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Interlocutory Decision
of 28 August 2002

Case Number:	T 0507/99 - 3.3.5
Application Number:	92116446.3
Publication Number:	0536607
IPC:	C03C 17/36
Language of the proceedings:	EN

Title of invention:
Heat processable metallic appearing coatings

Patentee:
PPG Industries Ohio, Inc.

Opponent:
SAINT-G0BAIN GLASS FRANCE

Headword:
Coatings/PPG

Relevant legal provisions:
EPC Art. 108, 123(2), 54, 56

Keyword:
"Admissibility of the appeal (yes)"
"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:
T 0323/97, G 0010/91

Catchword:
-

Case Number: T 0507/99 - 3.3.5

Interlocutory Decision of the Technical Board of Appeal 3.3.5 of 28 August 2002

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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 11 March 1999 concerning maintenance of European patent No. 0 536 607 in amended form.**

Composition of the Board:

Chairman: R. K. Spangenberg
Members: M. M. Eberhard
M. B. Günzel

Summary of Facts and Submissions

I. European patent No. 536 607 claiming the priority of two US patent applications US 768 791 and US 799 806 of 30 September 1991 and 29 November 1991 respectively was granted on the basis of 22 claims.

II. Appellant 1 (opponent) filed a notice of opposition requesting revocation of the patent on the grounds of lack of novelty, lack of inventive step and insufficiency of disclosure. During the opposition proceedings, inter alia the following documents were relied upon:

D1	EP-A-0 546 302	D2	EP-A-0 536 676
A2	US-A-4 992 087	A3	EP-A-0 281 894
A4	US-A-4 857 094	A6	EP-A-0 233 003
A7	EP-A-0 301 755	A8	US-A-4 900 630
B1	SPIE, vol. 652, Thin film Technologies II, 1986, pages 166-178		
P1	US application 768 791		
P2	US application 799 806		
P3	JP application 311723/91		

In an interlocutory decision, the oppposition division decided that the patent in suit could be maintained in an amended form. The decision was based on amended sets of claims all filed on 4 February 1999. The opposition division held that claim 1 of the main request for the Contracting States DE, FR, GB and IT (hereinafter states A) lacked novelty with respect to either of D1 and D2. Claim 22 of the first auxiliary request for the states A was not novel over the disclosure of D2. The claims of the third auxiliary request met the requirements of patentability. Claim 1 for the states A was novel with respect to D2, D1 and A8 since silicon nitride was deleted from the list of protective coatings and the TiN/Cr coating system of A8 was disclaimed. This disclaimer also established novelty of the claims for the Contracting States CH, ES, Li, LU and SE (hereinafter states B).

III. Appellant 1 (opponent) and Appellant 2 (proprietor of the patent) lodged an appeal against this decision. Appellant 1 cited three new documents, namely EP-A-456 487 (A9), US-A-4 965 121 (A10) and US-A-5 000 528 (A11) in the grounds of appeal and a further document EP-A-279 550 (A12) on 11 October 2000. Appellant 2 submitted three sets of amended claims for the contracting states A (as a main request and two auxiliary requests) and one set of amended claims for the contracting states B with the grounds of appeal. Further auxiliary requests were submitted during the appeal proceedings. In a communication, the board informed the parties of its provisional opinion concerning the admissibility of Appellant 1's appeal and drew the appellants' attention to decision T 323/97 (to be published in the OJ). Oral proceedings were held on 12 June 2002. During the oral proceedings appellant 2 submitted a set of amended claims for the contracting states A and a set of amended claims for the contracting states B, as the main request. At the end of the oral proceedings the board communicated to the parties that the decision would be given in writing and that the board would refer a point of law concerning the requirements for the admissibility of disclaimers under Article 123(2) EPC to the Enlarged Board of Appeal.

The five independent claims 1, 8, 17, 19 and 22 for the contracting states A filed at the oral proceedings read as follows:

"1. A heat processable, metallic appearing coated article comprising:
(a) a transparent glass substrate;
(b) a metal compound film with metallic properties selected from the group consisting of metal borides, metal carbides, metal oxynitrides, chromium nitride, titanium nitride, zirconium nitride, hafnium nitride, tantalum nitride, niobium nitride; and
(c) a protective layer comprising a different metal from the metal compound film which minimizes oxidation of the metal compound film and is selected from the group consisting of chromium, titanium, and nitrides and oxynitrides of silicon-metal alloys with the exception of silicon-zirconium nitride and silicon-tin nitride,
with the proviso that if the metal compound film is titanium nitride the protective layer is not chromium."

"8. A heat processable, metallic appearing coated article comprising:
(a) a transparent glass substrate;
(b) a metal compound film with metallic properties selected from the group consisting of metal borides, metal carbides, metal oxynitrides, chromium nitride, titanium nitride, zirconium nitride, hafnium nitride, tantalum nitride, niobium nitride; and
(c) a protective layer comprising a different metal from the metal compound film which minimizes oxidation of the metal compound film and is selected from the group consisting of chromium, titanium, and nitrides and oxynitrides of silicon and silicon-metal alloys;
wherein a stabilizing layer selected from the group

consisting of silicon, titanium, zirconium, tantalum, chromium, niobium, silicon alloys, nickel-chromium alloys and aluminum nitride is deposited between said glass substrate and said metal compound film."

"17. A method of making a heat processed metallic appearing article comprising the steps of:
(a) depositing on a surface of a glass substrate a metal compound film with metallic properties selected from the group consisting of metal borides, metal carbides, metal oxynitrides, chromium nitride, titanium nitride, zirconium nitride, hafnium nitride, tantalum nitride, niobium nitride; and
(b) depositing a protective layer comprising a different metal from the metal compound film which minimizes oxidation of the metal compound film and is selected from the group consisting of chromium, titanium, and nitrides and oxynitrides of silicon-metal alloys with the exception of silicon-zirconium nitride and silicon-tin nitride; and
(c) heating the glass substrate on which are deposited said metal compound film and protective layer to a temperature sufficient to bend the glass."

"19. A method of making a heat processed metallic appearing article comprising the steps of:
(a) depositing on a surface of a glass substrate a metal compound film with metallic properties selected from the group consisting of metal borides, metal carbides, metal oxynitrides, chromium nitride, titanium nitride, zirconium nitride, hafnium nitride, tantalum nitride, niobium nitride; (b) depositing a protective layer comprising a different metal from the metal compound film which minimizes oxidation of the metal compound film and is selected from the group consisting

of chromium, titanium, and nitrides and oxynitrides of silicon and silicon-metal alloys;
(c) heating the glass substrate on which are deposited said metal compound film and protective layer to a temperature sufficient to bend the glass,
further comprising the step of depositing a stabilizing layer selected from the group consisting of silicon, titanium, zirconium, tantalum, chromium, niobium, silicon alloys, nickel-chromium alloys and aluminum nitride, between said glass substrate and said metal compound film".

"22. A heat processable, metallic appearing coated article comprising:
(a) a transparent glass substrate;
(b) a metal compound film with metallic properties which is titanium nitride
(c) a protective layer which is silicon nitride."

The set of amended claims for the contracting states B contains two independent claims. Claim 1 differs from claim 1 for the contracting states A only by the deletion of the disclaimer with respect to D1, ie "with the exception of silicon-zirconium nitride and silicon-tin nitride". Claim 17 for the contracting states B differs from claim 17 for the contracting states A by the additional materials for the protective layer, namely "nitrides and oxynitrides of silicon" and by the deletion of the said disclaimer.

IV. Appellant 1 requested that the decision under appeal be set aside and that the patent be revoked. Appellant 2 requested that the decision under appeal be set aside and that the patent be maintained with the claims of the main request filed during the oral proceedings on

12 June 2002. Appellant 2 requested alternatively that three questions of law formulated in its letter dated 13 March 2002 be referred to the Enlarged Board of Appeal.

V. With respect to the admissibility of appellant 1's appeal the parties argued as follows:

Appellant 2 (proprietor of the patent) argued that appellant 1's appeal was not admissible since the opponent failed to present grounds in connection with the decision maintaining the patent on the basis of the third auxiliary request filed on 4 February 1999. It was clear from page 1 of the grounds of appeal that the appeal was directed only against the main, first and second auxiliary requests filed on 4 February 1999. There was no room for interpretation whether the arguments might be relevant for the third auxiliary request.

Appellant 1 (opponent) argued that its appeal was admissible since it was clear that the arguments presented in the grounds of appeal also applied to the claims of the third auxiliary request enclosed with the decision under appeal.

VI. As to the substance, appellant 1's arguments can be summarised as follows:

Claim 1 of the main request filed on 12 June 2002 did not meet the requirements of Article 123(2) EPC independently of the presence of the disclaimers. Furthermore, the case law concerning disclaimers had been reversed by decision T 323/97 and the disclaimers were not acceptable. The subject-matter of claim 1 of the main request (contracting states A) lacked novelty. The disclaimer with respect to D1 was not sufficient to establish novelty since the teaching of D1 was not restricted to Si/Zr nitrides and Si/Sn nitrides as the material for the protective layer. D1 further disclosed nitrides including silicon in general, ie nitrides of silicon-metal alloys, for example nitride of Si-Al, and the oxynitrides of Si-metal alloys. The term "siliconitride" was not equivalent to "silicon nitride" but designated products including an additional element. As the expression "or the like" was used in D1 (page 3, lines 16 to 22), the disclosure was not restricted to the two disclaimed examples. Furthermore, the conditions set out in the case law for selection inventions applied to the combination of two lists of materials. The two lists overlapped to a great extent, the selected components were not sufficiently far removed from the examples and it was not a purposive selection. The subject-matter of claim 8 lacked novelty with respect to D1 which disclosed a stabilizing underlayer of SiN_x or oxynitrides of Si-metal alloys. These compounds fell within the very general expression "silicon-alloy" stated in claim 8. The objections of lack of novelty over D1 applied likewise to the process claims.

D2 also destroyed the novelty of the coated article of claim 1 since the compounds $SiC_xO_yN_z$ indicated in D2 were oxynitrides of silicon alloys. The product of claim 22 was not novel with respect to D2 taking into account that TiN was one of the preferred compounds of the list disclosed in D2 for the functional layer and silicon nitride one of the preferred compounds of the list for the protective layer. The choice of these two specific compounds from the two lists of D2 did not fulfil the criteria for a selection invention. The coated articles of D2 were capable of undergoing a heat-treatment since they were used as heat-screening glass for automotive windows and building glazing. The former use implied that the coated articles were inevitably tempered or laminated for security reasons and to meet the legal requirements existing before the priority date (see in this respect A4).In the second use the articles were inevitably exposed to the sun-light, ie to temperatures of up to 70°C.

A7 represented the closest prior art. In the products of A7 the aluminium layer protected the underlying layer by forming alumina at its surface. According to A2 the formation of a dense oxide provided a barrier against the oxygen diffusion towards the subjacent layers. Although the products of A7 were toughenable without degradation of the coating, their optical properties were considerably changed on toughening. Starting from A7, the technical problem would have been to improve these products so as to achieve the protection against oxidation while maintaining the desired optical properties. The solution to this problem was given in A11 which taught that the optical properties of the coating remained unchanged on toughening when using a protective layer of silicon nitride, aluminium nitride or boron nitride. In A11, the inner metal layer was a Ag, Au or Pt layer. However, the skilled person would have applied the teaching of A11 to metal compounds with metallic properties such as the metal nitrides since he knew from A7 that titanium or chromium nitride layers also required a protection by an outer layer and were similarly affected by oxygen. The skilled person would have used the silicon targets available before the priority date, namely targets of silicon alloyed with various elements, to deposit the silicon nitride layers onto the chromium or titanium nitride layers. Doing so, he would have arrived without difficulties at the claimed subject-matter. Furthermore, B1 disclosed that the noble metal layers, such as Ag layers, were solar control coatings equivalent to metal nitride or metal carbide layers, in particular TiN or TiC layers, and that their properties and behaviour were similar to those of TiN or TiC layers. The subject-matter of claim 1 was also obvious to the skilled person in view of the teaching of A3 or A6 in combination with the teaching of B1.

VII. As to the substance, appellant 2 put forward inter alia the following arguments:

Concerning the allowability of the disclaimers under Article 123(2) EPC, decision T 323/97 was in contrast to the common practice of the EPO and contradicted current jurisprudence. Therefore, three questions should be referred to the Enlarged Board of appeal in order to assure uniform application of the law. Claim 1 of the main request was novel over the disclosure of D1. The wording "a nitride of at least two of silicon, boron, aluminium, zirconium and tin" disclosed a large number of combinations. D1 contained no unambiguous disclosure of the nitrides and oxynitrides of silicon-metal alloys in general or of a Si-Al nitride. The terms "and the like" did not clearly define what was meant. They were usually used for encompassing equivalents which, however, were not taken into account for the novelty issue. The word "siliconitride" represented another way for spelling "silicon nitride" and thus designated the same product. D1 also did not disclose a stabilizing layer as defined in claim 8 since nitrides and oxynitrides of silicon were not silicon alloys in the sense of the patent in suit. D2 did not mention any heat treatment. The coated article of claim 22 was new with respect to D2 since it was the result of the selection of one compound in each of the two lists of compounds disclosed in D2. The term "heat processable" was a limiting feature. It defined any subsequent processing of the glass under heat such as laminating, bending, tempering. The temperature resulting from the sun-shine was not a heat processing. Appellant 1 had not shown that the uses stated in D2 necessarily implied a heat processing. The new documents A9, A10, A11 and A12 were not closer to the patent in suit than references A3 and A6 and should be disregarded as filed belatedly. The claimed product was not obvious over the disclosures of A7 and A11. A11 indeed disclosed a silicon nitride layer as the protective layer, but silicon nitride was not stated any longer in amended claim 1. Furthermore the teaching about the protective layer in A11 concerned metal layers of Ag, Au and Pt and could not be transferred to a titanium nitride layer. The reason for the destruction of the metal layer in A11 was not necessarily the oxidation of the layer. In A3 the degradation of the silver layer was not attributed to oxidation but to an agglomeration, ie a fundamentally different mechanism. A4 also did not disclose an oxidation of the coating. B1 taught that the types of defects were quite different for the nitrides and the noble metals and did not teach that improved optical properties would be obtained with the nitrides. The cited prior art showed that very little changes in the protective layer led to very different results. The skilled person would have had no reason to try replacing the aluminium layer of A7 by a layer of silicon nitride or nitrides of silicon-metal alloys.

Reasons for the Decision

1. Appellant 2's appeal is admissible.

Appellant 2 has contested that the statement of grounds of appeal filed within the time limit by the opponent meets the requirement of Article 108 EPC, third sentence. The question arises whether or not the opponent's grounds of appeal actually specify legal and factual reasons why the interlocutory decision maintaining the patent in suit on the basis of the third auxiliary request filed on 4 February 1999 is incorrect. It is stated in the cover page of the opponent's grounds of appeal that appellant 2 has itself filed an appeal concerning the claims of the main request while maintaining two auxiliary requests and, thus, that reasons why the main request and the two auxiliary requests lacked patentability will first be given. The third auxiliary request is indeed not expressly referred to in the cover page. However, both in the notice of appeal and at the end of the grounds of appeals, the opponent has requested the entire revocation of the patent in suit, which undoubtedly implies that the opponent does not agree with the maintenance of the patent on the basis of the third auxiliary request. Furthermore, a comparison of the claims of the third auxiliary request for the contracting states A with those of the preceding requests shows in particular that claim 17 of the third auxiliary request is identical with claim 17 of the main request and of the first auxiliary request. It was not contested that the grounds of appeal contain reasons as to why claim 17 of the main request is considered by the opponent to lack novelty and inventive step (see grounds of appeal, page 6, point 5 in combination with point 3 for the novelty issue; page 9, point 13 in connection with the alleged lack of inventive step). Therefore, it can be immediately understood that the arguments presented in connection with claim 17 of the main request apply likewise to claim 17 of the third auxiliary request, ie the request on which the patent in suit should be maintained according to the interlocutory decision. Therefore, the grounds of appeal meet the requirements of Article 108 EPC, last sentence. As the other requirements set out in Articles 106, 107 and 108 are also fulfilled, appellant 1's appeal is admissible.

2. Appellant 2 requested that the new documents A9, A10, A11 and A12 cited by appellant 1 for the first time at the appeal stage be disregarded as being filed late. Appellant 2 argued in this respect that these references would not be closer to the patent in suit than A3 and A6 cited in the notice of opposition. The board observes that the first three documents were cited right at the beginning of the appeal proceedings in the grounds of appeal (16 July 1999) and A12 was relied upon in the letter dated 11 October 2000 in reply to the filing of five further auxiliary requests by appellant 2 on 11 January 2000. These documents were filed at a relatively early stage of the appeal procedure. They cannot prima facie be considered as not relevant when considered in combination with other documents already on file. The claims of the patent in suit encompass a great number of possible combinations

and alternatives and A9 to A12 disclose alternative materials for a protective layer which are not disclosed in A3 or A6, namely silicon nitride, nitrides of silicon-aluminium alloys and oxynitrides of silicon-aluminium alloys, these layers being used in combination with a silver layer in solar control multilayer coatings or optical interference films. These documents are prima facie closer to the claimed subject-matter than A3 and A6 regarding certain aspects of the claimed subject-matter, namely the use of silicon nitride, nitrides or oxynitrides of silicon-metal alloys for the material of the protective layer. Therefore, they are admitted in the proceedings.

3. Concerning the allowability of the amendments in the claims of the main request for the contracting states A, the board observes that claim 1 differs from granted claim 1 in that (i) silicon, silicon nitride, silicon oxynitride and silicon-metal alloys have been deleted from the list of materials for the protective layer indicated under (c), and (ii) two disclaimers have been introduced, the first one with respect to the disclosure of D1 and the second one with respect to the disclosure of A8. The board has no objection under Article 123(2) EPC against the deletion of the said compounds from the list of materials for the protective layer. As regards the disclaimers, neither silicon-zirconium nitride nor silicon-tin nitride are disclosed in the application as filed as materials suitable for the protective layer. These two compounds are cited in D1 as preferred compounds for the protective layer and were disclaimed in order to overcome an objection of lack of novelty with respect to D1. The second exclusion, ie the exclusion of the specific combination of a titanium nitride film with a protective layer of

chromium, also does not seem to be disclosed in the application as filed and was introduced into claim 1 following an objection of lack of novelty over the disclosure of A8. At end of the oral proceedings before this board, the board has come to the conclusion that, in view of decision T 323/97 (to be published in the OJ), a question of law concerning the allowability of disclaimers under Article 123(2) EPC would be referred to the Enlarged Board of appeal. The referral to the Enlarged Board of appeal will be the object of a separate decision. Therefore, the question whether or not the amendments in claim 1 meet the requirements of Article 123(2) EPC is not decided in the present decision.

At the oral proceedings appellant 1 wished to raise further objections under Article 123(2) EPC against claim 1 of the main request. In reply to a question from the board he further indicated, however, that the intended objections did not arise out of the amendments introduced into granted claim 1, ie the deletion of some components in the list of materials for the protective layer, but concerned features already contained in the claim as granted. However, no objection under Article 100(c) EPC had been raised by appellant 1 against granted claim 1 in its notice of opposition and this matter has not been dealt with in the appealed decision. Therefore, appellant 1's intended objection would have amounted to raising a new ground of opposition. According to opinion G 10/91 (OJ EPO, 1993, 420), fresh grounds of opposition may be considered in appeal proceedings only with the approval of the patentee. Appellant 2 having refused to give his agreement, the matter was not further discussed at the oral proceedings and is not taken into consideration by the board.

3.1 The preceding considerations apply likewise to the process claim 17, since the amendments introduced in this claim are also (i) the deletion of silicon, silicon nitride, silicon oxynitride and silicon-metal alloys from the list of materials for the protective layer and (ii) the disclaimer with respect to D1. The board has also no objection under Article 123(2) EPC against the amendments in independent claims 8, 19 and 22. No objection was raised by appellant 1 against the allowability of the amendments in these claims.

3.2 The amendments introduced in claim 1 for the contracting states B are, compared to granted claim 1, (i) the deletion of silicon and silicon-metal alloys from the list of materials for the protective layer and (ii) the inclusion of a disclaimer with respect to A8. The board has no objection under Article 123(2) EPC against this deletion. However, as claim 1 also contains the disclaimer with respect to A8, the question whether or not it meets the requirements of Article 123(2) EPC is not decided in this decision for the reasons given above. The board has also no objection against the allowability of the amendments introduced into claim 17 (ie deletion of silicon and silicon-metal alloy from the list of materials for the protective layer).

3.3 The scope of protection of the amended claims for the contracting states A and B has been restricted with respect to that of the granted claims. This was not in dispute. Therefore the amended claims meet the requirements of Article 123(3) EPC.

4. In order to determine whether the question of the allowability of the disclaimers is decisive for the outcome of the present appeal, novelty and inventive step of the subject-matter of the claims for the contracting states A and B are assessed on the basis of these claims, as they stand before the board.

5. D1 which was published on 16 June 1993 is a European patent application having a priority date of 30 October 1991. The patent in suit claims the priority dates of 30 September 1991 and 29 November 1991 of the US applications P1 and P2. However, as the claims of the main request for the contracting states A contain alternatives which are not entitled to the priority date of 30 September 1991, D1 represents a prior art document as defined in Articles 54(3) and (4) EPC for certain alternatives of these claims insofar as the disclosure in D1 is itself entitled to the priority date of 30 October 1991 of the Japanese application P3.

It was not disputed that P1 does not disclose a protective layer selected from an oxynitride of silicon, a nitride or an oxynitride of silicon-metal alloys. P1 also does not disclose a metal compound film with metallic properties selected from metal borides, metal oxynitrides, zirconium nitride, hafnium nitride, tantalum nitride and niobium nitride. Furthermore a protective layer of silicon nitride is disclosed only in combination with a titanium nitride layer in Example 8 of P1, but not in combination with a layer of chromium nitride or metal carbide. Independent claims 1, 8, 17 and 19 for the contracting states A are therefore not entitled to the priority date of 30 September 1991 for these alternatives.

5.1 D1 discloses coated glass articles which can be bent. The major component of the solar control film is silver, aluminium, chromium or the like, or at least one of a nitride, a boride or a carbide of stainless steel, titanium or chromium (see page 2, lines 52 to 54). The first protective layer is a film which prevents diffusion of oxygen into the solar control layer such as a film of at least one of a boron nitride, a carbon nitride and a silicon nitride. A representative example is especially a film of a nitride of silicon or boron, or a film of a nitride of at least two of silicon, boron, aluminium, zirconium and tin, particularly a film of zirconium siliconitride, a film of tin siliconitride or the like. "Or it may be a film whose major component is a partially oxided substance of the nitride, the boronitride, the carbonitride, the siliconitride and the like". In Example 1, the control solar layer and the first protective layer are made up of a chromium nitride and a zirconium siliconitride respectively (see D1, page 3, lines 4 to 21). It was not disputed that this disclosure is entitled to the priority date of 30 October 1991 of the Japanese application P3. Therefore it constitutes prior art pursuant to Article 54(3) EPC for the alternatives of the claims which are not entitled to the priority date of 30 September 1991.

Silicon-zirconium nitride and silicon-tin nitride as material for the protective layer are disclaimed in claims 1 and 17. Nitrides and oxynitrides of silicon as protective layers are no longer covered by these claims. Appellant 1's arguments that claims 1 and 17 lacked novelty over the disclosure of D1 since D1 disclosed silicon-aluminium nitride or more generally silicon-metal nitrides and silicon-metal oxynitrides as compounds suitable for the protective layer, are not convincing. According to D1 the protective layer may be composed of a nitride of at least two of silicon, boron, aluminium, zirconium and tin, particularly zirconium siliconitride or tin siliconitride or the like (page 3, lines 18 to 20). However, from the various possible combinations of two or more of these elements the only ones individualised are tin siliconitride and zirconium siliconitride. It is not directly and unambiguously derivable from D1 that an aluminium-silicon nitride or a silicon-metal nitride, which are not mentioned in D1, would be suitable as material for the protective layer in combination with the nitride, carbide or boride of titanium or chromium cited in D1 in the list of materials for the solar control layer. The expression "or the like" indicated in line 20 after the citation of zirconium siliconitride and tin siliconitride is unspecific and does not clearly define which kind of compounds are meant. This expression might mean compounds having properties similar to those of the tin siliconitride or zirconium siliconitride, or nitrides containing tin or zirconium with a further element of the list other than silicon, or nitrides containing silicon with a second element other than tin or zirconium, or a silicon-tin nitride containing a third element from the list. Other interpretations of this expression would also be possible. If equivalents of tin or zirconium siliconitride were meant, then they could not be taken into consideration for the assessment of novelty. In accordance with the established case law, the board holds that equivalents should be considered for the assessment of inventive step but not for novelty. Concerning the partially oxided compounds referred to in D1 (page 3, lines 20 to 21), there was no agreement between the parties as to what the phrase "partially oxided substance of the nitride, the boronitride, the carbonitride, the siliconitride and the like" actually means. According to appellant 1, the terms "the siliconitride" could only be construed as the siliconitride of an element, and thus, an oxidised substance of the tin siliconitride and zirconium siliconitride indicated in the preceding sentence would be disclosed in D1. Appellant 2 first indicated that an error might have occurred in the spelling of "the boronitride, the carbonitride and the siliconitride" in line 21 since it was referred in line 17 to "a boron nitride, a carbon nitride and a silicon nitride". Appellant 2 also argued that "siliconitride" and "silicon nitride" were in fact two ways of spelling the same compound, ie silicon nitride. This latter allegation was however contested and is not supported by any evidence. It cannot be excluded that typing errors or errors in the translation from Japanese into English have occurred. It is also not directly and unambiguously derivable from the disclosure in lines 20 to 21 that the two specific siliconitrides mentioned in the preceding sentence (ie zirconium siliconitride and tin siliconitride) are meant since the singular form, "the siliconitride", is used in line 21 and, furthermore, "the carbonitride" is also referred to in line 21 although carbon is not mentioned at all in the preceding sentence. These considerations show that the teaching concerning the oxidised compounds in lines 20 to 21 is not clear enough to conclude that it is directly and unambiguously derivable from D1 that oxynitrides of zirconium-silicon and tin-silicon, or oxynitrides of silicon-metal alloys are disclosed in D1 as suitable materials for the protective layer.

In these circumstances, the questions whether or not the conditions set out in the case law concerning the novelty of a "selection" of a sub-range of numerical values from a broad range also apply to the selection from two or three different lists of products and whether or not they are fulfilled in the present case are not relevant. It follows from the above that the product and the process of claims 1 and 17 (contracting states A) are new with respect to D1.

5.2 The priority document P1 does not disclose a stabilizing layer of a material as defined in claims 8 and 19 for the contracting states A. Therefore, the priority date of 30 September 1991 is not valid for these claims. D1 further discloses depositing a first underlayer (5) between the solar control layer (1) and the glass substrate. The material of this underlayer is the same as the material of the first protective layer (see page 3, lines 42 to 47). This disclosure benefits from the priority date of 30 October 1991. However, the underlayer of D1 is neither composed of aluminium nitride nor of one of the metals or alloys listed in claims 8 and 19. Appellant 1's argument that silicon nitride and oxynitrides of silicon-metal alloys are compounds falling under the term "silicon-alloys" is not convincing. Firstly, D1 does not disclose the use of oxynitrides of silicon-metal alloys for the protective layer and thus for the underlayer (5) (see the reasons in the preceding point). Secondly although D1 discloses a silicon nitride as a material suitable for the protective layer and the underlayer (5), silicon nitride would normally not be considered by the skilled person to be a silicon alloy. Furthermore it is clear from the patent in suit that the term "silicon alloy" used therein does not include silicon nitride.

Therefore the subject-matter of claims 8 and 19 (contracting states A) differs from D1 by the kind of the stabilizing layer and is thus novel.

5.3 D1 does not disclose the specific combination of a titanium nitride layer with a protective layer of silicon nitride. Therefore, the subject-matter of claim 22 (contracting states A) would be new even if the priority date of 30 September 1991 were considered not to be valid for claim 22.

5.4 D2 has a valid priority date of 19 August 1991 and thus constitutes a prior art document as defined in Articles 54(3) and (4) EPC for the claims of the contracting states A. D2 discloses a heat-screening glass comprising (i) a heat-screening film, the material thereof being selected from a metal nitride or a metal oxynitride, preferably nitrides and oxynitrides of Ti, Zr, Hf, Ta, and Cr, (ii) a first protective film comprising at least one of silicon nitride (SiN_x), silicon dioxide, stannic oxide, oxynitride of silicon carbide ($SiC_xO_yN_z$), and oxynitride of tantalum carbide ($TaC_xO_yN_z$), and (iii) a second protective film comprising at least one compound selected from zirconium oxide, tantalum pentoxide, niobium oxide, zirconium oxynitride, tantalum oxynitride and niobium oxynitride (see page 2, lines 41 to 45 and 56 to 58; page 3, lines 41 to 47). Appellant 1 argued that the coated article of claim 1 lacked novelty over this disclosure because the oxynitride of silicon carbide ($SiC_xO_yN_z$) fell within the definition of oxynitrides of silicon-metal alloys and the uses stated in D2 implied that the articles were heat-processable. The board is not convinced by these arguments for the following reasons. Although the expression "silicon-metal alloys" is not further defined in claim 1, the skilled person would normally not consider silicon carbide as being a silicon-metal alloy. According to the description of the patent in suit, the elements alloyed or doped with silicon include aluminium, nickel, chromium, iron, nickel-chromium alloys, boron, titanium and zirconium. It can neither be derived therefrom nor from the description of the patent in suit that the terms "silicon-metal alloys" encompass silicon carbides. Furthermore, D2 does not disclose that the coated article is heat processable. Even if, for the sake of argument, it were assumed that an oxynitride of silicon carbide is an oxynitride of a silicon-metal alloy, then the question would still arise whether or not the articles of D2 comprising a protective film of oxynitride of silicon carbide are heat processable. Although the burden of proof rests on appellant 1, he has provided no evidence that this is the case, nor that both uses indicated in D2, ie building glazing and automotive windows, necessarily implied a laminating, tempering or bending process at the priority date of D2. As pointed out by appellant 1, it is stated in A4 that in many applications including those described hereinbefore, ie the building sector and vehicle glazing, it is necessary to thermally toughen the glass carrier (see column 1, lines 16 to 19 and 51 to 53). However, it is not directly and unambiguously derivable therefrom that **all** glass panes coated with a solar control coating which are used in the building sector or in vehicle glazing are inevitably toughened. Furthermore an increase of the temperature of a building glazing to values of up to 70°C under exposure to the sun-light is not a heat **processing** of the glass. Therefore, the subject-matter of claim 1 (contracting states A) cannot be considered to lack novelty with respect to D2.

5.5 The coated article of claim 8 (contracting states A) is also novel over the disclosure of D2. The latter discloses the presence of a film between the glass substrate and the heat-screening film. However the film is a dielectric film comprising titanium oxide, tin oxide, silicon oxide, silicon oxynitride or silicon nitride (see page 3, lines 50 to 54), and thus none of the metals or compounds listed in claim 8 for the stabilizing layer.

5.6 The product of claim 22 (contracting states A) meets the requirement of novelty with respect to D2 since the specific combination of a titanium nitride layer and a protective layer of silicon nitride is not disclosed therein. D2 indicates one list of 10 preferred compounds which are suitable as material for the heat-screening film (see page 3, lines 43 to 45) and two further lists of materials for the first protective film and the second protective film respectively. The list for the first protective film contains five components plus mixtures thereof; silicon dioxide, silicon nitride and stannic oxide being preferred. The list for the second protective layer contains 6 compounds plus mixtures thereof; zirconium oxide and tantalum oxide being preferred ((see page 2, lines 56 to 58 and page 3, lines 7 to 13; claims 1, 8 and 9). None of the preferred combinations cited on page 3, lines 37 to 40, for the two-layered protective film comprises silicon nitride. The skilled person has therefore to select one specific material from each list of the preferred materials to arrive at the claimed subject-matter. Appellant 1 made reference to the conditions set out in the case law concerning the novelty of a selection of a sub-range of numerical values from a broad range and alleged that these conditions were not met. However the appellant gave no further explanation in this respect and, in the board's judgement, these conditions are not applicable to the present case where a specific **combination** of two compounds is selected from two or even three lists of materials.

The processes of claims 17 and 19 (contracting states A) differ from the process of D2 in that the coated glass substrate is heated to a temperature sufficient to bend the glass and are therefore new.

5.7 The multilayer coating film of A8 comprises a TiN layer adjacent to the glass plate surface and either a Ti layer or a Cr layer overlying the TiN layer (see claim 1, Examples 7 to 9). The combination of a TiN layer with a Cr layer is disclaimed in claim 1 for the contracting states A. A8 does not disclose heating the coated glass substrate to a temperature sufficient to bend the glass. The additional film interposed between the glass substrate and the TiN layer is made up of TiO_2 or Cr_2O_3 in the products of A8, ie materials different from those listed in claim 8 for the stabilizing layer. Therefore the products as defined in claims 1, 8 and 22 and the processes of claims 17 and 19 (contracting states A) are novel over the disclosure of A8. This was no longer in dispute at the oral proceedings.

5.8 The subject-matter of claims 1, 8, 17, 19 and 22 for the contracting states A is also novel with respect to the remaining documents cited during the opposition and appeal procedures. In particular the coated articles of claims 1 and 8 differ from those of A1 by the material of the protective layer. This was not disputed at the oral proceedings.

5.9 D1 and D2 are not comprised in the state of the art for the claims of the contracting states B. The combination of a TiN layer with a Cr layer disclosed in A8 is excluded from claim 1 by a disclaimer. Furthermore A8 does not disclose heating the coated glass substrate to a temperature sufficient to bend the glass. Therefore the product of claim 1 and the process of claim 17 for the contracting states B are novel over the disclosure of A8. They are also novel with respect to the remaining documents cited by appellant 1.

6. Concerning inventive step, appellant 1 based his argumentation on A7 as the closest prior art. The board can follow this approach taking into account that A7 concerns the production of a bent and/or toughened coated glass comprising a solar control coating and deals with the problem of degradation of the heat and light reflecting properties of a reflective coating when the coated glass is bent or toughened.

6.1 A7 discloses a method for the production of bent and/or toughened glass which comprises depositing a solar control coating, comprising metals of atomic numbers 22 to 29, ie Ti, V, Cr, Mn, Fe, Co, Ni, Cu, in the form of metal or a metal compound, such as a stainless steel layer, a chromium nitride layer, a titanium nitride layer or a copper layer, onto a glass substrate, applying a thin layer of aluminium over said coating, and subjecting the coated glass to a bending and/or toughening cycle in which the glass is heated to a temperature above the softening point of the glass. As the result of the application of the thin layer of aluminium on the solar control layer, the coatings substantially retain their reflection properties on bending or toughening, in particular a high reflectivity for both visible light and heat (see page 2, lines 5 to 23; page 6, Examples 14 to 16; claims 1 to 7).

Starting from this prior art, the technical problem underlying the patent in suit can be seen in the provision of further coated articles which substantially retain their metallic appearance and their reflectance and transmittance properties throughout high temperature processing such as bending (see patent in suit, page 2, lines 39 to 41, and page 3, lines 27 to 33).

It is proposed to solve this problem by the coated articles as defined in claims 1 and 8 for the contracting states A and claim 1 for the contracting states B. The claimed coated article differs from that of A7 in particular by the kind of material used for the protective layer. In claim 8 for the contracting states A, which includes the greatest number of alternatives for the material of the protective layer, the latter is selected from the group consisting of chromium, titanium, nitrides and oxynitrides of silicon and silicon-metal alloys, the protective layer comprising a different metal from the metal compound film. In view of the disclosure in the patent in suit, the reflectance and transmittance curves of Figures 1 and 2 and the examples, it is credible in the absence of evidence to the contrary that the problem stated above has actually been solved by the product as defined in claims 1 and 8 for the contracting states A and in claim 1 for the contracting states B. This was not disputed by appellant 1.

6.2 Appellant 1 defined a different technical problem starting from A7. His submissions in this respect cannot be followed by the board since they are based on an incorrect interpretation of the paragraph on page 3, lines 42 to 44, of A7. The substantial increase in the light transmission and in the solar heat transmission and the decrease in the heat and light reflection during the toughening process do not concern a coated glass having a solar control coating protected by an aluminium film according to the invention disclosed in A7 but a coated article without the aluminium protective film (see Example 1, in particular, lines 14 to 44).

6.3 A7 itself teaches that the coated article comprising a solar control coating of titanium nitride and an aluminium film substantially retain high reflectivity for both visible light and heat on toughening and/or bending, ie a reflectivity comparable with the commercially available untoughened solar control products which do not comprise the aluminium layer (see page 6, lines 25 to 56). A7 further deals with the question whether or not similar results might be achieved with protective layers other than an aluminium layer. In this context, it is indicated that attempts were made to replace the aluminium layer by other metals, for example titanium, but these attempts were not successful (see page 6, lines 57 to 58). Therefore this document would rather teach away from trying a metal layer such as a chromium or titanium layer instead of aluminium layer in combination with a reflective layer of titanium nitride or chromium nitride in order to solve the problem stated above. A7 also contains no pointers towards using nitrides or oxynitrides of silicon and silicon-metal alloys as the protective layer instead of aluminium.

6.4 A11 concerns an optical interference film which is generally used on the surface of a lamp. According to A11, the optical characteristics of conventional optical interference films are reduced if these films are used at a temperature > 200°C for an extended period of time because the silver layer is crystallised or oxidised by oxygen atoms of the dielectric layer. A11 aims at protecting the metal layer included in an optical interference film from oxidation, reduction, crystallization, etc.. This purpose is achieved by depositing an outer layer of a nitride selected from the group of aluminium nitride, silicon nitride and boron nitride on the Ag, Au, Pt layer. The exemplified interference film includes an underlayer of aluminium nitride, a metal layer of Ag and a thin outer layer of aluminium nitride. The latter is said to prevent oxygen gas or hydrogen gas from being transmitted therethrough. It is further taught that since the metal layer is sandwiched in between metallic nitride layers, no oxidation or crystallisation of the metal layer occurs even if the film is heated at a high temperature in air. Fig 3 and 4 show that the reflectance and transmittance characteristics of this example are not changed when this optical interference film is heated at 300°C for an hour in air, contrary to the conventional film (see column 1, lines 6 to 10 and 30 to 59; column 2, lines 19 to 64; column 3, lines 54 to 60).

Appellant 1's submissions that the claimed solution would be obvious in view of A7 and A2 in combination with the teaching of A11 and optionally B1 are not convincing. The skilled person would indeed have inferred from A11 that aluminium nitride, silicon nitride and boron nitride can efficiently protect a reflective metallic layer of Ag, Au, and Pt from oxidation or crystallisation during heating at 300°C for one hour in air and that the optical characteristics are retained under these conditions. However, A11 does not deal with the problem encountered when performing a bending or tempering process. Accordingly it is silent as to whether or not the reflectance and transmittance characteristics would also be retained at much higher temperatures, ie temperatures of between about 570°C and 680°C which are necessary for performing thermal tempering or bending. It is not suggested in A11 that the protection would still be effective at bending temperatures. Furthermore, A11 contains no information suggesting that the outer layer of titanium nitride, silicon nitride or boron nitride would also be suitable for avoiding a degradation of the optical properties of an article including a titanium nitride film or a chromium nitride film instead of a silver, gold or platinum layer as the solar control coating.

Neither A7 and A11, nor B1 and A2 contain information from which it could be inferred that a titanium nitride film or a chromium nitride film behaves in the same way or is degraded by the same mechanism as a silver layer when subjected to a bending process. B1, which compares the optical properties of noble metals with those of the 4th group transition metal nitrides (Ti, Zr and Hf nitrides) studies to what extent the nitrides might be considered as optically noble metal "like". It discloses not only some similarities in the optical properties but also important differences between these two groups of materials (see pages 166 to 171, and summary on page 177). It is pointed out that the types of defects appearing in the thin films are quite different for the nitrides and the noble metals (see page 166, the two last lines of the introduction). It is indicated on page 167 (paragraph above Fig.2) that the colours of elemental noble metals are stable, while the nitride colours are strongly affected by the preparation conditions. Films of TiN or HfN made at a lower deposition rate have a more yellow hue and the original reflectance can also be affected by long term, room temperature storage or tempering for 1 hour at 900°C. This does not suggest that the mechanism by which degradation occurs during a bending process would be the same for a silver film and a titanium nitride film.

It cannot be inferred from A7 that the degradation of the titanium nitride layer results from an oxidation thereof during bending or toughening since A7 is silent as to why the titanium nitride layer not protected by an aluminium layer does not retain the desired optical properties during bending or toughening. A2 which was relied upon by appellant 1 in this context teaches that a protective layer of an Al-Ti alloy or Al-Zr alloy provides an excellent protection to the metal coating against oxygen during bending or tempering (see column 1, lines 8 to 22; column 2, lines 38 to 50). However, in A2 the solar control coating is neither a metal nitride layer nor a silver, gold or platinum layer and the protective layer is different from that of A7. The reflective metal coating in A2 is selected from Ti, V, Cr, Mn, Fe, Co, Ni and alloys thereof, in particular chromium and a high-grade steel. Although

Ti, V, Cr, Mn, Fe, Co, Ni are also cited as possible solar control coating in A7, it cannot be deduced therefrom that oxidation would also be the cause of the degradation in the case of the titanium nitride layer. The board observes in this context that although A3 and A6 both relate to the degradation of the optical properties of a silver layer during bending or toughening, two totally different reasons or mechanisms are proposed in these documents for explaining the degradation of the silver layer, namely the oxidation of the silver layer in A6 and the formation of agglomerates in the silver layer in A3. In A4 where the metal layer is a Pt, Ir or Rh layer or alloys thereof, it is disclosed that the protective action of the overlying oxide layer cannot be preventing the oxygen from air from diffusing to the metal layer during the tempering process (see column 5, lines 10 to 18). Therefore appellant 1's arguments that the skilled person would have inferred from the prior art that the optical properties of the unprotected titanium nitride layer of A7 are degraded by oxidation during bending or toughening similarly to a silver layer cannot be accepted.

For the preceding reasons, the skilled person would neither have inferred from the teaching of A7, A2, A3, B1 and A11 nor expected in view of this teaching that a layer of the metal nitrides used in A11 for protecting the Ag, Au or Pt layer from oxidation or crystallisation at 300°C for one hour in air might be suitable for solving the problem stated above. In the absence of any reasonable expectation of success, he would not have tried replacing the protective layer of aluminium used in the products of A7 by the silicon nitride layer disclosed in A11. Under these circumstances the question whether or not the skilled person would have used a silicon target or available metal doped silicon targets for depositing the silicon nitride layer is irrelevant.

6.5 Appellant 1 further argued that the claimed subject-matter lacked an inventive step in view of the teaching of A3 or A6 in combination with the general knowledge illustrated by B1.

A3 discloses a process for making a reflecting glass in which an outer layer of a metal selected from Ti, Zn, Ce, Zr, Bi, Hf, Al, In, Ta or an alloy thereof, in particular Ti or Ta or alloys thereof, is deposited onto a silver layer and the coated article is subjected to a bending or toughening process at a temperature of 580°C to 680°C. The outer layer substantially avoids degradation of the optical properties which otherwise occurs during bending and/or toughening (see column 3, line 31 to column 4, line 46).

In A6, which also deals with the problem of non-stability of the optical properties (emissivity and light transmission) of a coating comprising a silver layer during bending or toughening, this difficulty is overcome by depositing a layer of a metal selected from Al, Ti, Zn, Ta and Zr over the silver layer. It is believed that the silver layer is protected from the effect of oxygen by the additional metal layer which becomes oxidised during the bending and/or toughening process (see page 2, lines 33 to 54; page 3, lines 20 to 32; claims 1 and 2).

Starting from A3 or A6 as the closest prior art, the technical problem to be solved would be the same as indicated above in point 6.1. The products as claimed in claim 1 or 8 for the contracting states A or claim 1 for the contracting states B for solving this problem differs from the products of A3 or A6 containing a protective layer of titanium at least by the material of the solar control layer. Although B1 discloses that the 4th group transition metal nitrides (TiN, HfN, ZrN) have some similarities with the noble metals regarding their optical properties, it also teaches that there are important differences (see point 6.4 above). B1 does not suggest that a silver layer and the layers of the 4th group transition metal nitrides have the same behaviour when heated to the high temperatures necessary for bending, nor that the cause for the degradation would be the same for these two types of layers. According to A3 the degradation might be due to the formation of agglomerates in the silver layer while a different reason is given in A6, ie oxidation at the bending temperatures. Furthermore, according to A7 in which a titanium nitride or a chromium nitride is used as the solar control coating, it is disclosed that attempts to replace the protective layer of aluminium by titanium were not successful (see page 6, lines 53 to 58). In view of the teaching of B1 and knowing from A7 that titanium is not adequate as a protective layer for titanium nitride, the skilled person would not have been encouraged to use in the products of A3 or A6 a layer of the metal nitrides cited in B1 instead of a silver layer in combination with a titanium protective layer since he would have had no reasonable expectation of success by effecting such a replacement.

6.6 A9 is a prior art document according to Article 54(2) EPC only for the subject-matter of the claims for which the priority date of 30 September 1991 is not valid. It discloses interference filters comprising an optically reflective layer of Ag, Au, Cu or Pt and a dielectric layer which may be of silicon nitride or a mixture of silicon nitride and aluminium nitride. They pass a durability test at 92°C and 98% relative humidity and a steam test for 10 minutes at 100°C (see claims 1 and 8, page 3, lines 26 to 35; page 4, lines 27 to 30; pages 7 and 8). A10 discloses a laminated vehicle windshield structure in which the solar control coating comprises a reflective layer of Ag, Pd, Pt and a dielectric layer, the latter being oxides of Zn, Ti, Ta, Sn, In, Bi, Mg and alloy thereof and silicon nitrides (see claims 4, 9 and 10). The coated glass substrate of A12 comprises a silver layer and an overcoating of a nitride or oxynitride of an aluminium-silicon alloy which is said to be a better barrier to corrosion than ZnO and other materials forming crystalline films (see claims 1 to 3, 6 to 11; page 3, lines 16 to 28; Table 6). These documents are less relevant than A11 since they do not deal with the problem of degradation of the optical properties at temperatures of 200°C or 300°C contrary to A11, nor with the problem of degradation at the higher temperatures required for a bending process. Therefore, in view of the teaching of B1 and any one of A9, A10 or A12, the skilled person would not have been prompted to replace the aluminium protective layer of the products of A7 by a layer of silicon nitride, or a layer of a nitride or oxynitride of a silicon-aluminium alloy.

6.7 The coated glass plates disclosed in A8 are useful as a building material or ornamental material. The Ti or Cr layer overlying the TiN layer adheres strongly to the latter and affords sufficiently high durability and wear resistance to the multilayer coating. The coated plate assumes a golden appearance when viewed from the uncoated side (see column 1, lines 6 to 12, and 51 to 68; column 2, lines 1 to 8). This document does not address the problem of avoiding degradation of the optical properties when the coated glass plate is exposed to high temperatures during a bending process. It does not contain information suggesting that the deposition of a protective layer of chromium onto a TiN layer might solve the said technical problem. Therefore, the skilled person faced with the problem stated above with respect to A7 would not have been encouraged to replace the aluminium protective layer by a chromium or a titanium layer, all the more so since A7 further teaches that the attempts to replace the aluminium layer by other metals such as titanium were not successful.

6.8 The remaining documents cited by appellant 1 are less relevant than those considered above and contain no teaching pointing towards the products as defined in claims 1 and 8 for the contracting states A or in claim 1 for the contracting states B.

6.9 It follows from the above that claims 1 and 8 for the contracting states A and claim 1 for the contracting states B meet the requirement of inventive step set out in Articles 52(1) and 56 EPC. The preceding considerations apply analogously to the subject-matter of claim 22 for the contracting states A, which is restricted to the specific combination of a titanium nitride layer with a protective layer of silicon nitride.

7. The processes for making a heat-processed article according to claims 17 and 19 for the contracting

states A and claim 17 for the contracting states B comprise depositing a metal compound film and a protective layer as defined in the different product claims considered above and heating the coated glass substrate to a temperature sufficient to bend the glass. Therefore, they derive their patentability from that of the product claims. The independent product and process claims being allowable, the same applies to the dependent claims appended thereto.

Order

For these reasons it is decided that:

The subject-matter of claims 1 to 22 according to the main request filed on 12 June 2002 for the Contracting States DE, FR, GB and IT and the subject-matter of claims 1 to 21 filed at the same date for the Contracting States CH, ES, LI and SE meet the requirements of patentability set out in Articles 52(1), 54 and 56 EPC.

The Registrar:	The Chairman:
P. Martorana	R. Spangenberg