resistance, whereby the use of a

solvent-based primer composition and a heat curing step in the coating process of the primer layer should be avoided. However, the process of amended Claim 1 encompassed very short curing times at ambient temperatures which obviously did not result in a sufficiently partially cured primer layer to avoid dissolution by a further coating. Thus, the process of amended Claim 1 included embodiments that did not solve the technical problem. Furthermore, the process was not based on an inventive step in view of the teachings of D1 and D3, and possibly D2.

- (b) In the statement of grounds of appeal, filed on 30 November 2001, the proprietor (appellant 02) argued in substance as follows:

When defining the technical problem to be solved over D1, the commercially competitive aspect of the new method should be taken into account. Thus, the problem was to provide a new process for the production of plastic lenses having good impact resistance and abrasive resistance, which avoided the use of solvent-based compositions in which the primer layer could simply be at least partially cured by air drying at ambient temperature, the method being commercially competitive with respect to that disclosed in D1. However, a skilled person, starting from D1 as the closest prior art and seeking to improve upon the method disclosed therein, would never be led to try and use Witcobond W 240, ie the aqueous polyurethane dispersion disclosed in D3, instead of the primer composition disclosed in D1, because the entire

thrust of the disclosure of D1 was that the polyurethane layer should be formed *in situ* on the lens substrate with the application of heat. D1 even taught away from using a material that could be air dried at ambient temperature in view of the short pot life of such a coating composition. Furthermore, D1 provided absolutely no hint or suggestion whatsoever that partial curing of the primer layer before application of the subsequent hard coat might be sufficient to prevent attack of the primer layer when the hard coat is applied. Thus, there was no compelling reason or motivation for the skilled person to use Witcobond W-240 in the method of D1, especially because D3 taught that the excellent solvent resistance of Witcobond W-240 was only achievable at ambient temperature after the coating had been allowed to cure for up to two weeks. Thus, the skilled person would not expect that the combination of D1 and D3 resulted, without the application of heat, in a commercially attractive method with a reasonable timescale. Thus, Claim 1 as granted was based on an inventive step.

- V. In a letter dated 21 November 2001, the proprietor (appellant 02) contended that the opponent's appeal was not in accordance with Rule 64 EPC since the corresponding notice of appeal did not identify the name and the address of the appellant. Consequently, opponent's appeal should be rejected as inadmissible.

In response to this objection, the opponent (appellant 01) provided in a letter dated 17 December 2004, the full name and address of appellant 01.



VI. Both the proprietor (appellant 02) and the opponent (appellant 01) presented observations on the statement of grounds of appeal of the other party in their letters dated 31 January 2002 and 12 February 2002, respectively.

(a) The proprietor (appellant 02) emphasized that the disclosure of D1 specifically referred to a primer coating formed *in situ* from a polyol and a blocked polyisocyanate whereby the blocking agent was removed by heating. Such a process did not include a partial curing at ambient temperature. In contrast to D1, the patent in suit required the use of a polyurethane dispersion (which a person of ordinary skill understood to be made up of discrete polyurethane particles) in the formation of a coating. Such polyurethane dispersions could be film-forming at ambient temperatures.

(b) The opponent (appellant 01) pointed out that an essential feature of the invention would be a relatively short air-drying of the primer layer at ambient temperature to obtain a primer layer that was cured to a sufficient degree so that the primer layer was not attacked by the solvent contained in the subsequently applied hard coat. This essential feature did not appear, not even implicitly, in the claimed process.

VII. In a communication, issued on 7 July 2004 accompanying a summons to oral proceedings, the salient issues of the appeal were identified by the board as being firstly, the admissibility of the opponent's appeal,

and secondly, the assessment of inventive step, in particular the definition of the objective technical problem.

- VIII. With a letter dated 22 October 2004, the proprietor (appellant 02) filed further written submissions and two further sets of amended claims as 2<sup>nd</sup> and 3<sup>rd</sup> auxiliary requests. The proprietor (appellant 02) emphasized that an *ex post facto* analysis had to be avoided when assessing inventive step of the claimed process, in particular when considering the combination of D1 and D3.
- IX. On 23 November 2004, oral proceedings were held before the board. Since neither of the parties had further comments on the admissibility of the opponent's appeal, the discussion focussed on the question as to whether or not the claimed subject-matter was obvious over D1 to D3. The opponent (appellant 01) pointed out that aqueous polyurethane dispersions were known from D2, a general review on waterborne polyurethanes. This type of polyurethanes offered the technological aspect of low solvent or solvent free applications. With respect to D1 and D3, the parties essentially relied on their written submissions.
- X. The opponent (appellant 01) requested that the decision under appeal be set aside and the patent be revoked in its entirety.

The proprietor (appellant 02) requested that the decision under appeal be set aside and the patent be maintained

- as granted (main request), or in the alternative,
- on the basis of the 1<sup>st</sup> auxiliary request (Claims 1 to 10) filed on 23 June 1998, or
- on the basis of the 2<sup>nd</sup> auxiliary request (Claims 1 to 11) filed on 22 October 2004, or
- on the basis of the 3<sup>rd</sup> auxiliary request (Claims 1 to 11) filed on 22 October 2004.

Furthermore, the proprietor (appellant 02) requested that the opponent's appeal be rejected as inadmissible.

### **Reasons for the Decision**

1. The proprietor's appeal complies with Articles 106 to 108 EPC and Rule 64 EPC and is therefore admissible.
2. *Admissibility of the opponent's appeal*
  - 2.1 The proprietor (appellant 02), referring to the requirements of Rule 64 EPC, challenged the admissibility of the opponent's (appellant 01) appeal. In particular, it was noted that the notice of appeal did not identify the name and the address of the appellant.
  - 2.2 The heading of the notice of appeal, filed by the opponent's representative, designates the parties involved in the present case, ie "Re. ESSILOR c/ SDC COATINGS, Inc.", and the patent in suit by its number. Furthermore, it was stated in the first sentence that

"Opponent hereby lodges appeal against the decision from the Opposition Division of 20 July 2001 which has maintained the litigious patent in an amended form". This sentence clearly identifies the decision under appeal by its date and leaves no doubt that the opponent, abbreviated in the heading as "Essilor", is the appellant. It is true that the exact name of the appellant and its address are missing, however, the opponent's exact name, Essilor International Compagnie Générale d'Optique, and the corresponding address is known to the parties and the board from the opposition proceedings. As set out in T 613/91 of 5 October 1993 (not published in the OJ EPO, point 1.1 of the reasons), this amounts to sufficient information for identification of appellant 01 (opponent) within the meaning of Rule 64(a) EPC.

2.3 In view of the above, the board holds that the appeal of the opponent (appellant 01) not only meets the requirements of Articles 106 to 108 EPC but also the requirements of Rule 64 EPC, in particular paragraph (a) thereof. Hence, opponent's (appellant 01) appeal is admissible.

3. In the present case, only inventive step is at issue. Novelty of the subject-matter of granted Claims 1 to 11 was never disputed by the opponent in the course of the opposition proceedings and also was acknowledged by the opposition division (section 3 of the decision under appeal).

4. *Problem and solution (main request)*

4.1 The patent in suit; the closest state of the art

- 4.1.1 The patent in suit is concerned with a process for improving the impact resistance of plastic substrates, such as ophthalmic lenses, by applying to at least one surface of the plastic substrate a primer layer consisting of an aqueous thermosetting polyurethane dispersion which can be cured by air drying, at least partially, at ambient temperature before an abrasion resistant layer is applied over it.
- 4.1.2 It was previously well-known to use plastic substrates instead of glass for ophthalmic lenses because plastic substrates offer advantages, such as lighter weight, ease of handling, and ease of formation of articles. Since plastic lenses are liable to scratching, an abrasion resistant hard coat film is generally provided on the surface of the plastic lens. However, such abrasion resistant hard coats are also known to reduce the impact resistance of the plastic substrate in certain applications (page 2, lines 14 to 31). In order to improve the impact resistance, D1 suggests to apply a thermosetting polyurethane primer layer between the plastic lens substrate and the abrasion resistant coating. According to the process of D1, the polyurethane primer layer is formed on the substrate by first applying a primer coating composition comprising a blocked polyisocyanate and a polyol on to the plastic substrate and then curing the coating composition by heating it to a temperature above 100°C. The blocked polyisocyanate on heating releases the blocking agent so that the reaction of the reformed isocyanate groups with the polyol ensues, thereby forming a crosslinked polyurethane layer *in situ* on the lens substrate. When the temperature is lower than 100°C, the blocking agent

is not released from the blocked polyisocyanate and the polyurethane formation and a curing reaction do not proceed (page 4, lines 11 to 16). Furthermore, D1 discloses that the primer coating composition is diluted with a solvent (page 4, line 2).

4.1.3 Thus, the process of D1 discloses purpose and technical effects most similar to the patent in suit, and is therefore considered by the board, in line with both parties and the opposition division, to represent the closest prior art.

4.1.4 The process of granted Claim 1 differs from the closest prior art in two aspects. Firstly, the process of granted Claim 1 requires the step of applying an aqueous polyurethane dispersion. In other words, the polyurethane primer layer is not formed *in situ* from a primer coating composition containing a polyisocyanate, a polyol and solvent but from a pre-formed aqueous polyurethane dispersion. Secondly, the composition of the polyurethane used in the method granted Claim 1 differs from the polyurethane obtained in D1 because it contains units derived from an anionic diol (eg Claim 1) which are not present in the polyurethane obtained in D1. The use of the anionic diol, a so called "hydrophilic monomer" or "internal emulsifier", results in the introduction of hydrophilic groups into the macromolecular polyurethane chain which aid in dispersing the polyurethane in the aqueous system.

4.2 The objective technical problem

4.2.1 According to the patent in suit, "*the addition of a heating step to cure the thermosetting polyurethane*

*primer layer before a protective hard coat can be applied over it is expensive, adds undue complexity to the process, and is generally not desirable. Moreover, the solvent(s) may also aggressively attack the plastic substrate"* (page 2, line 57 to page 3, line 1 of the patent specification; page 3, line 35 to page 4, line 5 of the application as originally filed).

4.2.2 It is evident from that passage in the patent specification that the proprietor (appellant 02) was aware of the teaching of D1 when filing the application although D1 is not identified in that passage by reference to a publication number. Thus, the proprietor (appellant 02) used the correct state of the art to define the technical problem. Taking furthermore into account that the technical problem must be so formulated as not to contain pointers to the solution (eg T 229/85, OJ EPO 1987, 237), the objective technical problem is to be seen in the provision of an alternative process to improve the impact resistance of a plastic substrate comprising a hard coat whereby the disadvantages of the process of D1 are avoided.

4.2.3 The opponent (appellant 01) took the position that this technical problem was not solved over the whole range because a very short curing time, encompassed by the process of granted Claim 1, did not result in a sufficiently partially cured primer layer to apply the abrasion resistant coating. If this were true, the problem would have to be reformulated. However, the board sees no reason for doing so for the following reasons. Firstly, the allegation of the opponent (appellant 01) is not substantiated by any evidence. Secondly, the whole thrust of the patent in suit when

read as a whole (as it must be considered) is that partial curing of the aqueous polyurethane dispersion before application of the subsequent hard coat is sufficient to prevent attack of the primer layer when the hard coat is applied. Thus, when in Example 1 of the patent in suit the SILVUE® 339 coating composition was applied after allowing only 15 minutes for the primer layer to cure by air drying at ambient temperature, it did not dissolve or otherwise attack the primer layer. Thus, the patent in suit demonstrates very short curing times so that there is no reason to question the formulation of the technical problem as set out in section 4.2.2, above. On the other hand, this surprising technical effect, ie that it is not necessary fully to cure the primer layer, cannot be taken into account when formulating the objective technical problem because the process of granted Claim 1 is neither restricted to partial curing ("at least partially curing") nor to a short curing time.

Hence, the objective technical problem is to be seen in the provision of an alternative process to improve the impact resistance of a plastic substrate comprising a hard coat whereby the disadvantages of the process of D1 are avoided (section 4.2.2, above).

- 4.2.4 The patent in suit suggests, as a solution to this technical problem, the use of a specific aqueous thermosetting polyurethane dispersion to form a primer layer on the plastic substrate which can be cured by air drying at ambient temperature, at least partially, before a hard layer is applied over it.



4.2.5 As shown in the examples in the patent in suit (Tables I and II), plastic substrates coated according to the process of Claim 1 have improved impact resistance over plastic substrates coated only with an abrasion resistant coating. Furthermore, it is evident that the disadvantages of D1, use of solvents and the provision of a heating step, are avoided. Thus, the board is satisfied that the above identified technical problem is solved by the process defined in Claim 1 as granted.

5. *Inventive step (main request)*

5.1 It remains to be decided whether the proposed solution, ie the application of a specific aqueous polyurethane dispersion, is obvious from the prior art.

5.2 In view of the high reactivity of unblocked polyisocyanate with diol, the teaching of D1 is restricted to the formation of the polyurethane primer layer via blocked polyisocyanates (page 3, lines 27 to 30). There is no suggestion as to how the impact resistance might be improved in an alternative way, let alone a hint to the application of an aqueous polyurethane dispersion.

5.3 D2 describes the constitution, the use and the application of waterborne polyurethanes in general. Although D2 refers to waterborne polyurethanes as being low in solvent or even solvent free (Table 4), it is evident from D2 that the chemistry of water based polyurethanes is vast and complex. For example, the table of contents of D2 shows that there is a wide variation in the components, physical properties,

preparation techniques, physical properties, chemistry and mechanisms of curing (cross-linking) for these different systems. In addition, Section IX of this reference teaches that water based polyurethane resins can be used for vastly different uses including *inter alia* coatings for textiles and fabrics, carriers for photographic developers, binders for wood chips, coatings for wood flooring, coatings on glass fibres and other glass articles, sizes for paper and cardboard, leather substitutes, rubber adhesives, caulking materials for sewer sealants, water based paint additives, and metal primers. This would, in the board's view, suggest to one skilled in the relevant art that water based polyurethanes comprise a vast and complex field and that particular resin systems useful for particular end uses must be selected, compounded, applied and processed with considerable skill and care, in particular because D2 does not disclose any particular water based polyurethane coating composition at all, let alone the water based polyurethane coating composition specified in Claim 1 of the patent in suit. Furthermore, D2 does not address the problem of improving the impact resistance of plastic substrates coated with an abrasion resistant layer.

Thus, D2, alone or in combination with D1, does not teach or suggest to the skilled person to use the aqueous polyurethane dispersion specified in granted Claim 1 in order to solve the technical problem defined in section 4.2.2, above.

- 5.4 D3 describes Witcobond W-240, the particular commercial, water based polyurethane used in the examples of the patent in suit. On page 2, this reference indicates

that coatings formulated from Witcobond W-240 offer excellent impact and solvent resistance and that coatings can be formed with little or no heat. Thus, Witcobond W-240's excellent solvent resistance is achievable after the film is allowed to cure at ambient temperatures for one to two weeks. It is evident that the impact resistance referred to in D3 relates to a Witcobond W-240 film. However, D3 does not specifically address the objective technical problem, namely the provision of an alternative process for providing impact resistance of a plastic substrate coated with an abrasion resistant coating, or any other teaching in that direction, for example that Witcobond W-240 might be a particular good primer layer to receive subsequent layers of hard resins. Thus, there is nothing in the teaching of D3 that would suggest to the skilled person to use Witcobond W-240 as a primer layer in the process of D1 in order to solve the objective technical problem (section 4.2.2).

When considering the combination of document D1 with D3, and assessing how a person skilled in the art might have proceeded in the face of these disclosures, one has to be careful not to succumb to the temptation to use an *ex post facto* analysis of the prior art, using knowledge of the invention as assistance. The question to be answered is not whether the skilled person **could** have arrived at the invention by combining the closest prior art with the teaching of D3, but whether he **would have done** so because the prior art incited him to do so in the hope of solving the objective technical problem (see T 2/83, OJ 6/1984, 265). However, there is no teaching in D3 that would have prompted the skilled person to consider Witcobond W-240 as the solution to

- the objective technical problem. Therefore, a person skilled in the art would not combine D1 and D3.
- 5.5 A further indicator why the process of granted Claim 1 is based on an inventive step over the cited prior art is to be found in the publication dates of D1 to D3. D1 was published on 27 December 1990 whereas D2 and D3 were published several years earlier, namely in 1987 (D2) and in April 1986 (D3). Thus, aqueous polyurethane dispersions were well-known several years before document D1. Nevertheless, the inventors of D1, seeking to improve the impact resistance of plastic substrates coated with a hard coating, still chose to use a composition comprising blocked polyisocyanate and solvent which must be heated to form the primer layer *in situ*, rather than to use an aqueous polyurethane dispersion which can be air dried at ambient temperature.
- 5.6 In summary, the documents cited by the opponent (appellant 01), namely D1 to D3, cannot render the claimed subject-matter obvious. Hence, the subject-matter of granted Claim 1, and by the same token, the subject-matter of granted Claims 2 to 11 involves an inventive step within the meaning of Article 56 EPC.
6. It follows, in view of the above, that the patent can be maintained as granted (main request of the proprietor (appellant 02)).

**Order**

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

1. The appeal of the opponent (appellant 01) is admissible.
2. The decision under appeal is set aside.
3. The patent is maintained unamended (ie as granted).

The Registrar:

The Chairman:

E. Görgmaier

R. Young