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**Datasheet for the decision
of 9 January 2012**

Case Number: T 1476/08 - 3.3.05
Application Number: 04795478.9
Publication Number: 1682458
IPC: C03C 3/097, C03C 3/11,
C03C 3/093, C03C 3/091,
C03C 3/085, C03C 3/087,
C03C 21/00
Language of the proceedings: EN

Title of invention:

Lithia-alumina-silica containing glass compositions and glasses suitable for chemical tempering and articles made using the chemically tempered glass

Applicant:

Schott AG

Headword:

Aircraft glass/SCHOTT

Relevant legal provisions:

EPC Art. 123(2)

Relevant legal provisions (EPC 1973):

EPC Art. 54(1)(2)

Keyword:

"Main request: Novelty (no)"
"First auxiliary request: Novelty (yes)"
"Remittal to the first instance for further prosecution"

Decisions cited:

T 0440/04, T 0666/89

Catchword:

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Case Number: T 1476/08 - 3.3.05

D E C I S I O N
of the Technical Board of Appeal 3.3.05
of 9 January 2012

Appellant:
(Applicant)

Schott AG
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D-55122 Mainz (DE)

Representative:

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Decision under appeal:

Decision of the Examining Division of the
European Patent Office posted 7 March 2008
refusing European patent application
No. 04795478.9 pursuant to Article 97(2) EPC.

Composition of the Board:

Chairman: G. Raths
Members: J.-M. Schwaller
S. Hoffmann

Summary of Facts and Submissions

I. This appeal lies from the decision of the examining division refusing European patent application No. 04 795 478.9 on the grounds that the main request then on file lacked the requirements of Article 56 EPC with respect to document

D5: DE 14 96 586 A1.

II. Claim 1 of the said main request read as follows:

*"1. A method of chemically strengthening a glass piece, comprising the steps of:
providing a glass piece having a predetermined shape and thickness and a composition comprising:*

<u>Ingredient</u>	<u>Percent by weight</u>
<i>SiO₂</i>	<i>60 to 75;</i>
<i>Al₂O₃</i>	<i>18 to 28;</i>
<i>Li₂O</i>	<i>3 to 9;</i>
<i>Na₂O</i>	<i>0 to 3;</i>
<i>K₂O</i>	<i>0 to 0.5;</i>
<i>CaO</i>	<i>0 to 3;</i>
<i>MgO</i>	<i>0 to 3;</i>
<i>SO₃</i>	<i>0 to 0.20;</i>
<i>Total iron expressed as Fe₂O₃</i>	<i>0 to 1.25;</i>
<i>ZrO₂</i>	<i>0 to 3;</i>
<i>Total tin expressed as SnO₂</i>	<i>0 to 0.70;</i>
<i>TiO₂</i>	<i>0 to 5;</i>
<i>P₂O₅</i>	<i>0 to 1.75;</i>
<i>ZnO</i>	<i>0 to 1.25; and</i>
<i>B₂O₃</i>	<i>0 to 1.75;</i>

where CaO + MgO is 0 to 6 wt%, Al₂O₃ + ZrO₂ is 18 to 28 wt%, and Na₂O + K₂O is 0.05 to 3.00 wt%, wherein the glass piece has a log 10 viscosity temperature of at least 1413°F (767°C) and a liquidus temperature of at least 2435°F (1335°C); submerging the glass piece in a molten sodium nitrate bath heated to a temperature of greater than 300°F for at least 8 hours to provide the glass piece with a case depth in the range of 7 to 16.5 mils, and removing the glass piece from the bath, wherein the glass piece has a modulus of rupture in the range of 76,000 to 120,000 pounds per square inch (524 to 827 mPa)."

The board notes that "mPa" is defined in the application in suit (claim 51) as meaning "mega Pascal".

III. In the contested decision, the examining division held the above method claim to be novel over the last (comparative) example in Table 1 on page 8 of D5 because of the higher modulus of rupture of the claimed glass piece (524 to 827 mPa vs. 294 mPa (calculated) for the glass in the said example). The examining division deduced from this difference that at least one essential feature was missing from the claimed subject-matter, since the disclosure in the prior art did "not suffice to produce the result desired to be obtained in what is essentially the same method pursuant to claim 1". The examining division concluded that the claimed method lacked inventive step with respect to said prior art example.

IV. The following documents were in particular taken into consideration during the first instance proceedings:

D2: US 4 059 454

D4: FR 2 132 269

D8: US 4 438 210

D9: US 4 755 488

D10: FR 1 542 517

D11: US 4 455 160.

V. With the grounds of appeal, the applicant (hereinafter "the appellant") submitted three amended sets of claims as a main request and as first and second auxiliary requests, respectively.

VI. In a first communication dated 20 December 2010, the board expressed its opinion that the claimed subject-matter lacked the requirements of Articles 54(1)(2), 82 and 84 EPC.

VII. With a letter dated 2 May 2011, the appellant dropped the requests then on file and submitted a single set of amended claims as a new main request, with a claim 1 reading as follows:

"1. A glass comprising:

<u>Ingredient</u>	<u>Percent by weight</u>
SiO_2	63.42 to 74.29;
Al_2O_3	18.26 to 28.51;
Li_2O	4.94 to 7.5;
Na_2O	0.39 to 2.39;

K_2O	0.07 to 0.25;
CaO	0 to 1.27;
MgO	0 to 2.6;
SO_3	0 to 0.19;
Total iron expressed as Fe_2O_3	0.05 to 0.061;
MnO_2	0 to 0.02
ZrO_2	0 to 1.5;
Total tin expressed as SnO_2	0 to 0.5;
TiO_2	0 to 1.89;
P_2O_5	0 to 1.06;
ZnO	0 to 0.5;
B_2O_3	0 to 2;
NF ($Al_2O_3 + ZrO_2$)	18.26 to 28.51;
RO ($CaO + MgO$)	0.04 to 2.64; and
R_2O ($Na_2O + K_2O$)	0.49 to 2.49;

wherein the glass has at least one of the following properties: (a) a log 10 viscosity temperature of at least 1280°F (694°C) and (b) a liquidus temperature of at least 2350°F (1288°C)."

VIII. On 1 June 2011, the board informed the appellant that the subject-matter of above claim 1 appeared to lack novelty in the light of document D4.

IX. With a letter dated 29 September 2011, the appellant filed two sets of amended claims as a new main request and as an auxiliary request, respectively. While claim 1 of the new main request was identical with that of the main request submitted on 2 May 2011, independent claims 1, 4 and 11 of the auxiliary request read as follows (differences with claim 1 of the main request in bold):

"1. A glass comprising:

<u>Ingredient</u>	<u>Percent by weight</u>
SiO ₂	64.83 to 69.29;
Al ₂ O ₃	21 to 23.51;
Li ₂ O	4.94 to 6.5;
Na ₂ O	0.39 to 2;
K ₂ O	0.07 to 0.1;
CaO	0 to 1.27;
MgO	0 to 2.49;
SO ₃	0 to 0.19;
Total iron expressed as Fe ₂ O ₃	0.05 to 0.061;
MnO ₂	0 to 0.02;
ZrO ₂	0 to 1.19;
Total tin expressed as SnO ₂	0 to 0.5;
TiO ₂	0 to 1.89;
P ₂ O ₅	0 to 1.06;
ZnO	0 to 0.5;
B ₂ O ₃	0 to 1.55;
NF (Al ₂ O ₃ + ZrO ₂)	21 to 23.51;
RO (CaO + MgO)	0.04 to 2.54; and
R ₂ O (Na ₂ O + K ₂ O)	0.49 to 2.07;

wherein the glass has at least one of the following properties: (a) a log 10 viscosity temperature of at least 1280°F (694°C) and (b) a liquidus temperature of at least 2350°F (1288°C).

4. A chemically tempered glass piece having a case depth, defined as a distance from a surface of the glass piece that has been chemically tempered to a point within the glass piece at which there is zero stress, and a tensile stress zone, defined as interior glass within the glass piece at a depth greater than the case depth, glass in the tensile stress zone having a glass composition according

to claim 1, wherein the glass in the tensile stress zone has at least one of the following properties: (a) a log 10 viscosity temperature of at least 1280°F (694°C) and (b) a liquidus temperature of at least 2350°F (1288°C).

11. *An aircraft transparency comprising;
a mounting frame;
a transparency secured in the mounting frame, the transparency comprising at least one chemically tempered glass sheet wherein the chemically tempered glass sheet has a case depth, defined as a distance measured along an imaginary line normal to a surface of the glass sheet that has been chemically tempered to a point on the line within the glass sheet at which there is zero stress, and a tensile stress zone, defined as interior glass within of the glass sheet at a depth greater than the case depth, glass within the tensile stress zone having a glass composition according to claim 1, wherein the glass in the tensile stress zone has at least one of the following properties: (a) a log 10 viscosity temperature of at least 1280°F (694°C) and (b) a liquidus temperature of at least 2350°F (1288°C)."*

- X. The appellant requested in writing that the contested decision be set aside and that a patent be granted on the basis of the set of claims according to the main request, or alternatively, on the basis of the claims according to the auxiliary request, both filed on 29 September 2011. The appellant further requested that the case be remitted to the first instance or, if none

of the preceding requests were considered allowable, it requested oral proceedings.

Reasons for the Decision

1. *Main request - Novelty*

1.1 D4 (claim 1) discloses a crystallisable glass comprising approximatively in wt%:

SiO ₂	67-75,
Al ₂ O ₃	16.5-22.5,
Li ₂ O	3.8-6.2,
ZrO ₂ + TiO ₂	2.3-3.8,
Na ₂ O	0.38-0.62,
K ₂ O	0.1-0.25,

with the mol ratio of Al₂O₃/R₂O being between about 1 and about 1.35, R₂O being an alkali metal oxide.

In its examples 5, 6 and 7, D4 discloses the following specific glasses compositions (in wt.%):

SiO ₂	69.5	69.9	67.6,
Al ₂ O ₃	21.2	20.2	22.0,
Li ₂ O	5.0	5.5	6.0,
ZrO ₂	1.6	1.6	1.6,
TiO ₂	1.8	1.8	1.8,
Na ₂ O	0.4	0.4	0.4,
K ₂ O	0.2	0.15	0.15,
Sb ₂ O ₃	0.3	0.3	---

1.2 The appellant argued that the disclosure of D4 did not anticipate the subject-matter of claim 1 because iron

and (CaO and/or MgO) were absent from the above glass compositions. Further, the amount of ZrO₂ was higher in the glasses of D4 than in the subject-matter of claim 1 at issue.

1.3 The board cannot follow this argumentation because the raw materials used in the preparation of glasses always contain iron and alkaline earths as impurities and in view of the very small values of the lower limits (0.05 and 0.04, respectively) of the ranges defined in claim 1 regarding iron and (CaO + MgO), the board is convinced that the glasses known from D4 also contain such low amounts of iron and of (CaO + MgO).

1.4 With respect to ZrO₂, it is true that in the Examples of D4 the amount of ZrO₂ is disclosed to be 1.6%, i.e. above the upper limit of 1.5% defined in claim 1 at issue.

It is however established jurisprudence that the teaching of a piece of prior art is not limited to the specific examples disclosed therein. In this context, it is observed that D4 further discloses (claim 1) the amount of ZrO₂ in terms of the total amount of ZrO₂ and TiO₂ in the glass, which is defined to be between 2.0 and 3.6% wt.

Considering that the examples in document D4 represent preferred embodiments of the above disclosure in claim 1 of D4, the board judges that the skilled reader of D4 would seriously contemplate (in the sense of e.g. decisions T 0440/04, point 4.3.2 of the reasons; T 0666/89) applying the broader disclosure in claim 1 of D4 to the production of other specific glass

compositions close to those in the examples of D4, in particular in view of the lower limit of 2.0% wt. as regards the sum of (ZrO₂ + TiO₂) defined in claim 1 of D4. The skilled reader of D4 would thus seriously contemplate preparing glass compositions with a lightly lower amount of ZrO₂ than in the examples of D4 (wherein the amount of ZrO₂ is 1.6%), namely an amount of ZrO₂ falling directly and unambiguously within the terms of claim 1 at issue, for instance 1.5% wt.

The board observes that D4 does not explicitly disclose the log 10 viscosity temperature or the liquidus temperature of the glass compositions in D4. Owing to their composition which - as explained above - reads on the wording of claim 1 at issue, at least one of these parameters should inevitably be fulfilled as a direct consequence of the chemical composition of the glasses. The board invited the appellant to comment on this issue and if the need arises, to provide evidence to the contrary, e.g. by reworking the glass compositions in D4. The appellant neither commented on this issue, nor did it provide any kind of evidence in this sense.

It follows from the above considerations that the subject-matter of claim 1 of this request lacks the requirements of Article 54(1) and (2) EPC 1973 in the light of the disclosure of D4.

2. *Auxiliary request*

2.1 Amendments

The claims of this request have a basis as follows in the application as filed and published as WO 2005/042423 A1:

- Claim 1 results from the combination of claims 1, 5 and 8 as filed;
- Claims 2 and 3: in claims 2 and 9 as filed;
- Claim 4 results from the combination of claims 25, 1, 5 and 8 as filed;
- Claims 5 to 10: in claims 26 to 31 as filed;
- Claim 11 results from the combination of claims 47, 1, 5 and 8 as filed.

It follows that the amended claims of this request meet the requirements of Article 123(2) EPC.

2.2 Novelty

2.3 The amount of ZrO_2 in the glass composition according to claim 1 of this request is still defined in terms of a range, namely "0 to 1.19", but in comparison to the corresponding range in claim 1 of the main request - which read "0 to 1.5", its scope has been considerably reduced and the board judges that it is no longer directly and unambiguously derivable from the disclosure of document D4. The amount of K_2O ("0.07 to 0.1") in claim 1 at issue being furthermore lower than in the glass compositions according to D4, it follows that the disclosure of D4 no longer anticipates the subject-matter of claim 1 of this request.

2.4 The board is furthermore satisfied that none of the prior art documents cited in the search report disclose in combination all the features of claim 1 at issue. In particular its subject-matter is distinguished from the disclosure in the documents cited in item III in the following respects:

The glass compositions in D2 (claim 1) in particular have a higher TiO_2 content (at least 2.5%) than those defined in claim 1 at issue (0 to 1.89%).

The glass compositions in D5 (claim 1) in particular have a higher Na_2O content (at least 10%) than those in claim 1 at issue (0.39 to 2%).

The glass compositions in D8 (claim 1) in particular have a higher TiO_2 (2 to 6%) content than those in claim 1 at issue (0 to 1.89%).

The ranges defining the glass compositions disclosed in document D9 overlap with those ranges defined in claim 1 at issue, but the ten preferred embodiments in Table 1 all differ from the subject-matter in claim 1 at issue by at least 3 features (the glass according to Example 3 - which is the closest to the subject-matter claimed - has a higher Al_2O_3 , a higher ZrO_2 and a higher P_2O_5 amount than the glass of claim 1 at issue).

The glass compositions disclosed in D10, Table 1, have a higher MgO (3.7 to 7%) and a lower Li_2O (2.5 to 4%) content than those of claim 1 at issue.

The glass compositions of D11 have a lower Li₂O (1 to 4%) and a higher TiO₂ (3 to 6%) than those of claim 1 at issue.

2.5 Claim 1 and claims 2 to 11 which depend thereon therefore meet the requirements of Article 54 (1)(2) EPC 1973.

3. *Remittal*

The board notes that, although the inventive step issue was addressed in the decision under appeal, it concerned an independent claim which related to a method of chemically strengthening a glass piece. All the claims directed to this type of independent claim 1 have been abandoned. As the inventive step issue raised in the contested decision concerned neither a glass composition, a chemically tempered glass nor an aircraft transparency, the board considers it appropriate under these circumstances to exercise the power conferred on it by Article 111(1) EPC to remit the case to the examining division for further prosecution, thus giving the appellant the opportunity to argue its case as amended before two instances.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance for further prosecution.

The Registrar:

The Chairman

C. Vodz

G. Raths