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**D E C I S I O N**  
**of 4 June 2002**

**Case Number:** T 0563/00 - 3.2.7

**Application Number:** 95119843.1

**Publication Number:** 0721922

**IPC:** C03B 29/08

**Language of the proceedings:** EN

**Title of invention:**

Method for heating glass sheets to be tempered or  
heat-strengthened

**Patentee:**

Tamglass Engineering Oy

**Opponent:**

Glastechnische Industrie Peter Lisec Gesellschaft m.b.H.

**Headword:**

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**Relevant legal provisions:**

EPC Art. 56

**Keyword:**

"Inventive step (yes) "

**Decisions cited:**

-

**Catchword:**

-



Case Number: T 0563/00 - 3.2.7

**D E C I S I O N**  
**of the Technical Board of Appeal 3.2.7**  
**of 4 June 2002**

**Appellant:** Glastechnische Industrie Peter Lisec  
(Opponent) Gesellschaft m.b.H.  
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**Representative:** Beer, Manfred, Dipl.-Ing.  
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**Respondent:** Tamglass Engineering Oy  
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SF-33730 Tampere (FI)

**Representative:** Grünecker, Kinkeldey,  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 11 April 2000  
rejecting the opposition filed against European  
patent No. 0 721 922 pursuant to Article 102(2)  
EPC.

**Composition of the Board:**

**Chairman:** A. Burkhart  
**Members:** H. E. Felgenhauer  
J. H. P. Willems

## Summary of Facts and Submissions

I. The appellant lodged an appeal against the decision of the Opposition Division rejecting the opposition against European patent No. 0 721 922.

Opposition had been filed against the patent as a whole based on Article 100(a) EPC (lack of inventive step).

The Opposition Division held that the subject-matter of claim 1 involves an inventive step in view of the following prior art documents:

D1: US-A-5 085 580;

D2: AT-A-223289;

D3: DUBBEL Taschenbuch für den Maschinenbau, 13th edition, Vol. 1, pages 468-474.

II. Oral proceedings before the Board of Appeal were held on 4 June 2002.

(i) The appellant requested that the decision under appeal be set aside and that the European patent No. 0 721 922 be revoked.

(ii) The respondent requested that the appeal be dismissed and that the patent be maintained.

III. Claim 1 of the patent in suit reads as follows:

"A method for heating glass sheets to be tempered or heat-strengthened, in which method glass sheets are heated in a preheating furnace (1) by applying a hot-

air blast and convection heating produced thereby to the opposite sides of a glass sheet and the preheated glass sheet is transferred from the preheating furnace (1) into a radiation heating furnace (2) for heating the glass sheet to a tempering temperature, characterised in that, in view of adjusting the coefficient of heat transfer for convection heating, the rotating speed of a hot-air fan (5) is increased for increasing the volume flow of blast as the glass temperature rises".

IV. The arguments of the appellant can be summarised as follows:

- (i) Document D1 constitutes the closest prior art in that, as defined by the first part of claim 1 of the patent in suit, it discloses a method for heating glass sheets to be tempered or heat strengthened, wherein glass sheets are preheated in a preheating furnace by applying a hot-air blast and convection heating produced thereby, and the preheated glass sheets are transferred into a radiation heating furnace for heating each glass sheet to a tempering temperature.

Starting from this document the problem to be solved according to the patent in suit consists in improving this type of tempering method, such that the preheating can be intensified and expedited.

The solution to this problem according to the characterising features of claim 1 is obvious considering document D2 and the physical principle expressed by Newton's law of heat transfer by convection as stated in document D3, which governs

the preheating step. Furthermore applying Newton's law it is common knowledge that the coefficient of heat transfer, which is one of the parameters comprised within this law, increases with an increasing volume flow of the hot-air blast applied.

Indicating that the volume flow of the hot-air blast should be increased for glass sheets having a larger thickness, document D2 suggests an adjustment of the coefficient of heat transfer while glass sheets are preheated, in order to intensify and expedite preheating. Although the disclosure, including the examples, of document D2 solely concerns an adjustment of this coefficient prior to actual preheating and dependent on the thickness of the particular glass sheets to be preheated, for the person skilled in the art it is obvious that this approach is not limited to this condition. On the contrary, considering the general knowledge according to which the coefficient of heat transfer increases with increasing volume flow of hot-air blast, it is obvious that consideration of Newton's law also leads to an adjustment of the coefficient of heat transfer in the course of preheating as defined by claim 1 of the patent in suit. Applying such improved heating as preheating within the method according to document D1, leads to the subject-matter of claim 1 without inventive step being involved.

V. The arguments of the respondent can be summarised as follows:

- (i) Admittedly Newton's law governs preheating of the kind concerned. Admittedly it belongs to general knowledge that the value for the coefficient of heat transfer, which constitutes one of the parameters of this law, increases with increasing volume flow of hot-air blast. Consequently this law and general knowledge are considered by the skilled person in order to design and dimension a preheating furnace as referred to in documents D1 and D2 and to set its process parameters, depending e.g. on the thickness of a particular glass sheet to be preheated. While document D1 remains silent on these parameters, document D2 discloses that once set for a particular thickness of the glass sheets to be heated, the volume flow of hot-air blast remains unchanged and will only be adjusted in case a change of the thickness of the glass sheets requires such adjustment.

Beyond that the preheating or heating disclosed in D1 and D2, considered together with Newton's law and the general knowledge concerning the coefficient of heat transfer, cannot be considered as giving an indication according to which, corresponding to the subject-matter of claim 1, while a particular glass sheet is preheated, the volume flow of hot-air blast is increased as the glass temperature rises, such that the coefficient of heat transfer for convection heating is adjusted.

- (ii) Considering the disclosure of document D2 concerning heating of glass sheets by applying a hot-air blast, the whole teaching of this document needs to be considered. Accordingly a hot-air

blast is applied to form an air-cushion supporting and transporting the glass sheets, and also for heating these glass sheets. Having regard to the function of the hot-air blast associated with the air-cushion, a low flow velocity of the hot-air is aimed at. Consequently, consideration of this function of the hot-air blast and the requirement resulting therefrom further indicates that the teaching of document D2 does not lead to the subject-matter of claim 1 of the patent in suit.

## **Reasons for the Decision**

### *Inventive step*

#### 1. *Closest prior art*

The parties and the Board consider document D1 as constituting the closest prior art.

D1 discloses a method for glass sheets to be tempered, within which the glass sheets are preheated in a preheating furnace by applying a hot-air blast and convection heating produced thereby to the opposite sides of a glass sheet. Each preheated glass sheet is transferred to a heating furnace for heating the glass sheet to a tempering temperature (column 2, lines 36 to 47; Figure 1).

#### 2. *Problem*

The problem to be solved in view of document D1 lies in improving this type of tempering method, such that the preheating can be intensified and expedited (patent in

suit, column 1, lines 46 to 48).

3. *Solution*

According to claim 1 the problem is solved in that within a method according to the first part of claim 1

- (a) in view of adjusting the coefficient of heat transfer for convection heating,
- (b) the rotating speed of a hot-air fan is increased for increasing the volume flow of blast
- (c) as the glass temperature rises.

Of these features (b) and (c) define a method step (increase of rotating speed of a hot-air fan) and the condition under which this method step is performed (as the glass temperature rises). Feature (a) defines the effect or purpose to be obtained by features (b) and (c).

4. The solution according to the subject-matter of claim 1 is not obvious to a person skilled in the art for the following reasons:

As is the case for the subject-matter of claim 1 also document D1 concerns improvement of the preheating step. To provide a uniform gas flow over the entire extent of the glass sheet during preheating (column 1, lines 22 to 25), a housing plenum of the preheating furnace provided for the supply of hot-air blast is equipped with a baffle leading to the provision of a mixing chamber for the hot-air blast (column 2, line 56 to column 3, line 5). Document D1 remains silent on the

rotating speed of hot-air fans delivering a hot-air blast to the housing plenum (column 3, lines 48 to 54) and thus does not give an indication leading to the subject-matter of claim 1, according to which, while a particular glass sheet is preheated, the volume flow of hot-air blast is adjusted according to features (b) and (c).

Document D2 discloses a method of convection heating of glass sheets, which e.g. can be employed as the preheating method within the method for heating glass sheets according to document D1. According to document D2 a disadvantage occurring during the convection heating of a glass sheet via a hot-air blast, which is due to the transport of the glass sheet by means of rollers, is avoided by replacement of the rollers by an air-cushion (claim 1; page 1, paragraph 3). The hot-air blast forming the air-cushion is at the same time used to heat the glass sheets (claim 1; page 6, paragraph 3). Apparently with respect to the first mentioned function of the hot-air blast, for the volume flow of the hot-air blast it is mentioned in document D2 that a high flow velocity of the hot-air is not required and that the flow velocity can be kept relatively low (page 2a, paragraph 1; page 5, paragraph 3; page 6, second paragraph from bottom).

Consequently it is doubtful whether consideration of the method disclosed in document D2, in an attempt to improve the preheating of glass sheets, could lead to an improvement involving adjustment of the volume flow of hot-air blast according to features (b) and (c), since it is evident that an increase of the volume flow of hot-air blast could affect the capability of the hot-air blast to form a stable air-cushion.

Furthermore even if with respect to the hot-air blast only the adjustment disclosed in document D2 is considered, this document does not give an indication leading to an adjustment of the volume flow of the hot-air blast according to features (b) and (c). According to document D2 to adjust the volume flow of the hot-air blast at least an element allowing adjustment of the flow rate and/or at least one hot-air fan is provided (page 3, last paragraph). These measures, which can according to document D2 be combined with the provision of a control for the hot-air fan, provide for an increase of the volume flow for thicker glass sheets, such that on the one hand the stability of the air-cushion can be increased and on the other hand more heat per time unit can be transferred. Correspondingly, these measures provide for a decrease of the volume flow in case thinner sheets are to be heated (paragraph bridging pages 3, 4). The adjustment of the hot-air blast thus serves to set the volume flow of air-blast depending on the thickness of a particular glass sheet to be heated and does not effect the transfer of heat to this glass sheet while it is heated.

Thus document D2 does not give an indication leading to an adjustment of the volume flow of hot-air - other than the one depending on the thickness of the glass sheet to be heated - and consequently it cannot lead to an adjustment of the volume flow of hot-air blast according to features (a) to (c), which for any particular glass-sheet is performed in the course of preheating of this glass sheet.

This applies likewise if the possibility disclosed in document D2 is additionally considered, according to which the heater can be divided in conveying direction

of the glass sheets in sections (page 4, paragraph 3), within which hot-air of different volume flows and/or hot-air of different temperatures can be provided (page 4, paragraph 3), since for the individual sections no adjustment of the volume flow of hot-air blast is disclosed which comes closer to the adjustment according to features (b) and (c).

Document D3 states Newton's law concerning convection heating. Uncontestedly this law underlies e.g. the preheating according to the subject-matter of claim 1 as well as according to document D1 and the convection heating according to document D2. In either case application of this law enables the person skilled in the art to design and dimension the heater required for heating of glass sheets of a given volume or range of volumes to the required temperature and, in case glass sheets of various volume are to be heated, to set for each particular glass sheet the parameters of the heater, including volume flow and temperature of the hot-air blast applied.

Additionally, concerning the coefficient of heat transfer for convection heating, which is a parameter of Newton's law concerned, it remains uncontested that, according to general knowledge, this coefficient increases with an increasing volume flow of hot-air blast.

Within the subject-matter of claim 1 of the patent in suit this relationship is expressed by defining the effect according to feature (a) as the result of an adjustment according to features (b) and (c).

Despite the fact that Newton's law and the associated

general knowledge inherently apply to all cases of heating referred to above, application of this theoretical knowledge as such does not lead to a particular method of preheating, since it does not give any information as to a practical method by means of which a glass sheet can be preheated.

Thus application of this theoretical knowledge in combination with the method according to document D1 and/or D2 can only lead to a judicious choice of the parameters involved, like the volume flow of hot-air blast and its temperature or the time required for preheating, and to an appropriate adjustment of the volume flow of the hot-air blast in case a change of the thickness of the glass sheet requires such an adjustment as referred to in document D2. Such an approach however cannot lead to an adjustment according to features (b) and (c), since an adjustment of the volume flow of hot-air blast, in the course of preheating a particular glass sheet, is beyond the framework given by the adjustment according to document D2 and, as indicated above, not suggested by this document.

5. The subject-matter of claim 1 thus involves 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