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D E C I S I O N
of 6 February 1995

Case Number: T 0768/92 - 3.2.2

Application Number: 87104414.5

Publication Number: 0275345

IPC: C03B7/06

Language of the proceedings: EN

Title of invention:
Glass forehearth

Patentee:
EMHART INDUSTRIES, INC.

Opponent:
Schelauske Peter J. Dipl.-Ing.

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (no)"

Decisions cited:
-

Headnote/Catchword:
-

Case Number: T 0768/92 - 3.2.2

D E C I S I O N
of the Technical Board of Appeal 3.2.2
of 6 February 1995

Appellant: Schelauske Peter J. Dipl.-Ing.
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Respondent: EMHART INDUSTRIES, INC.
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Decision under appeal: Decision of the Opposition Division of the European Patent Office dated 19 June 1992 rejecting the opposition filed against European patent No. 0 275 345 pursuant to Article 102(2) EPC.

Composition of the Board:

Chairman: H. Seidenschwarz
Members: M. Bidet
J. Van Moer

Summary of Facts and Submissions

- I. The Appellant (Opponent) lodged an appeal received on 18 August 1992 against the decision of the Opposition Division dispatched on 19 June 1992 rejecting the opposition against patent No. 0 275 345, the appeal fee being paid on the same date. The statement setting out the grounds of appeal was received on 16 October 1992.
- II. Opposition was filed against the patent as a whole and based on Article 100(a) EPC with respect to Article 56 EPC.

The Opposition Division held that the ground for opposition did not prejudice the maintenance of the patent having regard to documents DE-C-2 410 763 (D1) and US-A-1 900 361 (D2).

- III. Oral proceedings were held on 6 February 1995 during which document US-A-1 893 061 (D3) was cited by the Board of Appeal of its own motion.
1. The Appellant requested that the decision under appeal be set aside and that European patent No. 0 275 345 be revoked. The Respondent (Proprietor of the patent) requested that the appeal be dismissed and as a main request that the patent be maintained as granted, as auxiliary request as amended at the Oral proceedings.
 2. Claim 1 according to the main request reads as follows:

"A forehearth for the conveyance of molten glass having at least one cooling zone (10, 12), said cooling zone comprising a trough (2), a roof (17) over said trough, two spaced projections (28,30) extending downwardly from the roof to define in the space below the roof a central channel (36) over the central portion of a stream of molten glass in the trough and side channels (38,40) over respective side portions of the stream of glass, the side and central channels having about the same width, means for cooling a central portion of the stream of glass and a plurality of heaters (20) spaced longitudinally along the sides of the forehearth for heating side portions of the stream of glass, characterised in that the spaced projections (28,30) extend downwardly toward the glass below the centreline of the heaters and their outside surfaces are arranged to radiate heat back to the outside edges of the stream."

Claim 1 according to the auxiliary request corresponds to Claim 1 according to the main request with the addition at the end thereof of the feature "and that flue openings (60) are provided which communicate with each of the side channels (38,40).

3. The Appellant argued as follows:

3.1 The subject-matter of Claim 1 according to the main request lacked novelty in view of the forehearth disclosed in document D2.

The problems set out in documents D1 and D2 were identical and concerned the homogenization of the

temperature of the molten glass flowing through the forehearth, so as to reduce the temperature difference between the central portion of the glass current and the edge portion thereof (see document D1, column 2, lines 40 and ff, and document D2, page 1, left column, last paragraph). The skilled person would easily substitute the projections separating the side channel from the central channel in the forehearth of document D1 by the projections disclosed in the forehearth set out in document D2, which projections extend below the centreline of the heaters.

3.2 As regards Claim 1 according to the auxiliary request, the combustion gases of the heaters located along the side channels had to be removed, and the provision of flue openings in the side channels would not sustain an inventive step having regard to the disclosure of document D3.

4. The Respondent argued as follows:

4.1 Document D1 disclosed the forehearth as it was defined in the precharacterising portion of Claim 1 according to the main request. The only purpose of the spaced projections defining the three channels was to guide the cooling airflow in the central channel. According to the teaching of document D1 the solution to the problem as cited by the Appellant relied on the provision of the controlled guiding of a cooling air stream.

Document D2, however, disclosed a forehearth with channels which were not about the same width and with a roof which was not closed. It had a longitudinally

extending cooling opening, which permitted the hot gas to escape.

The subject-matter of Claim 1 was therefore new with respect to the disclosure of document D2 and involved also an inventive step since there was no way of combining the teachings of the documents D1 and D2.

- 4.2 As regards Claim 1 according to the auxiliary request, the flue openings 60 allowed the hot gas to escape without passing through the central channel. A combination of the teaching disclosed in document D3 with that disclosed in document D1 would not be taken into consideration, since there was no need in the forehearth according to document D1 for such a cooling airflow because of the existing guided cooling airflow in the central channel.

Among other differences between the forehearth as claimed and the forehearth disclosed in document D3, there was no central channel extending along the surface of the molten glass and only one burner was provided at one end of the forehearth, so that even by combining the teachings of the documents D3 and D1, the skilled person would not arrive at the subject-matter of Claim 1 according to the auxiliary request.

Reasons for the Decision

1. The appeal is admissible.
2. *Amendments*

Since the additional feature in Claim 1 according to the auxiliary request "and that flue openings (60) are provided which communicate with each of the side channels (38,40)" is disclosed in the description of the application as filed (see page 5, lines 13 to 15) and of the patent in suit (see column 4, lines 1 to 4) and reduces the scope of the protection, Claim 1 as amended does not contravene the requirements of Articles 123(2) and (3) EPC.

3. *Prior Art*

3.1 Document D1 discloses a forehearth for the conveyance of molten glass having at least one cooling zone, said cooling zone comprising a trough, a roof over said trough, two spaced projections extending downwardly from the roof to define in the space below the roof a central channel over the central portion of a stream of molten glass in the trough and side channels over respective side portions of the stream of glass, the side and central channels having about the same width, means for cooling a central portion of the stream of glass and a plurality of heaters spaced longitudinally along the sides of the forehearth for heating side portions of the stream of glass, whereby the outside surfaces of the spaced projections are arranged to radiate heat back to the outside edges of the stream.

According to this document, the spaced projections divide the roof into the central channel and the two side channels, which are designed as reflectors and promote convection currents to reheat the edge portions of the molten glass in the side channels.

The known forehearth is concerned with the uniformity of the temperature of the glass in the current flowing through the forehearth, so as to reduce the temperature differences in the molten glass between the central channel and the side channels.

Document D1, however does not disclose that the spaced projections extend downwardly from the roof below the centreline of the heaters and that flue openings are provided which communicate with each of the side channels.

- 3.2 Document D2 shows a forehearth for the conveyance of molten glass having (see Claim 1; Figure 2 and 3)
- one cooling zone;
 - a trough;
 - a roof (cover structure) over said trough, two spaced projections extending downwardly from the roof to define in the space below the roof a central channel over the central portion of a stream of molten glass in the trough and side channels over respective side portions of the stream of glass;
 - means for cooling (longitudinally extending opening) a central portion of the stream of molten glass, and
 - a plurality of heaters spaced longitudinally along the sides of the forehearth for heating side portions of the stream of molten glass.

The spaced projections extend downwardly below the centreline of the heaters and their outside surfaces are arranged to radiate heat back to the outside edges of the stream. Furthermore, the means for cooling i.e. the longitudinally extending opening decreases gradually in width from the rear end of the cooling

zone to the front end of the latter so that the heat will decrease regularly from the rear to the front end (see Figure 3; pages 2, lines 26 to 36, and page 3, lines 95 to 114).

An object of this forehearth is to provide glass passing to the delivery end of the forehearth which is homogeneous and uniform in temperature and viscosity (see page 1, lines 41 to 52).

This known forehearth does not comprise the feature that the side and central channels over the trough have about the same width and that flue openings communicating with each side channel are provided.

- 3.3 The forehearth for molten glass according to the Figures 6 and 7 of document D3 (see also: page 5, lines 7 to 67) comprises:
- a cooling zone;
 - a trough;
 - a roof over the trough, which roof has projections extending downwardly from the roof to define in the space below the roof longitudinally spaced openings over the central portion of a stream of molten glass in the trough and side channels over respective side portions of the stream of glass, the side channels and the openings having about the same width;
 - means for cooling the roof which means consist of said longitudinally spaced openings in the roof being covered by metallic heat radiating cover members and blow nozzles provided above each of the cover members for projecting cooling media against the cover member, and

- a heater installed in a firing chamber at the front end of the trough.

The spaced projections cooperate with the side walls of the side channels to define a passage through which hot gas from the firing chamber at the front end of the trough passes rearwardly to the stacks.

An object of this known forehearth is to provide for the conditioning of the glass during its passage along the trough so that the molten glass will be of uniform temperature, viscosity and condition for use in the manner desired (see page 1, lines 82 to 94).

This forehearth differs from the subject-matter of the Claims 1 according to both requests in that:

- it does not have a longitudinally extending central channel, and
- it does not have a plurality of heaters being spaced longitudinally along the sides of the forehearth.

4. *Novelty*

From the above, it follows that none of the documents cited during the opposition and appeal proceedings discloses all the features of Claim 1 according to the main and auxiliary requests.

The subject-matter of each said Claim 1 is novel within the meaning of Article 54 EPC.

5. *Nearest prior art*

Faced with the disclosure of the documents D1 and D2, (see above parts 3.1 and 3.2) the Board is of the opinion that document D1, disclosing the feature relating to the same width of the channels and therefore all of the features specified in the characterising part of Claims 1 of each request, represents the state of the art nearest to the invention.

6. *Inventive step*

6.1 Main request

The control of the transversal temperature of the molten glass is achieved in document D1 by cooling the central portion of the glass stream and heating its side portions. The central channel is separated from each side channel by the spaced projections whose outside surfaces radiate the heat of the heaters back to the edge portions of the stream. The embodiment as disclosed by Figure 2 shows that the flame of the burner or the hot gas may reach the central channel, thus reducing the efficiency of cooling the central portion of the glass stream and of heating the glass stream in the side channels.

According to the only feature of Claim 1 of the patent in suit, in which its subject-matter differs from the forehearth as disclosed by document D1 (see above part 3.1), namely that the spaced projections extend below the centreline of the heaters, the above mentioned deficiency is avoided by minimizing the interaction between the hot gas and the cooling airflow.

Having to cope with this deficiency the skilled person finds in document D3 a solution to the same problem.

In the forehearth known from this document an even flow of the glass is produced by causing a relatively greater radiation of heat from the molten glass in the central portion **without causing any interference with or influence on the draft and firing conditions**, i.e. the conditioning and control of the transverse temperature of the molten glass is attained by causing the **hot gas to pass longitudinally of the forehearth mainly or entirely in the side channels** and by causing a relatively greater radiation of heat from the molten glass in the central portion without opening the space above the central portion to the atmosphere. According to the construction shown in the Figures 6 and 7, the baffles (32) extend from the roof close enough to the molten glass level to prevent passage of any appreciable volume of hot gas along the central channel (see page 1, line 95 to page 2, line 10; page 2, lines 35 to 51; page 4, lines 51 to 72; page 5, lines 25 to 28). There is therefore no interaction between the hot gas in the side channels and the heat radiating from the molten glass in the central channel.

Knowing this teaching, it is obvious to the skilled person to apply correspondingly this teaching to a forehearth as it is known from document D1, i.e. the extension of the spaced projections toward the molten glass below the centreline of the heaters is a logical step within the common technical knowledge of this skilled person.

6.2 Auxiliary request

The forehearth as disclosed by document D1 does not have any means which would permit an independent adjustment of the draft for operation of the heaters and a proper extraction of the products of combustion.

This deficiency is avoided by the additional feature in the characterising portion of Claim 1, namely by the two flue openings, each communicating with the side channels.

As mentioned in part 3.3 of this decision, the side channels of the forehearth according to document D3 define passages for the hot gas passing from the front end to stacks at the rear end of the forehearth. The purpose of these stacks is to control the draft of the hot gas and to exhaust the products of combustion (see page 3, lines 83 to 90; page 5, lines 29 to 38).

It is obvious to the skilled person to apply this teaching of document D3 with corresponding effect to the forehearth as disclosed by document D1 if he wants to get an independent control of the heat and extraction of the products of combustion in each side channel.

- 6.3 The argument of the Respondent relating to the structural differences between the forehearth according to the documents D1 and D3 (see above part III 4.2) does not change the assessment of the inventive step.

The teaching of avoiding interaction between the gas in the side channels and in the central portion above the molten glass stream as disclosed by document D3 is independent of whether this central portion is defined

by longitudinally spaced openings or by one longitudinally extending channel. This teaching is also independent of the number and position of the burners in the forehearth.

6.4 For the above reasons, the subject-matter of Claim 1 according to the main and auxiliary requests does not involve an inventive step as required by Article 56 EPC.

7. The patent in suit cannot therefore be maintained.

Order

For these reasons it is decided that:

1. The impugned decision is set aside.
2. The European patent is revoked.

The Registrar:

The Chairman:

F.Fabiani

H. Seidenschwarz