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Datasheet for the decision of 22 September 2010

Case Number: T 1049/07 - 3.3.05

Application Number: 00115379.0

Publication Number: 1074521

IPC: C03C 3/087

Language of the proceedings: EN

Title of invention:
Boron-free glass composition and filtration media

Patentee:
Johns Manville International, Inc.

Opponent:
SAINT-GOBAIN ISOVER

Headword:
Boron-free fibers/JOHNS MANVILLE

Relevant legal provisions:
EPC Art. 56, 123(3)

Relevant legal provisions (EPC 1973):
-

Keyword:
"Extension of scope of protection: No"
"Inventive step: Yes"

Decisions cited:
-

Catchword:
-

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Case Number: T 1049/07 **-** 3.3.05

D E C I S I O N
of the Technical Board of Appeal 3.3.05
of 22 September 2010

Appellant: (Opponent)
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Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office posted 25 April 2007 concerning maintenance of European patent No. 1074521 in amended form.

Composition of the Board:

Chairman: H. Engl
Members: J.-M. Schwaller
H. Preglau

Summary of Facts and Submissions

I. The present appeal was lodged by the opponent (hereinafter "appellant") against the interlocutory decision of the opposition division maintaining the patent in amended form on the basis of the set of claims filed as first auxiliary request on 5 March 2003 with independent claims 1, 6 and 12 reading as follows:

"1. A substantially boron-free glass composition comprising the following by mole percent:

62-68%	*SiO_2*
2-6%	*Al_2O_3*
10-16%	*Na_2O*
0-6%	*K_2O*
3-10%	*CaO*
0-8%	*MgO*
0-3%	*BaO*
2-6%	*ZnO*
0-2%	*TiO_2*
0-2%	*F_2*

wherein the total amount of Na_2O and K_2O is less than 18 mol% and wherein the composition further contains Li_2O in an amount no greater than 8 mol%, the glass composition having an HTV of between about 1010°C (1850°F) and about 1204°C (2200°F), the liquidus temperature of the glass composition being at least 139°C (250°F) below said HTV, said HTV being defined as the temperature at which glass viscosity is 100 Pa.s (1000 poises).

6. A substantially boron-free fiberglass HEPA air

filtration media comprising a paper of glass fibers comprising the following by weight in mol percent:

60-70%	*SiO_2*
1-7%	*Al_2O_3*
8-19%	*Na_2O*
0-6%	*K_2O*
3-10%	*CaO*
0-10%	*MgO*
0-4%	*BaO*
0-8%	*ZnO*
0-4%	*TiO_2*
0-2%	*F_2*

wherein the total amount of Na_2O and K_2O is less than 20 mol% and wherein the composition further contains Li_20 in an amount no greater than 8 mol%, the glass composition having an HTV of between about 1010°C (1850°F) and about 1204°C (2200°F), the liquidus temperature of the glass composition being at least 139°C (250°F) below said HTV, said HTV being defined as the temperature at which glass viscosity is 100 Pa.s (1000 poises).

12. A process for manufacturing substantially boron-free glass media suitable for use in HEPA air filtration equipment which comprises:
a) fiberizing into glass fibers using a flame attenuation or rotary process a glass composition comprising the following on a weight basis in mole percent:

60-70%	*SiO_2*

1-7%	*Al_2O_3*
8-19%	*Na_2O*
0-6%	*K_2O*
3-10%	*CaO*
0-10%	*MgO*
0-3%	*BaO*
0-8%	*ZnO*
0-4%	*TiO_2*
0-2%	*F_2*

wherein the total amount of Na_2O and K_2O is less than 20 mol% and wherein the composition further contains Li_2O in an amount no greater than 8 mol%, the HTV of the glass composition being between about 1010°C (1850°F) and about 1204°C (2200°F), the liquidus temperature of the glass composition being at least 139°C (250°F) below said HTV with foregoing glass composition of the glass fibers having an HTV of between about 1010°C (1850°F) and about 1204°C (220°F), and a liquidus temperature at least 139°C (250°F) below said HTV and said HTV being defined as the temperature at which glass viscosity is 100 Pa.s (1000 poises)
b) processing said glass fibers through specialty paper-making equipment using weakly acidic white water 2.5-3.0 pH to provide a fiberglass paper."

II. The documents cited during the opposition procedure included the following:

D1: JP-A-11 029 344 and its PAJ abstract

D2: WO-A-98/43 923

D3: M. B. Volf, Glass Science and Technology 7, "*Chemical Approach to Glass*", Elsevier, Amsterdam, 1984, pages 219-227

III. With the statement of grounds of appeal dated 21 August 2007, the appellant raised objections under Articles 123(3) and 56 EPC against the claims as maintained by the opposition division.

IV. The patentee (hereinafter "the respondent") refuted these objections with its observations of 24 January 2008.

V. On 10 September 2010, the appellant submitted two new documents

D4: Excerpt from Wikipedia on the occurrence of lithium on Earth.

D5: Analytical data sheet from Saint-Gobain Recherche identified as "Bulletin n° 9673 X" relating to the partial chemical analysis of four different feldspar minerals.

VI. During the oral proceedings which took place on 22 September 2010, the issues under discussion concerned Articles 123(3) and 56 EPC.

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

The respondent requested that the appeal be dismissed.

Reasons for the Decision

1. Allowability of the amendments

1.1 The allowability under Article 123(2) EPC of the (amended) claims as maintained has not been contested. The board is also satisfied that these claims find a sufficient basis in the application as filed, as set out below:

- claim 1: claims 1, 2 and 3; page 8, lines 29 to 35; page 2, lines 23 and 24;
- claim 2: page 8, lines 34 and 35;
- claim 3: page 7, lines 1 and 2;
- claim 4: page 6, lines 26 and 27;
- claim 5: claim 4;
- claim 6: claims 5, 2 and 3; page 8, lines 29 to 35; page 2, lines 23 and 24;
- claim 7: page 8, lines 34 and 35;
- claim 8: page 7, lines 1 and 2;
- claim 9: page 6, lines 26 and 27;
- claims 10, 11: claims 6 and 7, respectively;
- claim 12: claims 8, 2 and 3; page 8, lines 29 to 35; page 2, lines 23 and 24;
- claim 13: page 8, lines 34 and 35;
- claim 14: page 7, lines 1 and 2;
- claim 15: page 6, lines 26 and 27;
- claims 16, 17, 18: claim 9, 10, 11, respectively.

Accordingly, said claims meet the requirements of Article 123(2) EPC.

1.2 The appellant held claim 1 as maintained in the contested decision to contravene Article 123(3) EPC.

In this respect, it argued that the feature:

"the composition further contains Li_2O in an amount no greater than 8 mol% ***and in an amount sufficient to render*** *the HTV of the glass composition between about 1010°C (1850°F) and about 1204°C (2200°F)"*

in granted claim 1 had been replaced in claim 1 as maintained in amended form by the following allegedly non-equivalent feature reading:

"the composition further contains Li_2O in an amount no greater than 8 mol%, the glass having an HTV of between about 1010°C (1850°F) and about 1204°C (2200°F)".

Consequently, claim 1 as maintained encompassed compositions which were not covered by claim 1 as granted, in particular compositions containing almost no Li_2O and wherein the HTV parameter was regulated by other oxides such as Na_2O. It argued in particular that in claim 1 as maintained the amount of Li_2O could be chosen freely between 0% and 8 mol%, whereas in accordance with claim 1 as granted, the amount of Li_2O was functionally linked to the achievement of an HTV in the claimed range. Hence, it had necessarily to exceed the lower limit of 0%. Consequently, claim 1 as granted excluded glass compositions having 0% Li_2O, whereas the claim maintained by the opposition division allowed such compositions. The scope of protection conferred by the claims had thus been extended.

1.3 The board does not share the appellant's view for the following reasons.

1.3.1 According to Article 123(3) EPC, "the European patent may not be amended in such a way as to extend the protection it confers". Therefore, in assessing whether claim 1 at issue meets the requirements of Article 123(3) EPC, the extent of protection conferred by claim 1 as granted has to be compared with that of claim 1 as maintained.

1.3.2 In the present case, it is observed that both claims under dispute (i.e. claim 1 as granted and as maintained) contain the feature "***the composition further contains Li_2O in an amount no greater than 8 mol%***". Although a lower limit is not explicitly stated in the claim(s), this feature clearly indicates that Li_2O is a mandatory constituent. As a logical consequence, in both glass compositions claimed the lowest possible amount of Li_2O cannot be zero, as alleged by the appellant.

As regards the lowest possible amount of Li_2O in claim 1 as maintained, the board - in the absence of any convincing counter-argument - accepts the respondent's argument that this amount has to be set as being "above the analytical detection limit for Li_2O".

In claim 1 as granted, the amount of Li_2O is not only defined as being "no greater than 8 mol%" - as in claim 1 as maintained - but also as being "sufficient to render the HTV of the glass composition between about 1010°C (1850°F) and about 1204°C (2200°F)". The board recognises that on reading this claim version,

the skilled person might be misled to assume the presence of an exclusive functional link between the amount of Li_2O in the glass composition and the HTV being between about 1010°C and about 1204°C.

However, the study of the description - which in the present case is necessary for the detailed assessment of the extent of protection of this claim - reveals that no such link (or at least not an exclusive one) in fact exists, for the following reasons.

Although paragraph [0027] of the patent in suit indicates that Li_2O acts as a glass viscosity reducer, it can be seen from paragraphs [0023], [0024] and [0025] that Li_2O is not unique. Other components, such as fluorine, TiO_2, CaO and MgO, are also disclosed as having this property of reducing glass viscosity. Since Li_2O is thus not the sole viscosity-reducer in the glass composition claimed, it is impossible to estimate its contribution to the viscosity and what the contribution of the other components is. For the same reason, it is impossible to assess whether Li_2O contributes to the high temperature viscosity (HTV) and what that contribution is.

In fact, the contested patent itself confirms that Li_2O does not automatically lead to an HTV of between about 1010°C and about 1204°C, since Example 1 of the contested patent discloses a glass composition not containing Li_2O but having a HTV within that range.

1.3.3 For the above reasons, the board is convinced that the patent has not been amended in such a way as to extend the protection it conferred in its version as granted.

Therefore claim 1 as maintained, and independent claims 6 and 12 - amended in the same way as claim 1 - fulfil the requirements of Article 123(3) EPC.

2. Main request - disclosure of the invention

This issue has no longer been disputed in the appeal procedure. The board sees no reason not to accept the arguments and conclusions of the first instance, namely that the contested patent discloses two examples falling within the ambit of the claim and that paragraphs [0021] to [0028] of the description provide sufficient information as regards the influence of the different components on the properties of a glass composition to enable the skilled person to produce without undue burden further glass compositions falling within the terms of the claims.

The requirements of Article 83 EPC are thus met.

3. Main request - novelty

This issue has also no longer been disputed and the board shares the opinion of the first instance that the subject-matter of claim 1 is novel having regard to the cited documents. It is in particular novel having regard to document D1 which discloses neither the presence of Li_2O in the glass composition nor that the liquidus temperature is at least 139°C below the HTV.

Essentially for the same reasons, the subject-matter of independent claims 6 and 12 (and of claims 2 to 5, 7 to 11 and 13 to 18, which are dependent on claim 1, 6 or 12) is novel.

The claims thus meet the requirements of Article 54(1) and (2) EPC.

4. Main request - inventive step

4.1 The contested patent relates to glass compositions especially useful for making fibers for high-efficiency fiberglass clean-room filters, especially filters for microelectronic clean-rooms where boron contamination on electronic integrated circuit chips must be avoided (see paragraph [0001]). Such filters are referred to as "High Efficiency Particle Air" or "HEPA" filters. The glass compositions of the present invention are substantially free of boron in the sense that no boron oxide (B_2O_3) is intentionally added to the glass compositions as an ingredient, so that any boron is present only in insignificant and unavoidable trace amounts.

4.2 The board considers - in agreement with the parties - that the closest state of the art is document D1. According to the abstract (PAJ), said patent document discloses ultrafine glass fibers usable as a filter paper generating no boron gas-like matter even if used for high-performance filters such as HEPA and having a durability comparable to that of E-glass. These ultrafine glass fibers, which can be produced economically, comprise

55-70 wt.% SiO_2,
8-12 wt.% $(R1)_2O$ (R1 being Na or K),
1-15 wt.% $(R2)_2O_3$ (R2 being Al or Fe),
10-14 wt.% (R3)O (R3 being Ca, Mg or Ba),

0-15 (pref. ≥ 10) wt.% ZnO, and
≤ 0.01 wt.% B_2O_3;

with the content of [$(R2)_2O_3$ + ZnO] being 9-20 wt.%.

According to paragraph [0008] of a machine translation into English of document D1, the glass fibers further have water and acid resistance.

D1 does not reveal whether the fibers are produced by rotary fiberisation or by flame attenuation fiberisation.

According to the table annexed to the minutes of the oral proceedings before the opposition division which is based on the table on page 4 of D1 and wherein weight percentages have been converted into mole percentages, the fiber produced in Example 4 of D1 comprises in mole percent: 65.5% SiO_2, <0.01% B_2O_3, 3.3% Al_2O_3, 0.15% Fe_2O_3, 10.5% Na_2O, 0.2% K_2O, 9.4% CaO, 5.8% MgO, 0.01% BaO and 5.3% ZnO and exhibits an HTV of 1193°C and a liquidus temperature of 70°C below said HTV. The values of the HTV and liquidus temperatures have been determined by the respondent and have not been contested.

4.3 The problem to be solved starting from this state of the art can be seen in the provision of further boron-free glass compositions suitable for making fibers for HEPA filters that can be produced in a flame attenuation process.

4.4 As a solution to this problem, the patent in suit proposes glass compositions as defined in claim 1,

characterised in that they further contain Li_2O in an amount no greater than 8 mol% and in that the liquidus temperature of the composition is at least 139°C below its HTV.

4.5 As to the question whether the problem is actually solved, it is observed that the contested patent (Examples 3 and 4) describes in detail the preparation of glass fibers using a glass composition according to the subject-matter defined in claim 1. In particular, the glass compositions of Examples 3 and 4 respectively exhibit a difference between HTV and liquidus of 154°C and 172°C, and the fibers obtained from these compositions were made in a flame attenuation process. Hence, the problem as defined in item 4.3 has actually been solved.

The appellant did not agree that the problem would already be solved with a difference between HTV and liquidus of 139°C, as defined in claim 1. It did not however provide any plausible arguments or evidence for this objection, so the board cannot accept it.

4.6 The question which remains to be decided is whether or not the proposed solution is obvious in view of the prior art.

4.6.1 The appellant regarded the subject-matter of claim 1 as maintained by the opposition division as obvious in view of the disclosures of documents D2 and D3.

It argued in particular that D2 suggested that glass compositions susceptible for processing in a pot and marble process had to exhibit a difference between HTV

and liquidus (hereinafter called ΔT) of at least 300°F. So it would have been obvious to modify the glass compositions of D1 such that their ΔT was at least 300°F (149°C).

It also pointed out that D3 suggested the use of Li_2O not only for improving the chemical durability of glasses but also for decreasing the liquidus and the viscosity of glasses and that, therefore, the subject-matter of claim 1 was obvious in view of D2 and D3.

4.6.2 The board cannot accept these arguments for the following reasons.

4.6.3 The above-mentioned disclosure in D2 regarding a ΔT of at least 300°F (149°C) is a general statement referring to the background art of D2 only.

The glasses according to the invention described in D2 in fact exhibit a ΔT of at least about 350°F (176.7°C) (see page 4, line 27 to page 5, line 4) and have a composition falling within the following ranges (in mole percent):

SiO_2	66 - 69.7
Al_2O_3	0 - 2.2
RO	7 - 18
R_2O	9 - 20
B_2O_3	0 - 7.1

with R_2O being an alkali metal oxide and RO an alkaline earth metal oxide. R_2O is preferably Na_2O, while RO may be MgO and/or CaO, preferably both, in a molar ratio of

MgO/CaO of 1:3 to 3:1, or more preferably 2:3 to 3:2 (D2: claim 1 and page 5, lines 7 to 17).

It is important to observe that contrary to the glasses according to claim 1 at issue, the glasses exemplified in D2 (Table 2) are **not boron-free** (they contain 6.08 and 5.99 mol.% B_2O_3, respectively) and furthermore **contain substantially less alumina** (respectively 1.04 mol.% and 1.02 mol.%) than those according to claim 1 at issue (2 to 6 mol.%).

So, even if the skilled person faced with the problem identified in item 4.3 finds in D2 the information that the ΔT should at least be 300°F (149°C), it does not find any solution in this document as to how glass compositions having a ΔT of 65 to 84°C - such as those disclosed in D1 - could be modified to render them suitable for the pot and marble process.

4.6.4 The appellant's argument that the skilled person would easily arrive at the glass compositions according to claim 1 at issue by trial-and-error experimentation is not accepted by the board, because in the absence of any teaching as to how the compositions of D1 might be modified in order to achieve a higher ΔT, such experimentation cannot be considered as purely routine, as the appellant contends.

4.6.5 The influence of lithium on the chemical and physical properties of glasses is discussed in general terms in D3. It is disclosed that, on the one hand, Li^+ improves the chemical durability with respect to water and acids in glasses (eighth line from the bottom of page 219 and lines 5 to 7 of page 225), and on the other hand, that

lithium raw materials improve the melting properties of glasses (page 220, last lines) and that Li_2O decreases the liquidus (page 22O, middle of the page) and the viscosity (page 221, line 10). However, there is no suggestion in D3 that lithium oxide increases the difference between the HTV and the liquidus temperatures. Therefore, D3 cannot suggest that the glass compositions of D1 could be modified by adding Li_2O such that their ΔT falls within the claimed range.

4.6.6 In view of the above, the skilled person starting from D1 and faced with the problem indicated in item 4.3 does not find guidance in documents D2 and D3 to arrive at the subject-matter of claim 1 at issue.

4.6.7 Documents D4 and D5, submitted by the appellant to show that lithium were often found as an impurity in raw materials (e.g. feldspar) used for the preparation of glass compositions, neither show that lithium was inevitably present in the glass compositions known from documents D1 or D2 nor give any hint as to how the glass compositions from D1 would have to be modified to arrive at the subject-matter of claim 1 at issue.

4.6.8 For the above reasons, the subject-matter of claim 1 cannot be considered as being obvious to a skilled person from the state of the art.

4.7 Independent claims 6 and 12 are characterised by the same non-obvious features as independent claim 1, namely:

- the glass composition further contains Li_2O in an amount no greater than 8 mol%; and

– the liquidus temperature of the composition is at least 139°C below its HTV.

Accordingly, the same reasoning as for the subject-matter of claim 1 applies to these claims, the subject-matter of which is therefore also not obvious in view of the state of the art.

4.8 Claims 2 to 5, 7 to 11 and 13 to 18 derive their patentability from claim 1, 6 or 12, on which they depend.

4.9 For the above reasons, the claims according to the main request involve an inventive step pursuant to Article 56 EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

C. Vodz H. Engl