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D E C I S I O N
of 21 June 2002

Case Number: T 0315/97 - 3.4.2

Application Number: 86308961.1

Publication Number: 0225103

IPC: G02B 5/128

Language of the proceedings: EN

Title of invention:

Encapsulated-lens retroreflective sheeting and method of making

Patentee:

MINNESOTA MINING AND MANUFACTURING COMPANY

Opponent:

NIPPON CARBIDE INDUSTRIES CO., LTD.

Headword:

-

Relevant legal provisions:

EPC Art. 84, 123, 54, 56

Keyword:

"Novelty (yes)"
"Inventive step (no)"
"Proper construction of claim 1"
"Reformatio in peius (1st auxiliary request: no; 2nd and 3rd auxiliary request: inadmissible)"

Decisions cited:

G 0001/99

Headnote:

A claim was directed to a method for manufacturing a product. The method comprised manufacturing conditions the presence or absence of which during manufacture could not be ascertained in a reliable and generally accepted way but could only be derived from a property observed on the obtained product.

For the purpose of establishing whether a method disclosed in a prior art document anticipated the claimed method, the Board construed the feature relating to the manufacturing conditions as if it defined the property observed on the obtained product (point 3.1 of the reasons).



Case Number: T 0315/97 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 21 June 2002

Appellant: NIPPON CARBIDE INDUSTRIES, CO., LTD.
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Decision under appeal: Interlocutory decision of the Opposition Division
of the European Patent Office posted 23 January
1997 concerning maintenance of European patent
No. 0 225 103 in amended form.

Composition of the Board:

Chairman: E. Turrini
Members: A. G. Klein
B. J. Schachenmann

Summary of Facts and Submissions

I. European patent No. 0 225 103 (application No. 86 308 961.1) was maintained in amended form by an interlocutory decision of the opposition division, with a set of claims, of which claim 1, the only independent claim, reads as follows:

"1. Method of making encapsulated-lens retroreflective sheeting which comprises the following steps:

- 1) partially embed substantially a monolayer of lenses into a carrier web,
- 2) deposit specularly reflecting material over the lens-bearing surface of the carrier web to deposit specularly reflecting material onto the lenses and the surface areas of the carrier web between the lenses,
- 3) assemble a high molecular weight thermoplastic binder film having a weight average molecular weight of at least 60,000, a gradual change in viscosity over a temperature interval of 50°C in the softening range indicated by a less-than-order-of-magnitude reduction in loss modulus measured in dynes per square centimeter, and a melt index less than 750 against the monolayer of lenses in the carrier web, pass the assembly between rollers, the heat, pressure and rate of passing between rollers being selected to embed the lenses into the thermoplastic binder film and thereby contacting the thermoplastic binder film

with the specularly reflecting deposit on the lenses but not to the extent that there is any contact between the thermoplastic binder film and any portion of the specularly reflecting deposit which is on the surface of the carrier web between lenses,

- 4) strip off the carrier web, thus removing the specularly reflecting deposit on the carrier web between the lenses thus leaving areas of the binder film between the lenses completely free from the specularly reflecting material,
- 5) lay a cover over the exposed lenses, and
- 6) apply heat and pressure along a network of interconnecting lines to soften and deform the binder material into contact with the cover film, thus forming hermetically sealed cells within which the lenses are encapsulated and have an air interface."

II. The appellant (opponent) lodged an appeal against the interlocutory decision.

III. First oral proceedings were held before the present board on 17 December 1998, at the end of which the respondent (patentee) as a main request requested that the patent be maintained in the amended form considered allowable by the opposition division.

As a first auxiliary request the respondent requested that the patent be maintained in an amended form, with

a claim 1 corresponding to claim 1 of the main request after deletion of the feature in paragraph 3 that the thermoplastic binder film has "a gradual change in viscosity over a temperature interval of 50°C in the softening range indicated by a less-than-order-of-magnitude reduction in loss modulus measured in dynes per square centimetre" (this feature will be referred to hereinafter as "the viscosity change feature").

In its decision of the same date, the board ruled that the viscosity change feature in claim 1 of the main request, which had been added to claim 1 as granted and was based on a passage of the description referring to Figure 6 of the prior art patent US-A-4 505 967 left the skilled reader in a situation where he could not determine whether the binder film materials intended for use in step 3 of the method were only those of curves A and B of Figure 6 or whether they also included at least the material of curve E. Accordingly, the board, could not envisage allowing the respondent's main request.

In respect of the respondent's first auxiliary request, based on a claim 1 which no longer comprised the viscosity change feature of the claimed allowed by the opposition division, the board referred the following point of law to the Enlarged Board of Appeal:

"Must an amended claim which would put the opponent and sole appellant in a worse situation than if he had not appealed - e.g. by deleting a limiting feature of the claim - be rejected"

IV. In its decision G 1/99 of 2 April 2001 the Enlarged Board of Appeal answered the question referred to it as

follows:

"In principle, an amended claim, which would put the opponent and sole appellant in a worse situation than if it had not appealed, must be rejected. However, an exception to this principle may be made in order to meet an objection put forward by the opponent/appellant or the Board during the appeal proceedings, in circumstances where the patent as maintained in amended form would otherwise have to be revoked as a direct consequence of an inadmissible amendment held allowable by the Opposition Division in its interlocutory decision.

In such circumstances, in order to overcome the deficiency, the patent proprietor/respondent may be allowed to file requests, as follows:

- in the first place, for an amendment introducing one or more originally disclosed features which limit the scope of the patent as maintained;

- if such a limitation is not possible, for an amendment introducing one or more originally disclosed features which extend the scope of the patent as maintained, but within the limits of Article 123(3) EPC;

- finally, if such amendments are not possible, for deletion of the inadmissible amendment, but within the limits of Article 123(3) EPC."

V. After resumption of the appeal proceedings before the present board, further oral proceedings were held on 7 December 2001 and 24 April 2002, at which the

appellant requested that the decision under appeal be set aside and that the European patent be revoked.

The respondent requested that the appeal be dismissed and that the patent be maintained as amended on the basis of any of its main and first to third auxiliary requests. Claim 1 of the respondent's main request filed at the oral proceeding of 7 December 2001 reads as follows:

"1. Method of making encapsulated-lens retroreflective sheeting which comprises the following steps.

- 1) partially embed substantially a monolayer of lenses into a carrier web,
- 2) deposit specularly reflecting material over the lens-bearing surface of the carrier web to deposit specularly reflecting material onto the lenses and the surface areas of the carrier web between the lenses,
- 3) assemble a high molecular weight thermoplastic binder film having a weight average molecular weight of at least 60,000, a gradual change in viscosity over a temperature interval of 50°C in the softening range indicated by a less-than-order-of-magnitude reduction in loss modulus measured in dynes per square centimeter as represented by curves A and B in Fig. 6, and a melt index less than 750, against the monolayer of lenses in the carrier web, pass the assembly between rollers, the heat, pressure and rate of passing between rollers

being selected to embed the lenses into the thermoplastic binder film with the specularly reflecting deposit on the lenses but not to the extent that there is any contact between the thermoplastic binder film and any portion of the specularly reflecting deposit which is on the surface of the carrier web between lenses,

- 4) strip off the carrier web, thus removing the specularly reflecting deposit on the carrier web between the lenses thus leaving areas of the binder film between the lenses completely free from the specularly reflecting material,
- 5) lay a cover over the exposed lenses, and
- 6) apply heat and pressure along a network of interconnecting lines to soften and deform the binder material into contact with the cover film, thus forming hermetically sealed cells within which the lenses are encapsulated and have an air interface."

Claim 1 of the respondent's first auxiliary request filed at the oral proceedings of 24 April 2002 corresponds to claim 1 of the main request, with the expression "and thereby contacting the thermoplastic binder film" being inserted before the expression "with the specularly reflecting deposit on the lenses" in paragraph 3 of the claim.

Claim 1 of the respondent's second auxiliary request filed as first auxiliary request at the oral

proceedings of 7 December 2001 reads as follows:

"1. Method of making encapsulated-lens retroreflective sheeting which comprises the following steps:

- 1) partially embed substantially a monolayer of lenses into a carrier web,
- 2) deposit specularly reflecting material over the lens-bearing surface of the carrier web to deposit specularly reflecting material onto the lenses and the surface areas of the carrier web between the lenses,
- 3) assemble a high molecular weight thermoplastic binder film having a weight average molecular weight of at least 60,000, a melt index less than 750 and a gradual change in melt viscosity with increasing temperature so as to allow a controlled introduction of the lenses to desired depths into the binder film, against the monolayer of lenses in the carrier web, pass the assembly between rollers, the heat, pressure and rate of passing between rollers being selected to embed the lenses into the thermoplastic binder film and thereby contacting the thermoplastic binder film with the specularly reflecting deposit on the lenses but not to the extent that there is any contact between the thermoplastic binder film and any portion of the specularly reflecting deposit which is on the surface of the carrier web between lenses,

- 4) strip off the carrier web, thus removing the specularly reflecting deposit on the carrier web between the lenses thus leaving areas of the binder film between the lenses completely free from the specularly reflecting material,
- 5) lay a cover over the exposed lenses, and
- 6) apply heat and pressure along a network of interconnecting lines to soften and deform the binder material into contact with the cover film, thus forming hermetically sealed cells within which the lenses are encapsulated and have an air interface."

Claim 1 of the respondent's third auxiliary request filed as second auxiliary request at the oral proceedings of 7 December 2001 corresponds to claim 1 as considered allowable by the opposition division, after deletion of the viscosity change feature.

VI. At the end of the oral proceedings of 24 April 2002, which had been appointed to give the parties an opportunity to present their comments on an experimental report (hereafter referred to as report D4-1) filed by the appellant with its notice of opposition to support an argument that the skilled person reducing to practice the manufacturing method disclosed in the prior art citation JP-A-189 839/82, an English translation of which as forwarded by the appellant will be referred to as document D4 hereinafter, the Chairman of the board declared the debate closed with the effect that the board would not accept any further submissions from the parties and

announced that the decision would be issued in writing as soon as possible.

VII. The appellant's arguments, as far as they concern issues which are relevant to the present decision, can be summarised as follows:

As compared to its version as granted, claim 1 of the respondent's main request no longer comprises the limitation in paragraph 3 that the thermoplastic binder film is contacted with the specularly reflecting deposit on the lenses. The protection conferred by this claim was therefore extended, in contravention of the provisions of Article 123(3) EPC.

Claim 1 of both the main and the first auxiliary requests also offend against the provisions of Article 123(2) EPC, because they now expressly refer to curves A and B in Figure 6, as taken from the various curves originally disclosed by reference to the prior art citation US-A-4 505 967. This particular selection extends beyond the contents of the application as originally filed.

Neither the specification of the patent in suit nor the above-mentioned US reference disclose in a sufficiently detailed manner a procedure for checking whether a given thermoplastic binder film undergoes a gradual change in viscosity as set out in claim 1 in respect in particular of the temperatures at which the measurement shall be performed or of the pressure to be applied to the samples. The test by which the thermoplastic binder film is defined in the claim therefore inherently lacks reproducibility.

Claims 1 of the respondent's main and first auxiliary requests by referring to Figure 6 also offend against the provisions of Rule 29(6) EPC, according to which claims shall not rely, in respect of the technical features of the invention, on references to drawings, except where absolutely necessary. Such reference is neither necessary nor appropriate in the present case, because it does not provide any further clarification.

The claimed subject-matter lacks novelty in view of the contents of document D4. Figures 4 to 5 of this citation unambiguously disclose the feature of the thermoplastic binder film being contacted with the specularly reflecting deposit on the lenses but not to the extent that there is any contact between it and any portion of the specularly reflecting deposit which is on the surface of the carrier web between lenses. This becomes even more apparent from a fair copy of the Japanese patent application laid open by the Japanese Patent Office and is confirmed by two declarations by Mr Maruyama the inventor of the method of document D4, as filed on 7 November 2001 and 22 March 2002. The Japanese patent corresponding to the patent in suit was revoked for lack of novelty by the Japanese Patent Office Trial Board which in its decision of 20 August 2001 also considered that the above feature was disclosed by Figure 4 of document D4.

The experimental report D4-1 by Mr Ochi as filed with the notice of opposition and a number of further reports and expert opinions by Prof. Eisenbach, Mr Römling and Mr Tanaka further show that a skilled person following the teaching of document D4 would necessarily achieve the claimed features by simply following the instructions given in document D4.

The counter experiments provided by the respondent are not conclusive. The sample preparation methods on which they rely are so harsh that any gap left between the laminated layers was bound to disappear in the process.

VIII. The respondent for its part denied that claim 1 of the main request extended the scope of the protection conferred, since the allegedly missing feature of the thermoplastic binder film contacting the specularly reflecting deposit on the lenses already resulted from the statement in paragraph 2 of the claim that such specularly reflecting material was deposited also on the lenses, in conjunction with the feature of paragraph 3 that the thermoplastic binder film is assembled against the monolayer of lenses in the carrier web.

Claims 1 of the main and first auxiliary requests clearly specify that the change in melt viscosity is such as shown by curves A and B of the US citation referred to in the specification, so as to overcome the objection raised by the board in its decision of 17 December 1998 in connection with claim 1 of the then main request. The allowability of a reference to the drawings in exceptional circumstances is explicitly provided for in Rule 29(6) EPC.

The respondent also contested that the claimed subject-matter lacked novelty in view of the contents of document D4. In the absence in particular of any hint in the document at the interest of providing a gap between the thermoplastic binder film and any portion of the aluminium deposit which is on the surface of the carrier web between lenses, the skilled person had no reason to assume that the slight separation left

between the two layers as shown in Figures 4 to 6 was meant to convey any technical information whatsoever to the reader.

The respondent also denied that the skilled person following the teaching of document D4 would automatically achieve a manufacturing method with a gap being left between the thermoplastic binder film and the specularly reflecting deposit between lenses in the laminating step.

The experimental data filed by the appellant in this respect are defective insofar as they are based on an arbitrary selection of parameters not disclosed in document D4 such as the lamination speed and the time of contact between the thermoplastic binder layer and the lamination rollers. Neither did the preparation conditions of the binder film material and the range of the lens diameters exactly correspond to those disclosed in document D4. The gap observed in the microphotographs produced by the appellant might have resulted from the particular method used for preparing the samples which involved cutting through the laminate with a razor blade hit with a hammer.

The respondent further produced a number of experimental reports to demonstrate that the teaching of document D4 resulted in laminates in which, contrary to what was set out in the claims, the binder film had come into contact with the aluminium-covered spaces between the lenses during the passage between the nip rollers, in particular a declaration by Mr Grunzinger filed on 25 March 2002 and a fourth report by Mr Dunning filed on 16 April 2002.

Reasons for the Decision

1. *Respondent's main request*

Claim 1 as granted specifies in paragraph 3 that portions of the specularly reflecting deposit which are on lenses shall be contacted with a binder film.

This feature is no longer set out in claim 1 of the respondent's main request. The board cannot in this respect endorse the respondent's view that such contact necessarily results from the requirement in paragraph 2 of claim 1 that specularly reflecting material is deposited onto the lenses, when read in conjunction with the statement in paragraph 3 that the binder film is assembled against the monolayer of lenses and the assembly is then passed between rollers. The explicit definition of a certain sequence of manufacturing steps in claim 1 does not unambiguously exclude the possibility of further steps providing for example an additional separation layer over the specularly reflecting material. In such a case there would be no contact between the specularly reflecting deposit lenses and the binder film.

For these reasons, deletion of the feature which in claim 1 as granted defined the direct contacting of the binder film with the specularly reflecting deposit on the lens extends the scope of the protection conferred by that claim, in contravention of the provisions of Article 123(3) EPC.

Accordingly, the respondent's main request is not allowable.

2. *Respondent's first auxiliary request*

2.1 *Reformatio in peius*

As compared to claim 1 of the version considered allowable by the opposition division in the interlocutory decision under appeal, claim 1 of the respondent's first auxiliary request further specifies that the viscosity change feature in paragraph 3 is "as represented by curves A and B in Figure 6". This indication does not extend the scope of protection of the claim allowed in the appealed decision, and it does not therefore put the opponent and sole appellant in a worse situation than if it had not appealed.

The respondent's first auxiliary request does not therefore offend against the principle of prohibition of *reformatio in peius*.

2.2 Compliance of amended claim 1 with the requirements of Article 123(2) and (3) EPC

Apart from the inclusion of a statement in paragraph 4 that when the carrier web is stripped off, areas of the binder film between the lenses are left completely free from the specularly reflecting material, which is based on the sentence bridging pages 5 and 6 of the description as originally filed, claim 1 of the respondent's first auxiliary request in substance corresponds to claim 1 as originally filed, with the addition of the viscosity change feature and the indication that this change is as represented by curves A and B of Figure 6.

These additional features are based on the last

paragraph of page 3 of the description as originally filed, which states that:

"Best results in the practice of this invention are obtained when the HMW thermoplastic binder resin has a gradual change in viscosity over a wide range of temperatures as taught in US Patent No. 4,505,967 (Bailey) at col. 8, lines 16-59 and Fig. 6"

The above-mentioned passage of the US reference explicitly indicates that best results in practice of the invention disclosed there are obtained with materials having properties as represented in curves A and B where there is a plateau or gradual change in viscosity over a longer temperature interval such as 50°C or 75°C or more in the softening range of the material, where the loss modulus, measured in dynes per square centimetre, is caused to change by less-than-order-of-magnitude (see column 8, lines 37 to 46). Curves A and B as referred to in this passage are those shown in Figure 6 as now added to of the drawings of the patent in suit.

Contrary to the appellant's submission, since curves A and B are clearly identified in the US reference as illustrating the behaviour of materials achieving best results, specifying these curves and qualifying the properties of the corresponding materials using the same words as in the US reference does not involve any arbitrary selection from a number of possibilities disclosed in that reference.

For these reasons, the amendments made to claim 1 of the respondent's first auxiliary request do not introduce any subject-matter extending beyond the

content of the application as filed.

This claim also comprises all the limitations of claim 1 in its version as granted, so that it does not extend the scope of protection as conferred by the latter.

Dependent claims 2 to 8 correspond to claims 2 to 8 as granted.

The amended claims thus meet the requirements of Article 123(2) and (3) EPC.

2.3 Clarity

Claim 1 now clearly specifies which of the curves disclosed in Figure 6 of the US reference are meant to define the viscosity change feature. The claim therefore overcomes the objections raised by the board in its decision dated 17 December 1998 against the wording of the claim considered allowable by the opposition division.

The claim also explicitly states that the less-than-order-of-magnitude reduction in loss modulus over a temperature interval of 50°C should be observed in the softening range of the material. This in the board's view makes it clear that the temperature interval of 50°C may be observed anywhere in the softening range so that the appellant's objection based on an allegedly unclear definition of this window is not considered convincing.

The expert opinion by Mr Dunning as filed by the respondent on 9 December 1997, reviewing loss modulus measurements performed earlier by Prof. Eisenbach on the appellant's behalf, also demonstrates to the board's satisfaction that although the sample preparation, the sample history and the particular set up of the experiments for measuring the dynamic mechanical data may indeed affect the absolute values obtained, any variations will not however produce substantial differences in the general shape of the curves showing the reduction of loss modulus in the softening range.

For these reasons, and taking also into account that the materials defined by reference to the viscosity change feature are undisputedly well known in the context of the invention so that their definition in paragraph 3 of the claim has no actual bearing on the issue of the patentability of the claimed subject-matter, the board is satisfied that claim 1 of the respondent's first auxiliary request also meets the requirement of Article 84 EPC.

3. *Patentability*

3.1 Proper construction of claim 1

According to the second portion of paragraph 3 of claim 1, the assembly constituted by the binder film and the lens carrying carrier web is passed between rollers,

"the heat, pressure and rate of passing between rollers being selected to embed the lenses into the thermoplastic binder film and thereby contacting the

thermoplastic binder film with the specularly reflecting deposit on the lenses but not to the extent that there is any contact between the thermoplastic binder film and any portion of the specularly reflecting deposit which is on the surface of the carrier web between lenses".

This wording might suggest that it is the direct determination of whether there is contact or not between the two layers which should be used to properly set the process parameters heat, pressure and rate.

However, the parties' submissions both in writing and at the oral proceedings of 24 April 2002 have clearly established that 15 years after the filing date of the patent there is still no standard or generally recognised inspection method available to the skilled person, which would allow determination of whether or not the process parameters in the lamination step produce such a contact.

The respondent in this respect submitted that the sample preparation method selected by the appellant, involving cutting through the laminate with a razor blade hit by a hammer, could have produced the small amount of layer separation visible in the micrographs on which it relies. Conversely, the appellant suspected that the sample preparation methods used by the respondent, involving slow slicing of the sheet maintained in a clamp or polishing of the sample surface with abrasives after treatment under vacuum and embedment into an epoxy resin might have destroyed any preexisting small gap between the layers.

The patent specification does not itself disclose any

means for determining whether in the laminate a small gap as represented schematically on Figure 3, the width of which as compared to the diameter of the lenses is no more than a few tenths of micrometres, actually separates the binder film and the reflecting material between the lenses. In respect of the claimed feature of the binder film not contacting portions of the reflecting deposit between the lenses, the patent specification only comprises a single passage stating that this causes the carrier web, when stripped off, to remove these portions of the deposit thus leaving areas of the binder film between the lenses completely free from the specularly reflective material and its unwanted colour (see page 3, lines 42 to 45).

The patent specification also only comprises one single reference to an inspection procedure according to which examination under a microscope of the stripped carrier web and the bead-transferred binder film showed that 99% of the beads had transferred to the binder film while nearly 100% of the aluminium vapour coat between the beads remained behind on the carrier web (see page 6, lines 53 to 55).

Thus, in the board's view, the patent specification does not teach that a direct investigation of whether the binder film in the laminate contacts the reflecting deposit between the lenses should take place and its results be used to select the proper process parameters. The claimed absence of contact is disclosed in the patent only as an explanation for the actually observed effect of the process parameter selection on the obtained product, namely the absence of any substantial transfer of reflective material to the binder film.

The board in this respect notices that the test report D4-1 filed with the notice of opposition by the appellant to support its argument that the method set out in claim 1 was known from document D4, did not rely on any investigation of the relative position within the laminate of the binder film and the layer of reflective material between the lenses, but merely on the absence of aluminium transfer from the carrier web layer to the binder film to establish the identity of the method steps. The fact that the respondent did not in the opposition proceedings in any way contest the opponent's equating of the aluminium transfer test with the non-contact criterium set out in paragraph 3 of claim 1 in the board's view confirms that a skilled person would not have considered the teaching of the patent in suit to encompass any direct determination of whether the laminated layers contact each other or not.

In these circumstances, the board considers that the second portion of paragraph 3 of claim 1 should be construed in the light of the specification as meaning that the heat, pressure and rate of passing the laminate between rollers shall be selected to embed the lenses into the thermoplastic binder film, **but not to the extent that there is any transfer of specularly reflecting material from the carrier web to the binder film in the final product**, the mention in the claim of the absence of contact between the binder film and the specularly reflecting deposit between lenses only providing a possible explanation for the lack of transfer, without adding any further limitation to the subject-matter of the claim.

3.2 Novelty

Document D4 undisputedly discloses a method of making encapsulated-lens retroreflective sheeting which comprises the steps of partially embedding substantially a monolayer of lenses into a carrier web, depositing specularly reflecting material over the lens-bearing surface of the carrier web, assembling a high molecular weight thermoplastic binder film which exhibits all the material properties set out in the first portion of paragraph 3 of claim 1, stripping off the carrier web, laying a cover over the exposed lenses and applying heat and pressure along a network of interconnecting lines to form hermetically sealed cells within which the lenses are encapsulated and have an air interface (see page 5, the last paragraph to page 10, the first paragraph).

The document is however silent as to whether specularly reflecting material is transferred to the binder film, and it does not disclose that the process parameters heat, pressure and lamination rate should be selected such as to avoid any such transfer.

The remaining citations on the file do not come closer to the claimed subject-matter.

For these reasons, the subject-matter of claim 1 of the respondent's first auxiliary request in the board's view is novel within the meaning of Article 54 EPC.

3.3 Inventive step

- 3.3.1 Document D4 describes a method of manufacturing encapsulate-lens retroreflective sheeting which comes closest to the claimed method, but it does not disclose whether there is any transfer of reflecting material

from the carrier web to the binder film or not.

It therefore remains to be considered whether or not the skilled person striving at reducing to practice the teaching of document D4 would inevitably achieve a method, and in particular a selection of heat, pressure and rate such that no reflective material is transferred to the binder film, thus leaving areas on this film between the lenses completely free from the reflecting material, within the meaning of claim 1.

- 3.3.2 The appellant provided a number of test reports and expert opinions which in its view all demonstrate that the skilled person, on the sole basis of the information given in document D4 and of his general knowledge would necessarily achieve a method wherein no reflecting material is transferred.

The respondent however contested that the experiments performed by the appellant exactly reproduced the conditions disclosed in document D4 in respect in particular of the solvent content of the binder film and of the dimensions of the lenses. Document D4 in its view also lacked important information concerning in particular the recommended lamination rate and the spatial arrangement of the rollers.

- 3.3.3 The respondent also produced its own experimental reports, in particular the declaration by Mr Grunzinger filed with the letter of 25 March 2002 and the report prepared by Mr Dunning and filed with the letter of 16 April 2002 (hereafter "the Grunzinger declaration" and "the Dunning report", respectively).

These reports describe experimental procedures

reproducing the process of document D4 following all the instructions given there, but the respondent also submitted that the information in document D4 was deficient, since neither the lamination rate nor the precise geometry of the lamination arrangement were specified.

However, the board is satisfied that the lamination rates selected in the reports, in particular the rate of 6 m/mn, correspond to lamination rates which the skilled person would have normally envisaged at the date of the invention. Mr Römling, an expert in the manufacturing of retroreflective sheeting (see his personal qualification and experience in the expert opinion filed by the appellant on 7 November 2001) at the oral proceedings convincingly established that substantially slower lamination rates would not have been considered compatible with the output requirements of an industrial production line. The experiments performed at 6 m/mn, 15.5 m/mn and 26 m/mn as referred to in the Grunzinger declaration also show that transfer of aluminium from the carrier web towards the binder film is hardly sensitive to variations in the lamination rate. The board further notices that the lamination speed of 6 m/mn is mentioned merely casually in a single passage of the specification of the patent in suit (see page 6, lines 48 to 50). The absence here of any emphasis also appears to confirm the standard character of such lamination rate.

The board is also satisfied that, given the minute thicknesses of the sheets to be laminated in accordance with the disclosure of document D4 - the carrier web is composed of 30 micrometres polyethylene laminated on 120 micrometres kraft paper and the thickness of the

binder layer is 50 micrometres - the laminate would be heated almost instantaneously when contacted with the rollers heated at 100°C under a nip pressure of 2 kg/cm². The duration of the contact between the laminate and the rollers is not therefore a decisive parameter, nor is accordingly the precise geometry of the lamination means.

Both the Grunzinger declaration and the Dunning report as filed by the respondent thus in the board's view describe how the skilled person, using the information from document D4 as read in the light of his technical knowledge, would actually have reduced its teaching to practice.

- 3.3.4 Although the reports were primarily meant to show that such reduction to practice would have resulted in the binder layer directly contacting the reflecting material on the carrier web between the lenses, they also explicitly state that upon stripping off the carrier web there was hardly any aluminium transfer from the carrier web onto the binder film (see the Grunzinger declaration, page 3, second paragraph in conjunction with micrographs 4 and 5 of assembly after stripping apart, "showing that the beads have transferred but hardly any aluminium has transferred" and the Dunning report, the paragraph bridging pages 9 and 10 in conjunction with Figures 13 and 14 showing "the binder side containing the beads but without aluminium between the beads" and illustrating the "lack of aluminium transfer" and the confirmation in the paragraph bridging pages 12 and 13 of the respondent's letter of 16 April 2002: "Essentially no aluminium transfer from the temporary carrier layer to the binder layer was observed").

3.3.5 For these reasons, taking into account the proper construction of the claim as set out in paragraph 3.1 above and the evidence produced by the respondent itself, the board comes to the conclusion that the method defined in claim 1 of the respondent's first auxiliary request would inevitably have been achieved by a skilled person reducing to practice the teaching of document D4 and that it does not therefore involve an inventive step within the meaning of Article 56 EPC.

4. *Respondent's second and third auxiliary requests*

Claim 1 of the respondent's second and third auxiliary requests no longer comprise the limitation of the claim considered allowable by the opposition division as directed to a less-than-order-of-magnitude reduction in loss modulus measured in dynes per square centimeter. The scope of these claims has thus being extended, which for the opponent and sole appellant could result in a *reformatio in peius* if claim 1 of any of these requests was admitted.

The Enlarged Board of Appeal, to which the present board had referred the question of whether an amended claim which would put the opponent and sole appellant in a worse situation than if he had not appealed - e.g. by deleting a limited feature of the claim - must be rejected, ruled in its decision G 1/99 that such amendment may not be allowed if the patent proprietor/respondent may file a request, in the first place, for an amendment introducing one or more originally disclosed features which limit the scope of the patent as maintained (see the order of the decision).

In the present circumstances, as shown in point 2 above, claim 1 as maintained by the opposition division could be amended by introducing such originally disclosed features limiting the scope of the patent as maintained. Accordingly, the option of merely deleting the contested features of claim 1 as maintained is no longer open to the respondent.

In any case, since as a result of the deletion of features the scope of claim 1 of the second and third auxiliary requests is broader than the scope of claim 1 of the first auxiliary request, the objection of lack of inventive step raised against claim 1 of the first auxiliary request necessarily also applies to claim 1 of the second and third auxiliary requests.

For these reasons, the respondent's second and third auxiliary requests cannot be allowed.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:

P. Martorana

E. Turrini