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**D E C I S I O N**  
**of 7 January 2003**

**Case Number:** T 0583/00 - 3.2.7

**Application Number:** 93921516.6

**Publication Number:** 0612307

**IPC:** C03B 5/235

**Language of the proceedings:** EN

**Title of invention:**

Method and apparatus for melting and refining glass in a furnace using oxygen firing

**Patentee:**

Johns Manville International, Inc.

**Opponent:**

LINDE AKTIENGESELLSCHAFT

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 56

**Keyword:**

"Inventive step - no"

**Decisions cited:**

T 0197/86

**Catchword:**

-



Case Number: T 0583/00 - 3.2.7

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.7  
of 7 January 2003

**Appellant:** Johns Malville International, Inc.  
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**Representative:** Grättinger & Partner (GbR)  
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**Respondent:** LINDE AKTIENGESELLSCHAFT  
(Opponent) Zentrale Patentabteilung  
D-82049 Höllriegelskreuth (DE)

**Representative:** -

**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 10 April 2000  
revoking European patent No. 0 612 307 pursuant  
to Article 102(1) EPC.

**Composition of the Board:**

**Chairman:** A. Burkhart  
**Members:** P. A. O'Reilly  
E. Lachacinski

## Summary of Facts and Submissions

- I. An appeal was filed by the proprietor against the decision of the Opposition Division to revoke the patent No. 0 612 307.
- II. The Opposition Division revoked the patent because claim 1 of the main request did not conform with Rule 57a EPC and the subject-matter of claim 1 of the auxiliary request lacked an inventive step.

The following prior art documents are relevant to the decision:

D1: DE-A-1 496 043

D1': US-A-3 337 324 (US equivalent to document D1)

D3: Application of 100% Oxygen Firing at Parkersburg West Virginia" by Donald E. Shamp and Douglas H. Davis; Manville Sales Corporation, Waterville OH USA, (Exhibit A)

D5: US-A-5 139 558 (Exhibit C)

D9: EP-A-0 115 863 (Exhibit G)

- III. The appellant requested in his grounds of appeal dated 17 July 2000 that the decision be set aside and the patent be maintained on the basis of claims 1 to 12 filed therewith. These claims correspond essentially to the claims of the auxiliary request before the Opposition Division. As an auxiliary request the appellant requested oral proceedings.

The respondent (opponent) made no requests.

IV. Independent claims 1 and 9 of the request read as follows:

"1. A furnace for melting and refining glass comprising:  
a melting and refining tank (26; 38) for melting and refining the glass, the melting and refining tank (26; 38) having an upstream end with an upstream end wall, a downstream end and opposed sidewalls extending the length of said tank between said upstream end wall and said downstream end wall;  
a forehearth downstream of and connected to the downstream end of the melting and refining tank (26; 38) for further refining the glass and delivering the glass to product forming means; glass batch feeder means at the upstream end of said tank for feeding glass batch materials into said tank;  
burner means (28; 40) located in the opposed sidewalls of said tank, wherein all of said burner means (28; 40) are oxygen fired burner means, characterised in that  
all of said burner means (28; 40) are located adjacent the upstream end of the melting and refining tank (26; 38), there being no burner means in at least one third of the length of the sidewalls adjacent the downstream end of the melting and refining tank (26; 38), an exhaust port (36; 48) for exhausting waste gases from said melting and refining tank being provided in the upstream end wall of the melting and refining tank (26; 28)."

"9. A method of melting and refining glass in a furnace having a melting and refining tank (26; 38) for melting and refining the glass, the melting and refining tank having an upstream end with an upstream end wall, a downstream end and opposed sidewalls extending the length of the melting and refining tank (26; 38) between the upstream end and the downstream end of the

melting and refining tank (26; 38), and a forehearth (14) downstream of and connected to the downstream end of said tank for further refining the glass and delivering the glass to product forming means, comprising:  
feeding glass batch materials into the upstream end of said tank,  
melting and refining the glass batch materials with heat provided by oxygen fired burner means (28; 40) located in said sidewalls,  
using only oxygen fired burner means (28; 40) and only in an upstream end portion of said sidewalls adjacent to the upstream end of said tank, the length of said upstream portion of said sidewalls containing said oxygen fired burner means (28; 40) being no more than two-thirds the total length of said sidewalls, there being no burner means in the remaining portion of said melting and refining tank adjacent said downstream end of said tank, said tank being entirely heated by said oxygen fired burner means (28;40), exhaust gases emitted by said oxygen-fired burner means (28; 40) being exhausted from said tank through an exhaust port or one or more openings located in said upstream end wall."

V. The appellant argued essentially as follows:

Claim 1 is distinguished from the disclosure of document D3 in that: all of the burners are located adjacent the upstream end of the melting and refining tank; there are no burner means in at least one third of the length of the sidewalls adjacent the downstream end of the tank; and there is an exhaust port in the upstream end wall of the tank. Claim 1 is thus novel. In this respect the Opposition Division was wrong in arguing that there are 22 burners per side, i.e. 44 in total. The reference in document D3 to 22 burners per side is inconsistent with the rest of the document as

seen for instance in the opening paragraph, in Figure 3 which shows only 22 burners, and in Figure 4 which shows the reduction to 8 burners.

The technical problem to be solved by the distinguishing features is to find a way to use oxygen-fuel firing of a larger furnace melting a more refractory glass. In particular, there is a problem of foaming which has to be overcome. Although it was not understood how the features of the invention overcame the foaming problem this is not necessary for an inventive step.

None of the prior art documents suggests the distinguishing features of the claim in order to overcome the technical problem. The teaching of document D3 leads away from the invention since this document suggests not to have burners at the upstream end. The same applies to the teaching of document D9.

- VI. The respondent made no submissions.
  
- VII. In a communication accompanying an invitation to oral proceedings the Board set out their provisional opinion. The appellant subsequently withdrew his request for oral proceedings and made no further submission. The content of the communication corresponded essentially to the reasons given below in the present decision.

## Reasons for the Decision

### *Inventive step*

#### 1. *Closest prior art*

The closest prior art is represented by document D3 which discloses:

A furnace for melting and refining glass comprising: a melting and refining tank for melting and refining the glass, the melting and refining tank having an upstream end with an upstream end wall, a downstream end and opposed sidewalls extending the length of said tank between said upstream end wall and said downstream end wall;

a forehearth downstream of and connected to the downstream end of the melting and refining tank for further refining the glass and delivering the glass to product forming means; glass batch feeder means at the upstream end of said tank for feeding glass batch materials into said tank;

burner means located in the opposed sidewalls of said tank, wherein all of said burner means are oxygen fired burner means,

wherein

all of said burner means are located adjacent the upstream end of the melting and refining tank, an exhaust port for exhausting waste gases from said melting and refining tank being provided in the upstream end wall of the melting and refining tank.

It is correct that at one point document D3 refers to 22 burners per side, i.e. 44 in total. However, that reference is inconsistent with the opening paragraph which only mentions 22 burners and with Figure 3 which shows only 22 burners. An interpretation of a total of 22 air/gas burners is also consistent with the positioning arrangement in Figure 4 which simply suggests that the same positions were maintained when the change was made to change from air/gas burners to oxygen/gas burner, with each alternate air/gas burner being replaced by an oxygen/gas burner. The resolution of the inconsistency within document D3 proposed by the Opposition Division of considering that the total number of burners in the apparatus shown in Figure 3 is 44 requires extra assumptions to be made, i.e. that not all the burners are shown in Figure 3. This would also require that Figures 3 and 4 are not drawn to a similar scale when in fact these figures are almost identical apart from the number of burners and the port of Figure 4 being partly bricked up though with an identical outline size. Given the inconsistency the skilled reader would not make an extra assumption but rather note the consistency between the figures and one part of the description and assume that the other part of the description is incorrect. In this respect therefore the Board agrees with the appellant.

The Board has arrived at a view regarding the disclosure of document D3, which nevertheless differs from that of the appellant, for the reasons which follow.

The Board considers that all of the burners disclosed in the patent are adjacent the upstream end in the sense of the patent. In claim 1 it is merely required that the upstream portion contains the burners and that this portion may be two thirds. Thus, the claim requires a very broad interpretation of the meaning of



the word adjacent. The Board considers that the only possible interpretation is that all burners are adjacent the upstream end and the only clear definition of the positioning of the burners is that they are absent from the one third of the sidewalls adjacent the downstream end of the tank. The fact that there is an absence of burners in a portion of the sidewalls adjacent the downstream end of the tank disclosed in document D3 is sufficient in the context of claim 1 to establish that the burners disclosed therein are adjacent the upstream end.

The Board also considers that the furnace of document D3 includes an exhaust port in its upstream end wall. In the first paragraph of the section entitled "Furnace Changes" it is stated that the cross-sectional area of the exhaust port was 14 ft<sup>2</sup>. This port is visible in Figure 3. In the description under Figure 3 it is explained (with respect to Figure 4) that the position 1 was left unused to reduce turbulence over the batch. This would mean that position 1 is at the upstream end. It is then indicated that the downstream positions are not used. Since there were previously 11 positions and only positions 2 to 9 are to be used this would imply that positions 10 and 11 were the downstream positions. A comparison of Figures 3 and 4 shows that there are more vacated positions at the end away from the exhaust port than at the end adjacent the exhaust port. This means that the exhaust port is at the upstream end.

However, the Board agrees with the appellant that document D3 does not disclose that there should be no burner means in at least one third of the length of the sidewalls adjacent the downstream end of the melting and refining tank. In the furnace of document D3 it appears that approximately 20% of the downstream ends of the side walls might be considered free of burners,

though the drawings are not necessarily to scale. This feature therefore constitutes the sole distinguishing feature of claims 1 and 9 of the patent over the disclosure of document D3.

2. *Problem to be solved*

The objective problem to be solved by the distinguishing feature is to find a way to use oxygen-fuel firing for a larger furnace.

3. *Solution to the problem*

The solution to the problem is that there are no burner means in at least one third of the length of the side walls adjacent the downstream end of the melting and refining tank.

4. The solution to the problem is obvious for the following reasons:

There are several prior art documents which indicate the positioning of oxygen/gas burners at the upstream end either alone or in combination with the lower powered air/gas burners. Document D1 discloses a single oxygen/gas burner at the upstream end. In this respect the absence of a second burner in Figure 3 of document D1 and the fact that on page 16, lines 9 to 13 it is merely stated that an additional burner (" Brenner als zusätzliches Heizmittel") can ("kann") be provided leads the Board to the conclusion that the provision of a further burner is an option. The Appellant has argued with respect to document D1' (US equivalent of document D1) that there is an auxiliary burner. It should be noted here that in Figure 3 of document D1' an extra burner is indeed illustrated, though it is not in the one third adjacent the downstream end. Moreover, claims 6 and 8 of document D1' refer to at least one

burner which would imply that a second (i.e. the auxiliary) burner is not mandatory. Moreover, if the extra burner were considered mandatory it is not taught to position it adjacent the downstream end. In summary therefore the teaching of documents D1 and D1' is to provide one oxygen burner adjacent the upstream end and possibly a further one not within one third of the downstream end, i.e. to provide the oxygen burners in accordance with the distinguishing feature of claim 1 of the patent in suit.

Documents D5 (Exhibit C) and D9 (Exhibit G) show oxygen/gas burners well away from the downstream end. The burners are concentrated on the upstream end to melt the solid glass (see D5, column 2, lines 61 to 65; and D9, page 6, lines 5 to 8 and page 7, lines 8 to 11). These documents show additional air/gas burners along their length to provide general heating. Nevertheless, there exists a general teaching to provide oxygen/gas burners as far upstream as possible.

In the case of document D3 the positions of the oxygen/gas burners were partly dictated by the number of burners required and the need to use the existing holes in the melting tank walls. The skilled person would recognise that there was no absolute requirement to spread the burners down the tank, but rather that the positions used were the most upstream available in the limited circumstances of that individual conversion. Document D3 cannot therefore be considered to teach away from the distinguishing feature of claims 1 and 9.

It would thus appear that when applying the teaching of document D3 in a situation which did not have limitations regarding the positioning of the burners, i.e. a new melting tank installation, the skilled person would place the burners further upstream nearer to the solids melting area.

The appellant has argued that the distinguishing features of claims 1 and 9 respectively, surprisingly solve the problem of foaming at the downstream end. This problem was not disclosed in the application, as filed, as is acknowledged by the Appellant, though other documents mention it. As evidence of the surprising effect the Appellant has filed two affidavits from the inventors of the patent in suit, who state that they or their colleagues were surprised. However, the proof of a surprising effect should be established by evidence in the form of a comparison with the nearest prior art, here document D3 (see for instance decision T 197/86). This has not been done.

5. Therefore the subject-matter of each of claims 1 and 9 of the set of claims filed with the appeal does not involve an inventive step in the sense of Article 56 EPC.

**Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:

D. Spigarelli

A. Burkhart