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Datasheet for the decision of 13 March 2015

Case Number: T 0561/11 - 3.2.07

Application Number: 03795798.2

Publication Number: 1558534

IPC: C03B5/225, B21D15/10

Language of the proceedings: EN

Title of invention:
REFINING CHAMBER MADE OF PLATINUM GROUP METAL MATERIALS

Patent Proprietors:
Umicore AG & Co. KG
Asahi Glass Company, Limited

Opponent:
Schott AG

Headword:

Relevant legal provisions:
EPC Art. 56
RPBA Art. 13(1), 13(3)

Keyword:
Inventive step -
main request and auxilary requests 1-3 and 8 (no)
Late-file auxiliary request 8 - admitted (yes)

Decisions cited:
T 0967/97, T 0558/00, T 0021/08, T 0308/09, T 1289/09

Catchword:

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European Patent Office
D-80298 MUNICH
GERMANY
Tel. +49 (0) 89 2399-0
Fax +49 (0) 89 2399-4465

Case Number: T 0561/11 - 3.2.07

D E C I S I O N
of Technical Board of Appeal 3.2.07
of 13 March 2015

Appellant: (Opponent)	Schott AG Hattenbergstrasse 10 55122 Mainz (DE)
Representative:	2K Patentanwälte Blasberg Kewitz & Reichel Partnerschaft mbB Schumannstrasse 27 60325 Frankfurt am Main (DE)
Respondents: (Patent Proprietors)	Umicore AG & Co. KG Postfach 1351 63403 Hanau (DE)
	Asahi Glass Company, Limited Shin-Marunouchi Building 1-5-1 Marunouchi Chiyoda-ku Tokyo 100-8405 (JP)
Representative:	Vossius & Partner Siebertstrasse 3 81675 München (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 20 December 2010 concerning maintenance of the European Patent No. 1558534 in amended form.**

Composition of the Board:

Chairman H. Meinders
Members: G. Patton
I. Beckedorf

Summary of Facts and Submissions

I. The appellant (opponent) lodged an appeal against the decision of the Opposition Division to maintain European patent No. 1 558 534 in amended form.

II. The opposition was filed against the patent as a whole and was based on Article 100(a) EPC (lack of novelty and lack of inventive step).

The Opposition Division held that the claimed subject-matter of the then main request (patent as granted) was lacking inventive step and that none of the grounds for opposition prejudiced the maintenance of the patent on the basis of the then auxiliary request.

III. The respondents (patent proprietors) requested that the appeal be dismissed and, subsidiarily, that the patent be maintained on the basis of one of the auxiliary requests 1 to 3 filed with the letter dated 9 November 2011.

With the annex to the summons to oral proceedings, subsidiarily requested by both parties, the Board provided its preliminary non-binding opinion that the claimed subject-matter of the main request and auxiliary requests 1 to 3 did not seem to involve inventive step.

In reaction the respondents filed further auxiliary requests 4 to 11 with the letter dated 13 February 2015.

IV. Oral proceedings took place on 13 March 2015 during which the followings aspects, *inter alia*, were discussed:

- inventive step of the subject-matter of claim 1 according to the main request in view of the teaching of document D2 in combination with the teaching of one or more documents D1, E3, E4, E11, E13 and/or with the common general technical knowledge and practice of the person skilled in the art,
- inventive step of the subject-matter of claim 1 according to auxiliary request 1 based on the teaching of the prior art and/or the common general technical knowledge and practice as discussed in respect of claim 1 according to the main request,
- inventive step of the subject-matter of claim 1 according to auxiliary request 2 based on the teaching of the prior art and/or the common general technical knowledge and practice as discussed in respect of claim 1 according to the main request and auxiliary request 1,
- inventive step of the subject-matter of claim 1 according to auxiliary request 3 based on the teaching of the prior art and/or the common general technical knowledge and practice as discussed in respect of claim 1 according to the main request and auxiliary requests 1 and 2,
- admission into the proceedings of the auxiliary requests 8 to 11,
- inventive step of the subject-matter of claim 1 according to auxiliary request 8 based on the teaching of the prior art and/or the common general technical knowledge and practice as discussed in respect of claim 1 according to the main request and auxiliary requests 1 to 3.

The respondents withdrew auxiliary requests 4 to 7 and 9 to 11.

The present decision was announced at the end of the oral proceedings.

V. The appellant requests that the decision under appeal be set aside and that the European patent No. 1 558 534 be revoked.

VI. The respondents request that the appeal be dismissed (main request) or, alternatively, that in setting aside the decision under appeal the patent be maintained in amended form on the basis of one of the sets of claims filed as auxiliary requests 1 to 3 with letter of 9 November 2011 and as auxiliary request 8 with letter of 13 February 2015.

VII. Claim 1 of the **main request** reads as follows:

"A refining chamber made essentially of platinum group metal material for glass production, comprising: a chamber in the shape of a tube having a cross section, (1) wherein the cross section (1) of the refining chamber is, in at least one segment, shaped in the form of an ellipse or an oval so that in the operating position the length (10) of a horizontal line (11) line that divides the surface of the cross section (1) into a lower (20) and an upper section (21) of the surface, both of which have essentially the same area, is greater than twice the maximum vertical extent of the lower segment of the surface."

Claim 1 of **auxiliary request 1** reads as follows (in bold the amended with respect to claim 1 of the main request; emphasis added by the Board):

"A refining chamber made essentially of platinum group metal material for glass production, comprising: a

chamber in the shape of a tube having a cross section, (1) wherein the cross section (1) of the refining chamber is, in at least one segment, shaped in the form of an ellipse or an oval so that in the operating position the length (10) of a horizontal line (11) ~~line~~ that divides the surface of the cross section (1) into a lower (20) and an upper section (21) of the surface, both of which have essentially the same area, is greater than twice the maximum vertical extent of the lower segment of the surface, **wherein the ratio of the length (10) of the horizontal line (11) to the maximum vertical extent (30) of the lower segment of the surface is between 2.5:1 and 5:1."**

Claim 1 of **auxiliary request 2** reads as follows (in bold the amended with respect to claim 1 of auxiliary request 1; emphasis added by the Board):

"A refining chamber made essentially of platinum group metal material for glass production, comprising: a chamber in the shape of a tube having a cross section, (1) wherein the cross section (1) of the refining chamber is, in at least one segment, shaped in the form of an ellipse or an oval so that in the operating position the length (10) of a horizontal line (11) that divides the surface of the cross section (1) into a lower (20) and an upper section (21) of the surface, both of which have essentially the same area, is greater than twice the maximum vertical extent of the lower segment of the surface, wherein the ratio of the length (10) of the horizontal line (11) to the maximum vertical extent (30) of the lower segment of the surface is between 2.5:1 and 5:1, **wherein the refining chamber has a wall thickness of approximately 0.5 mm to 3 mm, preferably 0.7 mm to 1.5 mm."**

Claim 1 of **auxiliary request 3** reads as follows (in bold the amended with respect to claim 1 of auxiliary request 2; emphasis added by the Board):

"A refining chamber made essentially of platinum group metal material for glass production, comprising: a chamber in the shape of a tube having a cross section, (1) wherein the cross section (1) of the refining chamber is, in at least one segment, shaped in the form of an ellipse or an oval so that in the operating position the length (10) of a horizontal line (11) that divides the surface of the cross section (1) into a lower (20) and an upper section (21) of the surface, both of which have essentially the same area, is greater than twice the maximum vertical extent of the lower segment of the surface, wherein the ratio of the length (10) of the horizontal line (11) to the maximum vertical extent (30) of the lower segment of the surface is between 2.5:1 and 5:1, wherein the refining chamber has a wall thickness of approximately 0.5 mm to 3 mm, preferably 0.7 mm to 1.5 mm, **and is stiffened by shaping measures, said shaping measures comprising forming of creases, corners, waves, folds, or combinations thereof, at the circumference of the refining chamber.**"

Claim 1 of **auxiliary request 8** reads as follows (in bold the amended with respect to claim 6 of the main request; emphasis added by the Board):

"A process for refining glass in which the molten glass flows through a tubular refining chamber~~, according to any one of the preceding claims,~~ **made essentially of platinum group metal material wherein the cross section (1) of the refining chamber is, in at least one segment, shaped in the form of an ellipse or an oval so**

that in the operating position the length (10) of a horizontal line (11) line that divides the surface of the cross section into a lower (20) and an upper section (21) of the surface, both of which have essentially the same area, is greater than twice the maximum vertical extent of the lower segment of the surface, the method comprising:
allowing glass in the molten state at a temperature of 1000°C to 1700°C to flow through the refining chamber, wherein ~~**the cross section (1) of the refining chamber is, in at least one segment, shaped in the form of an ellipse or an oval so that in the operating position the length (10) of a horizontal line (11) that divides the surface of the cross section into a lower (20) and an upper section (21) of the surface, both of which have essentially the same area, is greater than twice the maximum vertical extent of the lower segment of the surface and**~~ the level of the molten glass is adjusted in such a way that the surface of the glass perpendicular to the direction of flow of the molten glass has a width which is more than twice as great as the maximum vertical extent of the molten glass in the refining chamber."

The other independent claims of the main request and auxiliary requests 1, 2, 3 and 8 are not relevant for the decision.

VIII. The following cited documents of the opposition proceedings are of relevance for the present decision:

D1: JP-A-2000-128548
D2: DE-A-100 51 946
E3: US-B-6 286 337
E4: US-A-3 420 653
E11: US-A-6 119 484

E13: US-A-3 625 040, was filed in the appeal proceedings

The admission in the proceedings of E13, which was filed for the first time with the appellant's statement of grounds of appeal, has not been contested by the respondents and the Board did not see any reason to not consider it.

IX. The appellant argued essentially as follows

Main request

The only distinguishing feature of claim 1 over the chamber disclosed in D2, which is a proper starting point for assessing inventive step, is: "the cross section of the refining chamber being in at least one segment shaped in the form of an ellipse or an oval" (features a)). In view of their technical effects, the problem to be solved can be seen as to modify the refining chamber of D2 for providing a more effective refining of the glass.

The skilled person is aware, as illustrated in E4, D1 and/or E3, that the form of the cross section of a refining chamber has an effect on the effectiveness of the glass refining process: the shallower, the better. By applying this knowledge to the "round" shape of the refining chamber of D2 (which is not limited to a circular shape), he would arrive at the claimed subject-matter in an obvious manner.

E11, which is in the same technical field as that of D2, also discloses this skilled person's common general knowledge and explicitly mentions an elliptical shape.

Further, even though E13 does not concern refining chambers as correctly pointed out by the respondents, it shows that it is technically feasible to manufacture refining chambers with cross sections of an oval shape, continuing to use the process of D2.

Auxiliary request 1

Additionally to features a), "the ratio of the length of the horizontal line to the maximum vertical extent of the lower segment of the surface is between 2.5:1 and 5:1" is a further distinguishing feature (feature b)) of claim 1 of auxiliary request 1 over the chamber of closest prior art D2.

There is no indication in the contested patent that the claimed limits of feature b) are critical. The description of the contested patent merely mentions that the selected range is preferred. The ratios chosen are therefore arbitrary and cannot be regarded as being different from what the skilled person would do when applying the non-inventive elliptical or oval shape teaching to the round refining chamber of D2.

The mere fact that a distinguishing feature is not disclosed in the cited prior art is not as such a sufficient reason for acknowledging inventive step.

Therefore, feature b) cannot justify an inventive step and, hence, the subject-matter of claim 1 of auxiliary request 1 should be considered as lacking inventive step.

Auxiliary request 2

Additionally to features a) and b), "the refining chamber has a wall thickness of approximately 0.5 mm to 3 mm, preferably 0.7 mm to 1.5 mm" is a further distinguishing feature (feature c)) of claim 1 of auxiliary request 2 over the chamber of closest prior art D2.

Since the technical effect associated with distinguishing feature c) has no synergy with the technical effects of the other distinguishing features a) and b), its contribution to inventive step can be assessed independently.

The partial problem derived from the technical effect of distinguishing feature c) is to enable the refining chamber of D2 to withstand the mechanical stresses in operation with as little of the expensive platinum group metal material (PGM) as possible.

The skilled person faced with this technical problem would, when applying the non-inventive ellipse or oval form and shape ratio for the cross section of the refining chamber, inevitably choose a wall thickness within the claimed range by either trial and error or by usual engineering computations. Therefore, distinguishing feature c) cannot justify an inventive step and, hence, the subject-matter of claim 1 of auxiliary request 2 should be regarded as lacking inventive step.

A distinguishing feature being not disclosed in the cited prior art is not a sufficient reason as such for justifying an inventive step.

Auxiliary request 3

Since claim 1 of auxiliary request 3 does not comprise any further distinguishing feature over D2 with respect to claim 1 of auxiliary request 2, its subject-matter would lack inventive step for the same reasons.

Auxiliary request 8

Making use of its discretionary power under Articles 13(1) and (3) RPBA, the Board should not admit late-filed auxiliary request 8 into the proceedings since the appellant was compelled to deal with it in a short period of time before the oral proceedings together with other late-filed auxiliary requests, now withdrawn.

Additionally to features a), "the level of the molten glass is adjusted in such a way that the surface of the glass perpendicular to the direction of flow of the molten glass has a width which is more than twice as great as the maximum vertical extent of the molten glass in the refining chamber" is a distinguishing feature (feature e)) of claim 1 of auxiliary request 8 over the closest prior art chamber in D2.

In discussing claim 1 of the main request, it has already been concluded that features a) cannot justify inventive step.

The skilled person is aware that sufficient space above the molten glass is required for enabling the bubbles to escape. By applying this knowledge when operating the non-inventive refining chamber according to claim 1 of the main request, he will arrive at the claimed solution, i.e. feature e), in an obvious manner.

As a result, the subject-matter of claim 1 of auxiliary request should be regarded as lacking inventive step.

X. The respondents argued essentially as follows

Main request

D2 cannot be taken as the closest prior art since it does not deal with the problem of the contested patent of improving the effectiveness of the glass refining process.

A general principle: "the shallower, the better" for improving the effectiveness of the glass refining process is neither known by the skilled person nor is it derivable from any of the cited prior art.

The skilled person starting from a self-standing refining chamber as in D2 will not consider the teaching of E11 which deals with bricked refining chambers. Even if he would do it, he will select from E11 the preferred rectangular shape for the cross section of the refining chamber.

Since the cited prior art documents either do not disclose the claimed elliptical or oval shape for the cross section of the refining chamber (features a)) and/or teach that a different cross section is preferred, the skilled person would have no reason to implement an elliptical or oval shape as claimed.

For the above reasons, an inventive step for the subject-matter of claim 1 of the main request should be acknowledged.

Auxiliary request 1

Feature b) is a further distinguishing feature of claim 1 over D2. The problem derived from the technical effects associated with the ratio limits in feature b) is to modify the refining chamber of D2 in order to increase the effectiveness of the refining process while limiting the manufacturing costs of the chamber.

Since the selected range for the ratio specified in feature b) is disclosed in the contested patent as being advantageous, this selection cannot be regarded as arbitrary. Further, since the claimed range is not known from the cited prior art, an inventive step should be acknowledged.

Auxiliary request 2

Feature c) is a further distinguishing feature, additionally to features a) and b), over the chamber of D2. Its technical effect is to enable the refining chamber to withstand the mechanical stresses in operation with as little of the expensive PGM material as possible. Since neither the claimed shape ratio (feature b)), nor the claimed range for the wall thickness (feature c)) of the refining chamber, are disclosed in the cited prior art, inventive step should be acknowledged.

Auxiliary request 3

The arguments put forward with respect to claim 1 of auxiliary request 2 also apply for claim 1 of auxiliary request 3.

Auxiliary request 8

Auxiliary request 8 should be admitted in the proceedings since it does not comprise any new subject-matter over the main request already present since the beginning of the appeal proceedings.

D2 should not be taken as the closest prior art since it does not disclose a process, which is contrary to claim 1 of auxiliary request 8.

Features a) and e) are the distinguishing features of claim 1 of auxiliary request 8 over the process of D2 if so seen by the Board.

Features a) justify inventive step for the same reasons as those given for claim 1 of the main request.

Since none of the cited prior art discloses feature e), which enables to increase the effectiveness of the refining process, an inventive step for the subject-matter claim 1 of auxiliary request 8 should be acknowledged.

Reasons for the Decision

1. **Main request**

1.1 The Board shares the parties' view that the subject-matter of claim 1 of the main request is novel since none of the cited prior art discloses all its features in combination.

1.2 The appellant has raised an objection of lack of inventive step against claim 1 of the main request starting from D2 in combination with the teaching of

one or more of the documents D1, E3, E4, E11, E13 and/ or with the common general knowledge and practice of the skilled person.

1.2.1 The Board shares the appellant's view that document D2 can be taken as the closest prior art for claim 1 of the main request since it discloses a refining chamber for glass production (see [0029], [0030] and figure 3).

1.2.2 As argued during the oral proceedings, the respondents contest this view for the reason that D2 is not concerned with the problem of the contested patent of improving the effectiveness of the glass refining process but rather with a completely different problem of improving the refining chamber itself and its manufacturing process.

However, as underlined by the Board during the oral proceedings, inventive step of the claimed subject-matter has to be assessed in view of any plausible starting point (Case Law of the Boards of Appeal, 7th Edition, 2013, I.D.2; e.g. T 967/97, T 558/00, T 21/08, T 308/09 and T 1289/09, none of them published in OJ EPO). Since D2 belongs to the same technical field as that of claim 1 of the main request, namely of refining chambers for glass production, it unambiguously represents a plausible starting point for assessing inventive step.

1.2.3 D2 discloses a process for producing a refining chamber ("Läuterkammer") comprising inserting a smooth-walled tubular segment (Ausgangsrohrstück" 1) into a cylindrical mold ("Formwerkzeug" 2) having an inside diameter essentially the same as the outside diameter of the tubular segment (1) ("...Formwerkzeug (2) mit einem Innendurchmesser, der im wesentlichen dem

Aussendurchmesser des Rohrstücks entspricht...") which has radial corrugation-like depressions ("Ausnehmungen" 3, 3'), closing the two axial ends with a compression tool ("Preßwerkzeuge" 4, 5), filling the space thus formed completely with a hydraulic fluid ("Flüssigkeit" 6), and then, exerting an axial compression through the compression tools (4, 5) and generating an internal hydraulic pressure so that the walls of the tubular segment are corrugated ("Auswölbungen" 7) to match the depressions (3) in the mold with simultaneous shortening of the tubular segment ("...Verkürzung des Rohrstücks...").

The process of D2 leads to a refining chamber made essentially of platinum group metal material (hereafter called PGM) for glass production comprising a chamber in the shape of a tube ([0001]-[0002]; [0021]-[0022]; [0029]-[0030]; claims 8-10; figures 1 and 3), with a circular cross section.

1.2.4 As agreed with the parties, the distinguishing features of claim 1 over D2 are that:

a) the cross section of the refining chamber is, in at least one segment, shaped **in the form of an ellipse or an oval** so that in the operating position the length of a horizontal line that divides the surface of the cross section into a lower and an upper section of the surface, both of which have essentially the same area, is greater than twice the maximum vertical extent of the lower segment of the surface.

1.2.5 The Board shares the appellant's view that, in case the tube has the form of an ellipse or an oval, the other

further (distinguishing) features would be inherent (see also impugned decision, points 2.1 and 3.1.1).

1.2.6 As explicitly stated in the application of the contested patent as filed, page 4, line 21 to page 5, line 9, the technical effect of both alternatives, i.e. ellipse or oval, with respect to a circular cross section is that (see also contested patent, [0016]-[0018]):
"*(a) the free surface of the glass increases, resulting in better degassing;*
(b) the longest path from the lowest point at the bottom to the surface decreases, which means that degassing requires less time, with the result that either the throughput increases, the refining segment is shortened, or the cross section can be reduced. That, in turn, results in less PGM materials being tied up in the production plant, so that costs can be reduced substantially;
(c) the reduced depth of the glass bath and the altered flow cross section will result in a different flow profile, which again results in better mixing of the glass bath; and
(d) as heat is added along the refining segment, a lesser depth of the glass bath further results in decreased temperature differences in the glass, or faster heating of the glass."

1.2.7 The problem to be solved for both alternatives can then be seen as to modify the refining chamber of D2 in order to provide a more effective refining of the glass (contested patent, [0019]).

1.2.8 The Board is of the opinion that the skilled person is fully aware that the form of the cross section of a refining chamber has an effect on the effectiveness of

the glass refining process: **the shallower, the better**. As put forward by the appellant, this is illustrated for instance by E4 (column 3, lines 44-62; column 5, lines 5-6; figures 1 and 2), D1 (abstract; [0006], [0026]; claim 1) or E3 (column 12, lines 25-39).

1.2.9 As a consequence, the skilled person faced with the above problem and using his common general knowledge and practice about the influence of the form of the cross section on the refining process will immediately think of trying out a shape similar to the circular shape, but with less depth and more surface for the glass to let the bubbles escape. In doing so, he will arrive at the claimed elliptical or oval shape in the claimed operational position, in an obvious manner (Article 56 EPC).

1.2.10 The respondents contest that a general principle regarding "the shallower, the better" for improving the effectiveness of the glass refining process is known by the skilled person or can be derived from E4, D1 and/or E3.

The width to depth ratios for the refining chamber disclosed in E4 are linked to achieving a uniform front flow of the molten glass so that they are not concerned with improving the effectiveness of the refining process (column 3, line 59; column 5, lines 5-6).

In D1, abstract, all the features of the refining chamber disclosed therein are necessary to remove the fine bubbles included in the molten glass, i.e. not specifically only the width to depth ratios of the refining chamber are important.

E3, column 12, lines 25-39, discusses the cross section and the length of the refining chamber with regard to the ability of eliminating bubbles from the molten glass. Starting from a circular cross section E3 suggests, figure 9, a trapezoid cross section which is said to minimize the depth of the molten glass and to be more effective for removing the bubbles. There is no general teaching with respect to "the shallower, the better".

Consequently, such a teaching neither belongs to the skilled person's common general knowledge and practice nor can be derived from E4, D1 and/or E3 so that the skilled person starting from D2 would not arrive at the claimed subject-matter in an obvious manner.

1.2.11 The Board cannot share the respondents' view since the documents E4, D1 and E3 unambiguously and explicitly disclose that the widening of the cross section in the horizontal direction perpendicular to the flow of the molten glass with respect to the depth is desired, clearly to the benefit of the refining process (E4, column 3, lines 44-62; column 5, lines 5-6; figures 1 and 2; D1 abstract; [0006], [0026]; claim 1; E3 column 12, lines 25-39; see also impugned decision, point 3.1.1).

Further, document E11, which deals with a refining chamber for glass production ("a vacuum degassing apparatus"), discloses that when the width is extended with respect to the height, the quantity of flow can be easily increased. E11 also discloses that the "*sectional shape **may take any shapes** such as a rectangular one shown in Figure 3, a circular one, an **elliptical** one and a polygonal one*" (E11, column 1, lines 5-26; column 13, lines 27-42; column 18, line 32

to column 9, line 12; figure 3). Therefore, such a general teaching that "the shallower, the better" for improving the effectiveness of the glass refining process is also known from E11 which, furthermore, explicitly discloses an elliptical shape for the cross section.

1.2.12 For the respondents, documents E4, D1 and E3 relate to refining chambers with rectangular (E4, figures 1-2; D1, abstract, figure 1) or trapezoid (E3, figure 9) cross sections so that their teaching cannot be extrapolated to elliptical or oval cross sections as claimed.

In addition, the width to depth ratio of 10:1 in E4, column 3, lines 51-52, would not be suitable for elliptical cross sections since it would not enable to achieve a sufficient flow of treated molten glass nor to provide a sufficient space above the molten glass for allowing the bubbles to escape. E4, column 3, lines 50-56, even mentions an inwardly convex form for the bottom of the refining chamber, which goes against the concave claimed shape.

Regarding E11, the skilled person starting from the self-standing chamber of D2 would not consider that teaching which concerns bricked chambers. In addition, E11, which discloses a list of shapes for the cross section of the refining chamber, column 13, lines 37-39, makes clear that the rectangular one is preferred, i.e. an elliptical cross section is an inferior solution. Therefore, in case the skilled person would consider E11, he would select the preferred rectangular cross section. In addition, the claimed orientation of the elliptical cross section "in operating position" is not described in E11.

As a consequence, since the cited prior art documents either do not disclose the claimed elliptical or oval shape for the cross section of the refining chamber and/or teach that other cross sections are preferred (E4: rectangular shape or with inwardly convex bottom; D1: rectangular shape; E3: trapezoid shape; E11: rectangular shape), the skilled person would have no reason to implement an elliptical or oval shape as claimed.

1.2.13 The Board cannot share the respondents' view for the following reasons.

As put forward by the appellant during the oral proceedings, D2 discloses, column 3, line 6, a round shape ("mit rundem ... Querschnitt") for the cross section of the refining chamber which, as a general expression, encompasses any round shape so that it is not limited to the exact circular shape (the German word "**kreis**rund" is not used in D2). Therefore, the skilled person starting from the round shape known from D2, would in the first place certainly remain within the teaching of D2 and, hence, would not envisage to form cross sections with corners. Still using his common general knowledge and practice regarding "the shallower, the better" (see point 1.2.8 above), as illustrated by E4, D1 and/or E3, he will immediately come up with an increase in the width (in the horizontal direction) of the round shape of the refining chamber of D2, inevitably arriving at a width larger than the height "in operating position" as claimed, coming *de facto* to an elliptical cross section as disclosed among the alternatives in E11.

This is all the more true since there is no technical difficulty to obtain such a deformed (round) shape as illustrated for instance by the process known from E13, which is similar to that of D2 and supports the technical feasibility of obtaining an oval shape for the cross section (column 4, 23-28). As correctly pointed out by the respondents, E13 does not relate to the problem of improving the effectiveness of the refining process. However, that is beside the point since D2 already covers the refining process. It also deals with the manufacturing of refining chambers and E13 is merely there to indicate that the skilled person would have such manufacturing know-how at his disposal to produce the claimed shape for the cross section.

Further, as mentioned above, document E11 concerns, like D2, a refining chamber for glass production ("a vacuum degassing apparatus") so that the skilled person will certainly consider its teaching when looking for a solution to the above mentioned problem. As a matter of fact, the physics associated with the glass refining process are not linked to the type of refining chamber, i.e. self-standing (D2) or bricked (E11). This applies, even though the preferred embodiment in E11 relates to a rectangular cross section.

2. **Auxiliary request 1**

2.1 With respect to claim 1 of the main request, claim 1 of auxiliary request 1 further comprises the following feature (see point VII above):

b) the ratio of the length of the horizontal line to the maximum vertical extent of the lower segment of the surface is between 2.5:1 and 5:1.

2.2 Since the Board considers that the subject-matter of independent claim 1 of auxiliary request 1 lacks inventive step (see below), it is not necessary to discuss and decide in the present decision whether the requirements of Articles 123(2) and (3) EPC are fulfilled.

2.3 For the same reasons as those given under points 1.2.1 and 1.2.2 above for the main request, D2 can be taken as the closest prior art for claim 1 of auxiliary request 1.

2.4 The Board concurs with the parties that above feature b) is not known from D2 so that it is a distinguishing feature additional to those under point 1.2.4 above (features a): the form of an ellipse or an oval) over the closest prior art D2.

2.5 The respondents argue that 2.5:1 for the ratio specified in feature b) would correspond to the limit above which an effect on the increase in effectiveness of the refining process over a circular shape would become distinguishable.

The value of 5:1 would define the upper limit for reaching a compromise between the increase in effectiveness of the refining process and the necessary amount of expensive PGM material for forming the chamber.

2.6 In view of the respondents' alleged technical effects, a synergy between the technical effects of the distinguishing features a) and b) can be derived leading to the problem to be solved as to modify the refining chamber of D2 in order to increase the effectiveness of the refining process while limiting

the manufacturing costs of the chamber (see points 1.2.6 and 1.2.7 above).

2.7 However, as discussed during the oral proceedings, neither the contested patent, nor the computer simulations provided by the respondents (VP1: R. Hindrikx, "Influence of the radius ratio of oval, horizontal straight PGM tubes on their creep resistance", Umicore, 2 July 2010) enable to support the argument that the claimed limits of 2.5:1 and 5:1 would be critical. There is no justification available for the exclusion of, for instance, the ratios 2.4:1 or 5.1:1.

Hence, the Board considers the selection of the claimed range as being not purposive, but arbitrary. Hence, the range cannot be regarded as being a novel selection over what the skilled person would do when applying the non-inventive elliptical or oval shapes (features a)) to the round refining chamber of D2 as already discussed for claim 1 of the main request.

Therefore, feature b) cannot justify an inventive step and, hence, in view of the reasons given above for the main request, the subject-matter of claim 1 of auxiliary request 1 does not involve inventive step (Article 56 EPC).

2.8 As argued during the oral proceedings, the respondents consider that the contested patent explicitly discloses the selected range for the ratio as being advantageous so that this selection is not arbitrary (paragraphs [0016], [0026], [0031] and [0033]). Further, since the claimed range is not known from the cited prior art, an inventive step has to be acknowledged.

2.9 The Board cannot follow this view. The contested patent does not provide any indication of the motivation for having selected the claimed range. The cited passages of the contested patent merely repeat that the selected range is preferred without giving any specific reason(s) for the limits set.

Further, the mere fact that a distinguishing feature is not disclosed in the cited prior art is not as such a sufficient reason for acknowledging inventive step, especially, as in the present case, when the skilled person will, by implementing the non-inventive elliptical or oval shapes of the cross section for the refining chamber, inevitably consider sizes for the horizontal/vertical axes of the non-inventive elliptical form of the cross section that fall within the selected range.

3. **Auxiliary request 2**

3.1 With respect to claim 1 of auxiliary request 1, claim 1 of auxiliary request 2 further comprises the following feature (see point VII above):

c) the refining chamber has a wall thickness of approximately 0.5 mm to 3 mm, preferably 0.7 mm to 1.5 mm.

3.2 Since the Board considers that the subject-matter of independent claim 1 of auxiliary request 2 lacks inventive step (see below), it is not necessary to discuss and decide in the present decision whether the requirements of Articles 123(2) and (3) EPC are fulfilled.

3.3 For the same reasons as those given under points 1.2.1 and 1.2.2 above for the main request, D2 can be taken as the closest prior art for claim 1 of auxiliary request 2.

3.4 The Board concurs with the parties that above feature c) is not known from D2 so that it is an additional distinguishing feature to those mentioned under point 2.4 above (features a) and b): the form of an ellipse or an oval and the shape ratio) over the closest prior art D2.

3.5 As argued during the oral proceedings by both parties, the wall thickness as specified in feature c) enables to provide a stable refining chamber in view of withstanding the high mechanical stresses induced by the glass refining process, which operates at high temperatures. According to the respondents, this technical effect would be supported by the computer simulations shown in VP1.

3.6 Since this technical effect has no synergy with the technical effects of the other distinguishing features a) and b), which are essentially related to the increase in effectiveness of the refining process, the contribution to inventive step of the distinguishing feature c) can be assessed independently from the other distinguishing features a) and b).

3.7 Distinguishing features a) and b) have already been discussed above for the main request and auxiliary request 1. Since they were found not to justify inventive step, their contribution to inventive step need not be further assessed in the following.

3.8 The partial problem associated with distinguishing feature c) is to enable the refining chamber of D2 to withstand the mechanical stresses in operation, with as little expensive PGM material as possible.

3.9 The Board shares the appellant's view put forward during the oral proceedings that the skilled person faced with this technical problem would, when applying the non-inventive form and shape ratio for the cross section of the refining chamber (features a) and b)), inevitably consider thickness values for the refining chamber walls that fall within the claimed range by either trial and error or by usual engineering computations. Therefore, distinguishing feature c) cannot justify an inventive step and, hence, the subject-matter of claim 1 of auxiliary request 2 lacks inventive step (Article 56 EPC).

3.10 The respondents consider that, since neither the selected shape ratio (feature b)), nor the selected wall thickness (feature c)) of the refining chamber are disclosed in the cited prior art, inventive step should be acknowledged.

3.11 The Board cannot share the respondents' view. In view of the lack of synergy between their technical effects features b) and c) may be dealt with independently for assessing inventive step. Since feature b) is regarded as not justifying an inventive step, see the discussion above for auxiliary request 1, it need not be discussed again for auxiliary request 2.

Further, as also already mentioned above, a distinguishing feature not being disclosed in the prior art is not a sufficient reason as such for justifying an inventive step, especially when, as in the present

case, it is believed that the skilled person will inevitably choose a wall thickness that falls within the claimed wall thickness range.

4. **Auxiliary request 3**

4.1 With respect to claim 1 of auxiliary request 2, claim 1 of auxiliary request 3 further comprises the following feature (see point VII above):

d) the refining chamber is stiffened by shaping measures, said shaping measures comprising forming of creases, corners, waves, folds, or combinations thereof, at the circumference of the refining chamber.

4.2 Since the Board considers that the subject-matter of independent claim 1 of auxiliary request 3 lacks inventive step (see below), it is not necessary to discuss and decide in the present decision whether the requirements of Articles 123(2) and (3) EPC are fulfilled.

4.3 For the same reasons as those given under points 1.2.1 and 1.2.2 above for the main request, D2 can be taken as the closest prior art for claim 1 of auxiliary request 3.

4.4 As discussed during the oral proceedings and not disputed by the respondents, above feature d) is disclosed in the closest prior art D2 (see figures 2-3, "Wellenformen", "Wellprofil" 14, 15, 16, 18).

4.5 As a result, the subject-matter of claim 1 of auxiliary request 3 lacks inventive step for the same reasons as

those given above for claim 1 of auxiliary request 2 (Article 56 EPC).

5. **Auxiliary request 8**

5.1 Admission into the proceedings

5.1.1 The respondents filed auxiliary request 8 with the letter dated 13 February 2015, i.e. after their reply to the statement of grounds of appeal and after having received the summons for oral proceedings and the Board's preliminary opinion. The admission of this request into the proceedings is therefore subject to the discretionary power of the Board in accordance with Articles 13(1) and (3) RPBA.

5.1.2 As argued by the respondents during the oral proceedings, auxiliary request 8 was filed in reaction to the negative preliminary opinion of the Board, one month before the oral proceedings so that the appellant had sufficient time to examine it in substance.

5.1.3 The Board concurs with the respondents that this is all the more true since the claims of auxiliary request 8 are, by the deletion of all device claims, merely restricted to the process claims already present in the set of claims of the main request and dealt with in the impugned decision.

In claim 1 of auxiliary request 8 the reference to the device claims was replaced by including literally the features of the device claim 1 of the main request.

Consequently, there is no new subject-matter in auxiliary request 8 with respect to the main request, the latter request being already present at the very

beginning of the appeal proceedings. This has not been contested by the appellant.

5.1.4 According to the appellant, auxiliary request 8 should not be admitted in the proceedings since it had to deal with it within a too short a period of time before the oral proceedings, together with other late-filed auxiliary requests, withdrawn in the course of the oral proceedings. Further, the representative had been away on a business trip and had also been struck by illness.

5.1.5 As underlined by the Board at the oral proceedings, the appellant's arguments do not relate to any reasons which the Board sees as falling under Articles 13(1) and (3) RPBA.

In the present case, the Board finds three weeks sufficient to deal with these requests. The absence of the representative on a business trip and subsequent illness are issues which have to be dealt with by a proper organisation of the representative's office, more particularly having an appropriate substitute. Further, the subject-matter of the process claims according to auxiliary request 8 is not different from what was discussed for the device claim and was already dealt with by the appellant in its statement of grounds of appeal.

5.1.6 Therefore, the Board decided to exercise its discretion under Articles 13(1) and (3) RPBA to admit auxiliary request 8 into the appeal proceedings.

5.2 Since the Board considers that the subject-matter of independent claim 1 of auxiliary request 8 lacks inventive step (see below), it is not necessary to discuss and decide in the present decision whether the

requirements of Articles 123(2) and (3) EPC are fulfilled.

5.3 The Board shares the parties' view that the subject-matter of claim 1 of auxiliary request 8 is novel since none of the cited prior art documents discloses all its features in combination.

5.4 For the same reasons as those given under points 1.2.1 and 1.2.2 above for the main request, D2 can be taken as the closest prior art for claim 1 of auxiliary request 8.

5.5 The respondents contests this view again, arguing that D2 does not disclose a refining **process** so that it cannot be regarded as the closest prior art for a claim directed to such a process.

5.6 The Board cannot, however, follow this argument for the reasons given by the appellant during the oral proceedings, namely that D2, even though it focuses on a manufacturing process of a refining chamber, also discloses a glass refining process, in particular the use of the chamber for refining molten glass (see [0029]-[0030], claims 8-10). D2 can therefore still be regarded as a plausible starting point for assessing inventive step.

5.7 Further, as accepted by the respondents during the oral proceedings, in a refining process such as in D2 the molten glass flows at a temperature of 1000°C to 1700°C through the refining chamber ([0005]-[0006]).

5.8 As a consequence, also in view of the disclosure of D2 discussed under point 1.2.3 above, the only

distinguishing features of claim 1 of auxiliary request 8 over the closest prior art D2 are:

a) the cross section of the refining chamber is, in at least one segment shaped in the form of an ellipse or an oval so that in the operating position the length of a horizontal line that divides the surface of the cross section into a lower and an upper section of the surface, both of which have essentially the same area, is greater than twice the maximum vertical extent of the lower segment of the surface; and

e) the level of the molten glass is adjusted in such a way that the surface of the glass perpendicular to the direction of flow of the molten glass has a width which is more than twice as great as the maximum vertical extent of the molten glass in the refining chamber

5.8.1 The technical effects of the distinguishing features are both related to the increase in effectiveness of the refining process so that the problem to be solved can be seen as to provide a more effective refining of the glass (see point 1.2.7 above).

5.9 Distinguishing features a), which are device features, have already been discussed for claim 1 of the main request, more in particular in view of this problem and have been found not to justify inventive step. Hence, these features need not be further discussed in the following.

5.10 Indeed, during the oral proceedings the respondents repeated for distinguishing features a) the same

arguments as those already provided for the discussion of the main request.

The respondents only additionally argued that none of the cited prior art discloses the height of the molten glass in the refining chamber according to feature e), which should support inventive step.

5.11 The Board cannot follow this view for the reasons put forward by the appellant at the oral proceedings. Distinguishing feature e) merely implies that the level of the molten glass remains during the refining process below the horizontal plane of symmetry of the non-inventive elliptical or oval shape of the cross section of the refining chamber. The skilled person is aware that sufficient space above the molten glass is required for enabling the bubbles to escape. As a consequence, when operating the non-inventive refining chamber according to claim 1 of the main request, he will immediately decide not to fill it above its horizontal plane of symmetry. He will indeed realize that by operating above this limit the width over which the bubbles will have to escape is again reduced, with the further disadvantage of operating at the curved edges of the elliptical or oval cross section.

As a result, taking into consideration the discussion for claim 1 of the main request, the skilled person starting from D2 and using his common general knowledge and practice as illustrated for instance by E4, D1 and/or E3, will arrive at the subject-matter of claim 1 of auxiliary request 8 in an obvious manner (Article 56 EPC).

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

G. Nachtigall H. Meinders

Decision electronically authenticated