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D E C I S I O N
of 19 July 2000

Case Number: T 0633/97 - 3.4.2
Application Number: 90110854.8
Publication Number: 0401845
IPC: G02B 1/00, C03C 3/06

Language of the proceedings: EN

Title of invention:

Optical members and blanks of synthetic silica glass and
method for their production

Patentee:

Hareus Quarzglas GmbH & Co. KG, et al

Opponent:

NIKON CORPORATION

Headword:

Optical members/HERAEUS

Relevant legal provisions:

EPC Art. 54, 56, 84, 87(1), 114(2), 123(2)

Keyword:

"Exercise of discretion with respect to "late-filed" evidence
and requests"

"State of the art - document published before priority date
(no) - insufficient proof"

"Prior use - prima facie confidentiality obligation (yes)"

Decisions cited:

G 0001/92, G 0004/95, G 0002/98 (pending), T 0743/89,
T 0472/92, T 1076/93

Catchword:

1. Once oral proceedings have been arranged in appeal cases, the decision to admit new evidence or requests into the procedure should be governed primarily by a general interest in the appeal proceedings being conducted in an effective manner, i.e. in dealing with as many of the issues raised by the parties as possible, while still being brought to a close within a reasonable time.

2. In these circumstances, new submissions should normally be disregarded if the complexity of the technical or legal issues raised is such that neither the Board nor the other party can be clearly expected to deal with them without adjournment of the oral proceedings. Complex fresh subject matter filed at short notice before or during oral proceedings thus runs the risk of being not admitted to the proceedings without any consideration of its relevance or allowability. (See Reasons for the Decision, point 2)



Case Number: T 0633/97 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 19 July 2000

Appellant: NIKON CORPORATION
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Decision under appeal: Interlocutory decision of the Opposition Division
of the European Patent Office posted 22 April
1997 concerning maintenance of European patent
No. 0 401 845 in amended form.

Composition of the Board:

Chairman: S. V. Steinbrener
Members: A. G. Klein
B. J. Schachenmann

Summary of Facts and Submissions

- I. The appellant (opponent) lodged an appeal against the interlocutory decision of the Opposition Division finding European patent No. 0 401 845 as amended at the oral proceedings before the first instance to meet the requirements of the Convention.
- II. The opposition filed by the appellant against the patent in suit as far as it concerns claims 1 to 16 and 26 to 32 as granted had been based on Article 100(a) EPC since the claimed subject-matter allegedly lacked novelty or inventive step.
- III. In its decision, the Opposition Division held that the amended claims were admissible and that claim 1 was entitled to the priority of the first priority document. Furthermore, the subject matter of said claims was considered novel and inventive with respect to the available prior art comprising (in the numbering of the Opposition Division) *inter alia* the following documents:
- D1a: Corning catalogue "Fused Silica", Revision 1/89
- D1b: Corning catalogue "Premium-Quality Fused Silica Low Expansion Material Code 7940", FS7940/9-78(A)
- D2: Toshiba Ceramics Co., Ltd. catalogue "Quartz Glass and Silica Glass", IC 032 83 9 12, and several partial English translations thereof furnished by the opponent

D8: Letter of Mr Misuhashi of Corning K.K dated 19 June 1984 and an English translation thereof (a further version of this letter including a copy of the attached catalogue was filed during the appeal proceedings)

D18: Corning order acknowledgement for order dated 26 July 1984, filed by the patent proprietors

D19: Letter of Mr Taylor of Lawrence Livermore National Laboratory (LLNL) dated 25 January 1996

and the following further evidence

A-1/2 to A-1/3: Affidavit by Mr Schermerhorn of Corning Incorporated dated 3 February 1997

A-1/4 to A-1/11: "Summary of Evaluation of 1984 LLNL part", analysis report of Corning Incorporated dated 2 February 1996

D-1: Corning order acknowledgement for order dated 8 August 1984, filed by the opponent

D-2: University of California confirmation dated 3 October 1984 of the telephone order of 8 August 1984

D-3: University of California shipping document dated 25 January 1996.

IV. The above documents were again cited by the parties in the present appeal proceedings.

In addition, *inter alia* the following documents were for the first time referred to by the parties before the Board of Appeal:

- D1b': Corning catalogue "Premium-Quality Fused Silica Low Expansion Material Code 7940", FS7490/9-84 (Rpt.)
- D20: Affidavit by Mr Taylor of LLNL dated 21 July 1997
- D21: Affidavit by Mr Willis of LLNL dated 21 July 1997
- D26: G. H. A. M. van der Steen et al., Philips Research Reports, vol. 30, 1975, pages 192 to 205
- D27: S. Yamagata, Mineralogical Journal, vol. 15, no. 8, October 1991, pages 333 to 342
- D28: Graph furnished by the appellant, correlating the H₂ released amount to the H₂ concentration as derivable from the patent in suit
- D29: Affidavit by Mr Mochida of Nikon Corporation dated 12 June 2000 and English translation thereof furnished by the appellant
- D30: Affidavit by Mr Totsuka of M. Watanabe & Co., Ltd. dated 14 June 2000 and English translation thereof furnished by the appellant
- D32: Calculation method for OH group concentration derived from transmittance in Corning catalogue

furnished by the appellant

- D33: Further affidavit by Mr Schermerhorn dated 3 February 1997 and completed by attachments A and B (replacing affidavit A-2/1 to A-2/2 submitted before the first instance)
- D38: Newspaper articles (The Nikkan Kogyo, 7 June 1989; The Nikkei Sangyo, 7 June 1989; The Nippon Kogyo, 7 June 1989) and English translation thereof furnished by the appellant
- D39: V.S. Khotimchenko et al., Journal of Applied Spectroscopy, vol. 46, no. 6, 1987, pages 632 to 635, and
- D40: Y. Morimoto et al., Showa 63 (1988) Illumination Society Tokyo Branch Meeting, page 51 and English translation thereof furnished by the appellant.

V. In a communication pursuant to Article 11(2) of the Rules of Procedure of the Boards of Appeal, the Board considered claim 1 of the then only request to be in substance based on claim 3 as granted, the latter being essentially a combination of original claims 1 to 3. Although from a formal standpoint, the combination of original claims 1 to 3 seemed questionable under Article 123(2) EPC, one might conclude from the application documents as filed that the alternative definitions of H₂ concentration were in fact equivalent in that they related to one and the same condition the specific parameter had to meet(see in particular the correlation of the respective numerical values given in Tables 2A and 2B for said definitions).

Furthermore, the Board held the provisional view that the question of whether the patent in suit might validly claim the first priority depended mainly on the point raised above, since the definition of an H₂ concentration "of at least about 5 x 10¹⁶ molecules/cm³" could not be found in the first priority document. Thus, claim 1 might only be considered to be "in respect of the same invention" (Article 87(1) EPC) if the said further definition of the H₂ concentration obtained from Raman scattering experiments were in fact redundant.

Moreover, the Board informed the parties that it tended to admit documents D20 to D25 to the present proceedings since they had already been filed with the statement of grounds of appeal with the intention to back up the appellant's arguments and did not appear to be entirely irrelevant. Without further evidence, the Board had, however, doubts as to whether document D1a belonged to the pre-published state of the art. Similar doubts arose with respect to the publication dates of documents D1b and D2 although these dates had not been contested by the respondents (patent proprietors). In any case, the burden of proof for these facts lay with the opponent.

Having regard to patentability, the parties' attention was drawn to the circumstances which had to be clarified in accordance with established jurisprudence in order to determine whether an invention was made available to the public by prior use.

Finally, if novelty of the claimed subject matter could be accepted, the existence of an inventive step should be assessed with respect to the available prior art.

- VI. The parties reacted to this communication by filing further evidence, arguments and requests with their respective letters dated 19 June 2000.
- VII. Oral proceedings which had been arranged at the appellant's subsidiary request took place on 19 July 2000. At the end of the oral proceedings, the decision of the Board was given.
- VIII. The appellant requested that the decision under appeal be set aside and that the European patent No. 0 401 845 be revoked in so far as claims 1 to 16 and 26 to 32 of the granted patent are concerned.
- IX. The respondents requested that the appeal be dismissed and that the patent be maintained in amended form
- as decided by the first instance (main request) or,
 - as auxiliary request 1, on the basis of claim 1 filed as main request on 19 June 2000, or
 - as auxiliary request 2, on the basis of claim 1 filed as second auxiliary request on 19 June 2000, or
 - as auxiliary request 3, on the basis of claim 1 filed as third auxiliary request on 19 June 2000, with deletion of the expression "at least" before " 10^6 at a wavelength of 248 nm...".
- X. The impugned independent claims of the main request read as follows:

"1. Use of a synthetic silica glass optical member with a high-power ultraviolet laser beam having a wavelength shorter than about 250 nm, wherein said optical member is made of high-purity synthetic silica glass material which is free from striae in at least one direction corresponding to the incident light and which has an OH group concentration of at least about 100 wt.ppm, and a doped hydrogen molecule concentration of at least about 5×10^{16} molecules/cm³ and such that when the temperature of said optical member is raised to 1000°C under vacuum, at least about 1×10^{20} molecules/m² of hydrogen are released from said member."

"24. A method of producing an optical member or blank therefor for use with a high-power ultraviolet laser beam having a wavelength range shorter than about 250 nm, said method comprising the steps of: forming a blank from high-purity synthetic silica glass containing OH groups in an amount of at least 100 wt.ppm; removing striae from said blank in at least one direction corresponding to the incident light, removing internal strains from said blank by heating the blank at a temperature of at least 1000°C, and doping said silica glass with hydrogen to a hydrogen molecule concentration of at least about 5×10^{16} molecules/cm³ and such that when the temperature of said optical member or said blank is raised to 1000°C under vacuum, at least about 1×10^{20} molecules/m² of hydrogen are released from said member or said blank."

The impugned claims 2 to 14 and 25 to 28 are appended to the above independent claims.

XI. The appellant advanced the following arguments at the oral proceedings:

In accordance with G 4/95, Mr Schermerhorn from Corning Incorporated should be allowed to give some further explanations concerning the facts and circumstances which are already described in his affidavits. However, if the Board considers this to be necessary, Mr Schermerhorn could also be heard as a witness.

The subject matter of claim 1 is based on a combination of the features of original claims 1 to 3. Since original claims 2 and 3 separately refer back to original claim 1 and there is no further disclosure of said combination in the original application documents, claim 1 must be considered to contravene Article 123(2) EPC.

This contravention is not remedied by the alleged equivalence of the claimed alternative definitions for the H₂ content as set out in original claims 2 and 3, respectively, since such equivalence does not exist. As can be seen from documents D39 and D40, the conditions in accordance with the Khotimchenko method and the Morimoto method both applied in the contested patent and leading to said alternative definitions in the original claims are different so that the respective results cannot be correlated. In particular, the vacuum is rather low in D39 and only physically dissolved hydrogen can be detected by the Raman method, whereas D40 (which is an abstract of the article cited in the patent in suit) applies a much lower pressure and detects two released H₂ amount peaks relating to two different kinds of hydrogen involved, i.e. the physically dissolved hydrogen released at 500°C and the hydrogen obtained by cleavage of the OH groups at 1000°C. Although the numerical values of Tables 2A and 2B may be linearly correlated, the fact that the

preferred parameter ranges of the patent in suit do not comply with this linear correlation is manifest from document D28. A consistent relationship between both methods could only be expected if the same outgassing conditions were employed which is clearly not the case.

Therefore, said alternative definitions in claim 1 are not redundant and, accordingly, in the US patent corresponding to the patent in suit the claimed combination was not allowed. Also from the filing of five separate priority applications, it must be concluded that the respective contents were considered by the appellant to be separate inventions.

Of these priority documents, only the last one refers to document D39, whereas the other documents solely rely on the Morimoto method. Since no correlation between the different methods is disclosed in said priority documents either, claim 1 would at most be entitled to the fifth priority. However, the feature "free from striae in at least one direction" is not disclosed in any one of the priority documents which are restricted to the absence of striae "in three directions". Hence, claim 1 has been broadened with respect to the contents of the priority documents and is not entitled to any priority.

Claim 1 is also not clear since the conditions under which the released amount of hydrogen is measured have not been specified in the claim. As can be seen from document D26, hydrogen is released from different sources depending on the measurement conditions, in particular on sample thickness and pressure applied. Moreover, a comparison of both methods for determining the H₂ content in document D27 shows an error margin of

± 10%, i.e. the measured values are hardly reliable so that it cannot be decided whether or not an actually obtained value falls under the claim.

Having regard to the prior art identified, document D1a must be considered to be pre-published since the original catalogue shown at the oral proceedings bears the indication "Revision 1/89", which means that it was printed in January 1989. Although Corning Incorporated were not able to explicitly confirm this fact for the specific case of D1a, they confirmed their usual practice of indicating the printing date in the number code of the respective document. Thus, the code "FS7940/9-78(A)" on the last page of document D1b means "Fused Silica Corning code 7940, printed in September 1978". In accordance with decision T 743/89, this constant practice should be sufficient proof for the publication of document D1a before the first priority date of the patent in suit, i.e. 9 June 1989.

In any case, from document D2, a high purity synthetic silica glass can be derived which has all the properties of the material specified in claim 1. In particular, as can be shown by straightforward calculations and assumptions, the H₂ content and the released H₂ amount fall within the claimed ranges. The possibility of utilising the known material for high-power ultraviolet laser beams is apparent for a skilled person from Figure 9 of D2 showing an extraordinarily high transmittance at short wavelengths. Already the standard material, i.e. T-4040, in substance does not contain any striae, whereas the product T-4042 is explicitly specified to be free of striae in one direction. The two products must however be considered identical with respect to all the other properties

since they are derived from the same ingot and can be obtained by different cuts of the same material. Therefore, novelty of the claimed subject matter should be denied.

In combination with the newspaper articles dated 7 June 1989 (document D38), the claimed use of the known material would be obvious in any case since such use with excimer lasers is explicitly suggested in D38 and the reported transmittance value corresponds to that shown in Figure 9 of D2. A skilled person would still take account of the glass T-4040 of document D2 in combination with D38 because he understands that the newly developed product only differs from the older one by the reduction of some metal impurities contained in silica glasses. As generally known in the technical field concerned (see also affidavit A-1/2 to A-1/3 and analysis report A-1/4 to A-1/11), apart from any such further impurity reductions the composition of fused silica glasses is hardly changed.

Hydrogen would, however, not be considered to be an undesirable impurity in materials intended for UV high-power laser optics, even though this may be the case for semiconductor or lamp applications.

As regards the delivery of Corning product 7940 to LLNL, the host of documents A-1/2, A-1/4, A-1/5, A-1/7, A-1/8, D-1, D-2, D-3, D19, D20 and D21 proves that a lot of 36 blanks was ordered and shipped to LLNL in 1984, out of which 20 samples remained with LLNL until 1996, where one sample was sent back to, and analysed by, Corning Incorporated to prove that the material corresponded to that specified in claim 1. A further sample of the lot shipped to, and stored at, LLNL is

handed over to the Board in its original package for visual inspection at the oral proceedings. In this context, the letter of Mr Taylor dated 25 January 1996 (see document D33, attachment A) may lead to a misunderstanding which however has been clarified by document D20. Moreover, document D-1 is the correct order acknowledgement according to Corning files, whereas document D-18 furnished by the respondents was not retrieved and may relate to a separate order. Thus, there can be no doubt that the material delivered to LLNL in 1984 already had the claimed properties.

In view of the advantageous transmittance of Corning product 7940 at short wavelengths as shown in document D1b and proved in document A-1/7, it would be obvious for a skilled person to use this prior art glass with high power UV lasers, in particular excimer lasers.

The Corning products delivered to LLNL were made publicly available since they had to be worked prior to use at LLNL and the working, in particular grinding and polishing, is regularly done by subcontractors outside LLNL who thus had the possibility of analysing the material. There is no proof that this knowledge had to be kept secret or specifically related to the uranium project in which LLNL was involved at the time.

Having regard to method claim 24, analogous arguments apply. The only difference may be seen in the doping step with hydrogen which however - according to the patentee - only means that the material contains hydrogen. Such a content can obviously be achieved by annealing the glass in a hydrogen atmosphere.

XII. The respondents' arguments in support of their requests

may be summarised as follows:

Mr Schermerhorn should not be allowed to supplement his affidavits in the function of a technical expert but must be heard as a witness in this context. However, in this case he could not take part in the oral deliberations.

The subject matter of claim 1 aims at defining the hydrogen concentration in the silica glass and uses two different methods to describe one and the same requirement since there is no standard test available. Irrespective of whether or not these methods are equivalent, there is ample disclosure in the application documents as filed (see e.g. the examples given in Tables 2A and 2B) to justify their combination in one claim even if original claim 3 does not refer back to original claim 2.

Nevertheless, document D28 shows that all of the measured examples of Tables 2A and 2B are on the lower straight line, i.e. a linear correlation exists between both methods, the proportionality factor of which may be derived from the graph. The second straight line in D28 having a different slope is not based on measured values but on the limits of preferred ranges which need not necessarily be selected in an identical way for both methods. Hence, any deviation between the respective correlations is not significant and only the correlation of the measured values has a physical meaning. The equivalence of both methods also forms the basis of document D39 referred to in the contested patent since the Raman data must be calibrated by outgassing results. Whether or not some hydrogen from OH groups may be included in this calibration, is

irrelevant in view of the observed linear dependency. Finally, the fact that the different methods were originally set out in separate dependent claims is only due to an unlucky provisional formulation of those claims, the overall contents of the application documents clearly disclosing the combination as claimed in claim 1 of the main request.

In the respondents' view, all five priorities can be validly claimed by the patent in suit since the finding of equivalence of both methods directly applies to the priority discussion. The additional objection concerning the absence of striae in at least one direction is not justified either because a skilled person would readily find out that the restriction to three directions is not essential and in accordance with the existing case law the assessment of the "same invention" involves some flexibility as long as the character and nature of the invention are not changed.

It has to be remembered that clarity is not a valid ground for opposition. Nevertheless, the claims are directed to a skilled person and as such are clear, the experimental details being available from the description. Late-filed documents D26 and D27 are not considered relevant in this respect.

Whereas documents D1b, D1b' and D2 may be considered to form part of the prior art, the alleged publication date of document D1a is contested. The imprint "Revision 1/89" differs from the code used in documents D1b and D1b', so that the explanation of the latter given by the appellant does not apply. Hence, the imprint cannot be unquestionably associated with the printing or publishing dates. The burden of proof is on

the appellant, and the present situation is distinguished from the case decided in T 743/89.

As can be seen from the appellant's assessment of catalogue D2, although neither time nor pressure for the outgassing treatment are given in Table 2 of D2, a straightforward calculation of the released amount is possible. However, a clear disclosure for the absence of striae is missing in D2. "Hardly any striae" or "substantially no striae" means, in fact, the presence of striae. If this were not the case, it would have been mentioned in the catalogue. Therein, the absence of unidirectional striae is separately specified for the product T-4042 only, the composition of which is however unknown. Whether or not T-4042 may come from the same ingot as T-4040 is a matter of speculation. More likely, T-4042 relates to a version of T-4040 which has been annealed to remove striae, such annealed version however no longer containing any hydrogen. Moreover, in D2 (and in D39 as well), hydrogen is considered to be an impurity and the importance of low gas content is stressed. Finally, the claimed use cannot be derived from the transmittance curve given in D2 since the mere indication of a short wavelength transparency in Figure 9 does not imply the teaching of using the glass with a high power UV laser beam.

The newspaper articles of document D38 do not render the present invention obvious. Rather, they point in a different direction reporting that Toshiba had developed a new product for excimer laser applications. A skilled person therefore would not consider the old product T-4040 to be good enough in this respect. The appellant's assertion that the composition of fused silica glasses does not change in time is not correct

as can be seen from a comparison of documents D1a and D1b with respect to the impurity content. Furthermore, the absence of striae is not disclosed in D38.

Document D1b from 1978, i.e. a time where excimer lasers were hardly known, only shows that the Corning material was transmissive at small wavelengths. The affidavits submitted to prove a prior use by delivery to LLNL contain a lot of contradictions and uncertainties. In particular, document D20 mentions 20 remaining parts, whereas attachment A of document D33 refers to one remaining blank. The different order acknowledgements D-1 and D18 suggest two independent deliveries to LLNL, whereas attachment A of document D33 refers to a single purchase. Affidavit A-1/3 insists on the fact that no change in the material occurred, whereas such change is apparent from Corning catalogues D1a and D1b. Therefore, it is not beyond any doubt that a prior use actually took place.

However, the crucial issue is whether or not the delivery to LLNL made the material available to the public. As can be seen from the Internet homepage of LLNL, the laboratory was founded in 1952 as a reaction to the detonation of the first Russian atomic bomb and since then strongly involved in the development of US nuclear deterrents. Its mission is to apply science and technology in the national interest, with a focus on global security, global ecology, and bioscience.

Therefore, it is beyond any reasonable doubt that LLNL in general is a top secret institution doing classified work for the US government. Confidentiality must also be particularly assumed for the specific application of the delivered glass blanks in the uranium enrichment method mentioned in document D20. According to D20, the delivered blanks have never been used, i.e. they never went out for being worked on by subcontractors.

However, even if this had been the case, then any such subcontractor *prima facie* would have been bound by further confidentiality agreements. As can be seen from decision T 1076/93, under these circumstances no explicit secrecy agreement must be produced.

In consequence, the alleged prior use has not been proven, was not public and in any case would neither destroy novelty nor inventive step.

Having regard to method claim 24, there is no document describing a hydrogen doping step which therefore cannot be considered obvious. For the rest, reference is made to the arguments given for claim 1.

Reasons for the Decision

1. *Admissibility of appeal*

The appeal meets the requirements of Rule 65 EPC and is therefore admissible.

2. *"Late-filed" evidence and requests*

2.1 New arguments, evidence and requests were submitted by the parties, both before the expiry of the time limit set by the Board in the summons to oral proceedings and in the course of the oral proceedings.

2.2 Taking account of the fact that both the Board and the parties must be considered to be technically and legally competent, the Board holds the view that a limitation of its discretion under Article 114(2) EPC by applying fixed time limits to the submission of new evidence or requests is in general not appropriate. Nor does the application of a criterion based on the relevance of the "late-filed" material or the substantive allowability of "late-filed" requests seem to offer a convincing approach in the present context because this implies that the merits of such evidence or requests must indeed be duly assessed in advance.

In the Board's opinion, once oral proceedings have been arranged in appeal cases, the decision to admit new evidence or requests into the procedure should hinge neither on a fixed time limit for their submission nor on their merit. It should instead be governed primarily by a general interest in the appeal proceedings being conducted in an effective manner, i.e. in dealing with as many of the issues raised by the parties as

possible, while still being brought to a close within a reasonable time.

In these circumstances, new submissions should normally be disregarded if the complexity of the technical or legal issues raised is such that neither the Board nor the other party can be clearly expected to deal with them without adjournment of the oral proceedings. Complex fresh subject matter filed at short notice before or during oral proceedings thus runs the risk of being not admitted to the proceedings without any consideration of its relevance or allowability.

2.3 This means for the present case, that the Board is prepared to admit documents D20 to D39 filed before the date fixed in the annex to the summons to oral proceedings as there was sufficient time to study these documents not raising further complex substantive questions. An analogous argument holds for the additional requests submitted with the respondents' letter dated 19 June 2000.

2.4 Having regard to document D40 handed over by the appellant during the oral proceedings, the Board decided to also admit this document to the present proceedings because

- it only comprises one and a half type-written pages of text and thus is rather concise so that it can be checked through within a short break; and
- its contents should basically be familiar to all those taking part in the oral proceedings since it appears to be the abstract of - or at least is

closely related to - a fundamental document cited in the patent in suit (see page 11, lines 11 to 15).

Similarly, the amendments of the respondents' requests submitted at the oral proceedings have been admitted by the Board since these amendments only amount to a rearrangement of the order of the requests and a minor deletion in one of the requests and, thus, are immediately understandable.

- 2.5 However, the *ad hoc* request at the oral proceedings to hear Mr Schermerhorn as a witness in order to give further explanations concerning the facts and circumstances already described in his affidavits had to be rejected without further consideration as to its merits since it must be considered to have been submitted too late on the basis of the above findings. In view of the requirements provided in Rule 72 EPC such a request involves a high probability that it cannot be handled within the time available at the oral proceedings if not duly prepared in advance.

In consequence, Mr Schermerhorn was not allowed to supplement his affidavits as a witness at the oral proceedings, but only to act as an accompanying person in accordance with decision G 4/95 of the Enlarged Board of Appeal (OJ EPO 1996, 412; see Headnote) and the appellant's request duly filed with the letter of 19 June 2000.

3. *Admissibility of the main request*

- 3.1 The appellant based its objection under Article 123(2) EPC against claim 1 of the main request basically on

the argument that original claim 3 was not referred back to original claim 2 and that therefore the two hydrogen concentrations determined by different methods defined in these claims were in fact properties of separate, uncorrelated embodiments of the glass material.

- 3.2 The Board is not persuaded by this argument since in view of Article 123(2) EPC the whole contents of the application as filed has to be taken into account.

From the original disclosure (see in particular page 6, line 55 to page 7, line 2 and page 11, lines 37 to 58 of the A-publication of the patent in suit), a skilled person learns that there is no standard test for measuring the H₂ concentration in glass blanks. Rather, two different methods are known, the Khotimchenko method (see document D39) based on Raman data and the Morimoto method (see related document D40) based on an outgassing procedure. Thus, it is clear from the cited passage of the application that a property of the claimed material, i.e. its H₂ concentration, may be characterised in two different ways. In other words, said different characterisations do not lead to different embodiments but define one and the same material which may well be described in parallel by the parameter values of the alternative methods. This has in fact been done in all of the examples given in Tables 2A and 2B of the application as filed, the lower limits of the H₂ concentration derivable from the examples according to both methods complying with the respective limits set out in claim 1 of the main request. Therefore, although originally claimed separately, on the basis of the original disclosure both characterisations of the H₂ content are

independent, but equivalent definitions of the same subject matter and may together be included in claim 1 without infringing Article 123(2) EPC.

- 3.3 Moreover, it must be assumed that the results of both methods are linearly correlated as can be derived from the examples of Tables 2A and 2B (see the lower straight line of document D28 relating to the actually measured values given in said Tables). The observed proportionality cannot be surprising if account is taken of the fact that the Khotimchenko method is calibrated by the results of an outgassing procedure of the type used by Morimoto and the calibration also leads to a linear dependency (see Figure 4 of document D39). Whether the outgassing procedure applied in D39 differs in some experimental details from the procedure used by Morimoto seems to be of secondary importance with respect to the correlation actually obtained.

Furthermore, the appellant's argument that the respective preferred ranges of both methods (see page 7, lines 5 to 13 of the A-publication of the patent in suit) are correlated in a different way (see the upper straight line of document D28) is not persuasive since these ranges are obviously not based on measured values but appear to be limits selected by the drafter of the patent application so that the skilled reader would not derive any actual correlation from them.

- 3.4 The above findings analogously apply to the method claim 24 of the main request, originating from impugned claim 26.

4. *Clarity of the main request*

4.1 Article 84 EPC is no ground for opposition and thus could only be invoked with respect to amendments effected after grant of the patent in suit. In the present case, the amendments of the independent claims substantially consist in the addition of features from the dependent claims as granted. Therefore, strictly speaking, any lack of clarity which could be objected to in the present proceedings should originate from said new combination and not from the individual features as such.

4.2 Nevertheless, the appellant's objections concerning the lack of further experimental parameters of the outgassing method and its broad error margin are not considered justified since the essential condition of raising the temperature to 1000°C under vacuum is specified in the claim and the detailed procedure is described in the patent specification referring to the Morimoto paper (see page 11, lines 11 to 23 of the patent in suit). The appellant's own calculations presented at the oral proceedings with respect to the hydrogen content disclosed in D2 show that it had no difficulties in putting the claimed teaching into practice.

Furthermore, the error margin is an inherent property of the type of measurement performed and would be taken into account by a skilled person when interpreting the claim, whereby a margin of $\pm 10\%$ neither seems to be extraordinarily high for experimental data in general nor unrealistic for the specific measurement involved.

5. *Validity of the priority claimed*

5.1 Although it is correct that the first four priority

documents are based on the released H₂ amount, i.e. the Morimoto method (though not explicitly referred to), for defining the H₂ concentration, whereas the Khotimchenko method has only been applied in the fifth and last priority document, this fact is not relevant because of the above finding of equivalence of both definitions describing one and the same material property so that the claimed subject matter is neither changed by deleting one of the redundant definitions nor by combining them. Therefore, in this respect claims 1 and 24 relate to the same invention as the first priority document.

- 5.2 As regards the absence of striae, it is true that in the priority documents the ingots are described to be "cord-free in three directions" (see e.g. the first priority document, page 9, first paragraph) whereas the application documents (see e.g. page 7, lines 25 to 29 of the A-publication of the patent in suit) and claim 1 only require absence of striae in at least one direction corresponding to the incident light.

In this context, the Board notes that the President of the European Patent Office has *inter alia* referred the following points of law to the Enlarged Board of Appeal (case pending under Ref. No. G 2/98):

- (1a) Does the requirement of the "same invention" in Article 87(1) EPC mean that the extent of the right to priority derivable from a priority application for a later application is determined by, and at the same time limited to, what is at least implicitly disclosed in the priority application?

(1b) Or can a lesser degree of correspondence between the priority application and the subject-matter claimed in the later application be sufficient in this respect and still justify a right to priority?

In the present case, however, these questions need not be answered for the following reason. It is common general knowledge that the evaluation of striae (or cord) content is made in the direction perpendicular to the direction of intended use, if known, or in the direction of maximum light path (see e.g. document D35 which is standard MIL-G-174B, point 4.4.6.1), i.e. the requirement of absence of striae has the standard meaning of being striae-free in at least one direction corresponding to the incident light. In the Board's view, the disclosure "cord-free in three directions" in the first priority document would therefore be implicitly understood by a skilled person to depend on the intended use of the material and in case of a predetermined light direction to be reduced to the minimum condition of being free from striae in at least that direction.

5.3 The Board thus arrives at the conclusion that the highest standard applicable in respect of the "same" invention (see referred question (1a) above), i.e. implicit disclosure, is met in the present case so that in view of the appellant's arguments the subject matter of the independent claims must be considered to be entitled to the first priority date irrespective of the opinion the Enlarged Board will give in G 2/98 on the meaning of "the same invention".

6. *State of the art*

6.1 Documents D1a, D1b, D1b' and D2

Document D1a bears the imprint "Revision 1/89" as the only possible indication of a printing or publication date. However, as the respondents have rightly pointed out, without further evidence this indication is unclear: it could refer to

- (i) a first revision of the Corning catalogue in 1989, the printing and publication dates of the revised version being unknown;
- (ii) a printing date of January 1989, the publication date of the printed version being unknown; or
- (iii) a publication date of January 1989.

The appellant's interpretation based on the assumption (ii) is thus all but conclusive. The assertion that the codes printed on further Corning catalogues D1b and D1b', i.e. "FS7940/9-78(A)" and "FS7490/9-84 (Rpt.)", respectively, imply printing dates of September 1978 and September 1984 is not useful in this context, because even if the assertion were accepted, the codes of D1b and D1b' are not related to the imprint on document D1a so that no analogous conclusions can be drawn with respect to the imprint's meaning.

Since claim 1 is entitled to the first priority dated 9 June 1989, it has thus not been proven that document D1a was made available to the public before that date.

Decision T 743/89 (not published in OJ EPO; see Reasons for the decision, point 3) referred to by the appellant is distinguished from the present case in that the

printing date of a brochure was well-established and only the sufficiency of a period of about seven months for its distribution had been questioned. However, since assumption (ii) is not persuasive in the present case, said decision is not applicable.

The fact that documents D1b, D1b' and D2 form part of the prior art has not been contested by the respondents at the oral proceedings. Nor has the Board any doubts in this respect in view of documents D8, D29 and D30.

6.2 Prior use by delivery of Corning Product 7940 to LLNL

In order to determine whether an invention has been made available to the public by prior use, the following circumstances have to be clarified in accordance with established jurisprudence of the boards of appeal (see the decisions cited in "Case Law of the Boards of Appeal of the European Patent Office", 3rd edition 1998, European Patent Office 1999, VII-C, 8.6.3):

- (a) the date on which the prior use occurred;
- (b) exactly what was in prior use; and
- (c) the circumstances surrounding the prior use.

Since in prior public use cases practically all the evidence in support of an alleged prior public use lies within the power and knowledge of the opponent, the latter has to prove his case in accordance with rigorous standards (see decision T 472/92, OJ EPO 1998, 161; Headnote).

As regards requirement (c) above, this means that the opponent has to prove that an alleged prior use has in fact been public, i.e. there was no obligation to maintain secrecy between the respective contractors. Depending on the nature of the business relations and the status of the companies involved, the existence of such an obligation may be assumed on a *prima facie* basis without the necessity of a written agreement. In T 472/92 (see Reasons for the decision, point 3.4), it was found that an existing joint venture agreement normally will include an explicit or implicit confidentiality obligation between the common daughter and its parents, and in the absence of any evidence to the contrary the high standard of proof referred to above is not met. Similarly, in decision T 1076/93 (not published in OJ EPO; see Reasons for the decision, point 4.1), the Board considered a weapons manufacturer normally not to form part of the public but to be implicitly supposed by its contractors to behave as if an agreement of secrecy had been specified.

In the present case, as is immediately apparent from its Internet homepage, Lawrence Livermore National Laboratory is acting in the national interest of the United States of America in fields which must be considered classified. Specifically, the glass blanks delivered by Corning Incorporated to LLNL and referred to by the appellant were to be used in the Atomic Vapour Laser Isotope Separation (AVLIS) project depending on the highest quality fused silica available (see document D20, point 4, which is an affidavit by Mr Taylor, an employee of LLNL). The very nature of this project, i.e. uranium enrichment technology, leads to the conclusion that all persons involved must have been bound to secrecy.

This fact which was not contested by the appellant is further stressed by Mr Taylor's declaration that the blanks were stored at LLNL in an optics warehouse with restricted access as part of the material control program (see document D20, point 10).

The appellant asserted that LLNL would not itself process the blanks received but would have all the necessary grinding and polishing done by external subcontractors which undoubtedly were part of the public and in a position to analyse the material. However, in view of document D20 (see points 8 and 10) it is uncertain whether said blanks have been used at all at LLNL since they became obsolete shortly after receipt and - if some have indeed been used - in which form they have been used, i.e. whether they left the LLNL premises or not. Moreover, even if the appellant's assertion that some of the blanks were sent to external subcontractors were accepted, then in view of the classified work at LLNL it is to be expected on a *prima facie* basis that those subcontractors were not at liberty to use any information derivable from LLNL contracts freely, but were also under a confidentiality obligation.

Hence, under these circumstances it has not been proven that the glass material was made available to the public.

In consequence, irrespective of the conclusiveness of the further objections raised by the respondents with respect to requirements (a) and (b) above, the alleged public prior use by delivery of Corning glass blanks to LLNL is not comprised in the state of the art pursuant to Article 54(2) EPC.

6.3 The further alleged prior use by delivery of Corning product 7940 to the appellant took place after the first priority date of the patent in suit (see document D36, point 2) and thus can in any case not be considered to be prior art.

7. *Main request: Novelty*

7.1 At the oral proceedings, the appellant considered the claimed subject matter to be anticipated by document D2. While the remaining properties of the prior art glass material T-4040 obtained from Table 2 of D2 and straightforward calculations were not contested by the respondents, the discussion focussed on the issues of whether or not

- the material T-4040 is free from striae in at least one direction, and
- its use with a high power ultraviolet laser beam having a wavelength shorter than about 250 nm has been disclosed in D2.

In the Board's view, from the fact that in the Toshiba Catalogue two material grades are offered (see document D31, the English translation of page 18 of D2), i.e. grade T-4040 which is specified to have substantially no striae and grade T-4042 which is striae free in one direction, it must be concluded that grade T-4040 does not meet the requirement set out in claim 1, but grade T-4042 only. The OH group content and the gas content of T-4042 are however not specified in D2. According to the appellant, these parameter values of T-4042 should be identical to those given in D2 for grade T-4040 since both grades are obtained from

the same ingot, i.e. T-4042 is a specifically selected striae free portion cut of a material which may contain some striae in other portions.

This allegation, however, appears to be doubtful in the light of the fact that striae are normally removed by an additional severe heat treatment above the softening point of the silica glass, which treatment must influence the gas content of the material (see the patent in suit, page 10, lines 11 to 21). In this case, the gas content of striae free grade T-4042 would no longer be comparable to that of grade T-4040 given in Table 2 of D2. In fact, as can be seen from Table 2 of the English translation D31, though product T-4042 is not listed, there appears to be a consistent nomenclature that all products with a final number "2" have been heat-treated, the heat-treatment apparently resulting in a very low OH group content (see e.g. T-7032 as compared to T-7030).

Hence, grade T-4040 cannot be considered to be striae free in one direction, whereas the gas content of grade T-4042 has not been proven to correspond to that set out in claim 1. On the contrary, it seems more likely that the gas content of T-4042 due to additional annealing steps for striae removal does not come up to the claimed values.

Moreover, although the synthetic silica glass products T-4040 and T-4042 are said to have relatively high transmittance of UV light of 0.25 μm or less (see D31, the English translation of page 18 of D2) and this is reflected in the transmittance curve of T-4040 (see Figure 9 shown at page 8 of D2), this does not imply that the material is used - or at least suitable for

use - with high UV power lasers as can e.g. be seen from document D38 reporting the fact that rapid deterioration of initially high transmittance values under laser irradiation is possible (see the English translation of The Nikkan Kogyo, third paragraph).

Therefore, document D2 does not destroy the novelty of the subject matter of claim 1.

7.2 Similar to document D2, Corning catalogue D1b (or D1b') only discloses the UV transmittance of Corning fused silica code 7940 (see page 3 of D1b), but not its use with high power laser beams below 250 nm. However, as has already been pointed out above a relatively high transmittance in the deep UV region does not imply the use of the material for high power laser beam applications.

Moreover, document D1b does not contain any explicit specification of the OH group concentration, the doped hydrogen molecule concentration or the released H₂ amount. Even if the OH group concentration may be calculated from the transmittance curve as has been suggested in document D32, the H₂ content cannot be derived from the catalogue.

The Board is not aware of any actual delivery of the material offered in D1b before the first priority date of the patent in suit, apart from that to LLNL which, however, cannot be considered to be in the public domain (see point 6.2 above). Although in accordance with opinion G 1/92 of the Enlarged Board of Appeal (OJ EPO 1993, 277; see Headnote), the composition or the internal properties of a product become state of the art if it may be analysed and reproduced by a skilled

person without undue burden, a *conditio sine qua non* for this fact is the public use of the product, i.e. that it was freely accessible on the market. Since the only evidence produced by the appellant in this respect relies on the analysis of material not available to the public, i.e. the blanks delivered to LLNL, the internal properties derivable from such analysis have also not been made available to the public.

In consequence, document D1b (or D1b') cannot be considered novelty destroying.

- 7.3 The Board is also convinced that the remaining documents not specifically referred to by the appellant in the appeal proceedings do not anticipate the claimed use of a synthetic silica glass optical member.

The subject matter of claim 1 therefore meets the requirement of novelty (Article 54 EPC).

- 7.4 The method of independent claim 24 is also novel since none of the prior art documents discloses the steps of removing striae and internal strains from the blank in combination with the step of doping the silica glass with hydrogen.

8. *Main request: Inventive step*

- 8.1 The appellant based its inventive step attack mainly on a combination of documents D2 and D38: starting from document D38, a skilled person would turn to catalogue D2 and, by selecting products T-4040 or T-4042, would arrive at the claimed invention.

The Board has however serious doubts as to whether a

skilled person would follow such an approach.

8.2 Document D38 which actually consists of three different newspaper articles all published on 7 June 1989, relates to an announcement of Toshiba Ceramics on the day before that they have developed a high-purity synthetic silica glass having extremely high UV transmittance and being suitable for excimer laser exposure at wavelengths of 250 nm or less. The impurity content of this silica glass was reported to be one-half to one-tenth of conventional products. As an advantageous consequence of the impurity reduction, a particularly low decrease of transmittance after prolonged irradiation at 250 nm was achieved (see in particular D38, the English translation of The Nikkei Sangyo, first paragraph). Finally, the first shipments were announced for August or September of the same year. Document D38 is, however, silent on the presence of striae.

8.3 Since the emphasis in D38 is on the development of a new material which was intended to be delivered in autumn 1989 for the first time (*sic*), in the Board's view a skilled person would not expect an old product of the same company offered in a catalogue dating from 1983 to have similar advantageous properties. In such circumstances, the most natural inquiry to the manufacturer would instead be about the new material.

Furthermore, according to D38 the high UV transmittance is related to a further reduction of impurity content, which low content is, e.g., not achieved for T-4040 as regards the potassium content (see D2, Table 1 and D38, the English translation of The Nikkan Kogyo, second paragraph). Therefore, even had a skilled person had a

look at the old Toshiba catalogue D2 he would not have been able to identify a promising product. In this context, the Board also shares the respondents' opinion that the whole presentation of the gas content in document D2 (see D31, the English translation of page 4 of D2, right-hand column) gives the impression of any gas being an impurity which should be removed from the material as much as possible. Therefore, neither D38 nor D2 would seem to prompt hydrogen doping.

Finally, even a combination of D38 and D2 would not lead to the claimed subject matter since grade T-4040 can neither be considered to be free from striae in at least one direction, nor has the gas content of grade T-4042 been unambiguously disclosed (see point 7.1 above).

- 8.4 The appellant advanced the counterargument that a skilled person would assume the properties of the recently developed material not to have substantially changed, apart from the impurity content, and therefore still consider the use of the conventional material for the new excimer laser application. However, because of the clear link in D38 between high UV transmittance and low impurity content, the latter would, in fact, appear to be the crucial improvement for a skilled person, thus rendering irrelevant the possibility of retaining any other properties.
- 8.5 Hence, the subject matter of claim 1 is not considered obvious from a combination of documents D2 and D38.
- 8.6 Document D1b does not come closer to the subject matter of claim 1 than document D2, in particular insofar as product T-4042 is concerned, since it lacks any

information on the gas content so that arguments analogous to those given with respect to a combination of documents D2 and D38 apply.

- 8.7 Nor can, in the Board's view, the remaining documents not referred to at the oral proceedings question the presence of an inventive step.

In consequence, the subject-matter of claim 1 of the main request is considered as involving an inventive step as required by Articles 52(1) and 56 EPC, and claim 1 is accordingly allowable.

- 8.8 Having regard to independent method claim 24, the above inventive step arguments with respect to claim 1 apply *mutatis mutandis*. In particular, starting from document D38, a skilled person would neither have taken documents D2 or D1b into consideration nor, in any case, do these documents disclose a method comprising the step of doping the silica glass with hydrogen in addition to the steps of removing striae and internal strains from the blank. In the Board's view, such a doping step is clearly defined in the claim.

Even if it were known that the hydrogen content could be increased by annealing the material in a hydrogen containing atmosphere, as alleged by the appellant, the Board cannot see any incentive in the prior art for doing so if *ex-post facto* considerations are avoided.

Hence, claim 24 is also allowable.

- 8.9 For the above reasons, the Board comes to the conclusion that the objections raised by the appellant in the appeal proceedings do not prejudice the

maintenance of the contested patent as amended before the first instance.

9. *Auxiliary requests*

In view of the allowability of the main request, the first to third auxiliary requests need not be considered.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

P. Martorana

S. Steinbrener