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**D E C I S I O N**  
of 8 April 2003

**Case Number:** T 0183/01 - 3.2.4

**Application Number:** 95302043.5

**Publication Number:** 0687807

**IPC:** F01N 3/28

**Language of the proceedings:** EN

**Title of invention:**  
Heater unit and catalytic converter

**Patentee:**  
NGK INSULATORS, LTD.

**Opponent:**  
Emitec Gesellschaft für Emissionstechnologie mbH

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 54, 56

**Keyword:**  
"Novelty - yes"  
"Inventive step - yes"

**Decisions cited:**  
-

**Catchword:**  
-



Case Number: T 0183/01 - 3.2.4

**D E C I S I O N**  
**of the Technical Board of Appeal 3.2.4**  
**of 8 April 2003**

**Respondent:** Emitec Gesellschaft für  
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**Appellant:** NGK INSULATORS, LTD.  
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**Representative:** Paget, Hugh Charles Edward  
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**Decision under appeal:** Interlocutory decision of the Opposition Division  
of the European Patent Office posted 28 November  
2000 concerning maintenance of European patent  
No. 0 687 807 in amended form.

**Composition of the Board:**

**Chairman:** C. A. J. Andries  
**Members:** T. Kriner  
H. Preglau

## Summary of Facts and Submissions

- I. The Appellant (Patent Proprietor) lodged an appeal, received at the EPO on 6 February 2001, against the interlocutory decision of the Opposition Division posted on 28 November 2000 on the amended form in which the European patent No. 0 687 807 can be maintained. The appeal fee was paid simultaneously and the statement setting out the grounds of appeal was received at the EPO on 5 April 2001.
- II. Opposition was filed against the patent as a whole and based on Article 100(a) EPC together with Articles 52(1), 54(1) and 56 EPC, and on Article 100(b) EPC together with Article 83 EPC.

The Opposition Division held that the cited grounds for opposition did not prejudice the maintenance of the patent as amended according to the auxiliary request filed with letter of 15 September 2000.

- III. The Opposition Division considered the following documents:

D1: EP-A-0618 353

D2: WO-A-92/02714

D3: US-A-5 177 961

D4: US-A-5 202 548

D5: SAE Paper 930384

D6: EP-B-0 685 027

D7: US-A-5 079 210

D8: WO-A-89/10471.

IV. Oral proceedings took place on 8 April 2003.

The Appellant requested that the decision of the Opposition Division be set aside and that the patent be maintained on the basis of claims 1 to 5 as filed during the oral proceedings.

The Respondent (Opponent) requested that the appeal be dismissed.

V. Claim 1 and claim 5 according to the Appellant's request read as follows:

"1. A heater unit comprising:  
a honeycomb heater comprising a metallic honeycomb structure (1, 10, 12) having a large number of parallel passages extending along an axial direction, and at least one electrode (22) for passing electric current through the honeycomb structure, attached to the honeycomb structure;  
a metallic casing (3, 19) for holding the honeycomb heater; and  
one of the following (a), (b) and (c):-  
(a) supporting means (6, 16) for supporting the honeycomb heater in the casing, absorbing displacement of the honeycomb heater with respect to the casing in a direction substantially perpendicular to the axial direction, and preventing displacement of the honeycomb heater with respect to the casing along the axial direction, said supporting means (6, 16) comprising at least one metallic supporting member connecting the

honeycomb heater to the casing, there being an insulation portion (18, 26) provided at least between the honeycomb heater and the supporting member or between the supporting member and the casing;

(b) connecting means (25) for connecting the electrode, which is secured to the casing via an insulating member (42), to the honeycomb structure and absorbing displacement of the honeycomb heater with respect to the casing in a direction substantially perpendicular to the axial direction, said connecting means (25) comprising a metallic connecting member;

(c) buffer means (27) for securing the electrode, which is connected directly to the honeycomb structure and has an insulating member (26) secured thereto, to the casing and absorbing displacement of the honeycomb heater with respect to the casing in a direction substantially perpendicular to the axial direction, said buffer means (27) comprising a buffer member provided between the insulating member (26) and the casing;

said heater unit further having gas flow-controlling means (7) provided at the inlet and/or at the side of the honeycomb heater so that an amount of the exhaust gas flows outside the honeycomb heater, which amount is in the range 2 to 20 % of the total flow amount of the exhaust gas."

"5. A catalytic converter comprising a heater unit according to any one of claims 1 to 4 and a light-off catalyst, said metallic casing holding both the honeycomb heater and the light-off catalyst therein via supporting means, the light-off catalyst comprising a honeycomb structure having a large number of parallel passages extending in an axial direction and being provided downstream of the honeycomb heater in the

vicinity thereof."

VI. In support of his request the Appellant relied essentially on the following submissions:

The subject-matter of claim 1 was novel, since none of the documents cited by the Respondent disclosed a heater unit comprising all features of this claim. D2 which represented the most relevant state of the art did not disclose a supporting means which absorbed the displacement of a honeycomb heater with respect to its casing in a radial direction, and did not disclose gas flow-controlling means which controlled the exhaust gas flow in such a way that a predetermined amount of the exhaust gas flew outside of the honeycomb heater, let alone an amount in the range of 2 to 20% of the total flow amount of the exhaust gas. The supporting means of D2 held the heater in a fixed location and did not allow a displacement of the heater. The thermal expansions of the heater were also not absorbed by the supporting means, but rather by the gaps within the heater and the gap between the heater and the casing. Moreover, D2 did not describe that the gap between the heater and the casing was provided as a by-pass for exhaust gas. In accordance with D2, the gap was only provided as an insulation means and as a compensation means for thermal expansion of the heater. Since a flow of exhaust gas through the gap between the heater and the casing of a heater unit had been always avoided before the priority date of the patent in suit, the skilled person would not even believe that the gap was provided as a by-pass means.

Since none of the present documents suggested a by-pass flow outside the heater of a heater unit, the subject-

matter of claim 1 was not only new, but also based on an inventive step.

With respect to the plurality of drawings of the claimed heater unit and with respect to the fact that the amount of the by-pass flow could be determined by existing measurement methods, as for example shown in table 1 in the patent specification, the skilled person had no difficulties to design the gap between the heater and the casing so that an amount of 2 to 20% flew through this gap.

VII. The Respondent disputed the views of the Appellant. His arguments can be summarized as follows:

D2 disclosed a heater unit comprising all structural features of the heater unit described in claim 1. It was correct that D2 did not explicitly describe

- (a) that the supporting means for supporting the honeycomb heater absorbed displacement of the heater in a radial direction with respect to the casing surrounding the heater;
- (b) that the heater unit had gas flow-controlling means which controlled the flow of exhaust gas in such a way that a predetermined amount of the exhaust gas flew outside of the honeycomb heater.

It was, however, obvious that the heater expanded when heated and that the structure holding the heater consequently had to absorb a radial displacement of the heater as described in feature (a). Feature (b) could not be considered, since it was not possible to verify a by-pass flow of 2 to 20% in a small gap of a heater

unit. But even if this feature was considered, it could not justify novelty of the subject-matter of claim 1. The heater unit according to D2 comprised a flow-controlling means which was formed by the gap between the heater and the casing. With respect to the size of this gap it was not likely that the flow through the gap was outside the range of 2 to 20% of the total flow amount of the exhaust gas. Therefore, the subject-matter of claim 1 was not novel.

In case that the subject-matter of claim 1 should nevertheless be regarded as novel, it did at least not involve an inventive step. If there was any doubt that the gap between the heater and the casing did not serve as a by-pass, D5 clearly showed that a heater unit according to D2 had to be arranged in an exhaust system in such a way that there was an exhaust gas flow through this gap. Hence, under consideration of D2 and D5, the provision of a heater unit according to claim 1 was obvious.

## Reasons for the Decision

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

In comparison to the patent as granted, only claim 5 has been amended. While the granted claim 5 referred to a catalytic converter comprising a **honeycomb heater** according to any of claims 1 to 4, the present claim 5 refers to a catalytic converter comprising a **heater unit** according to any of claims 1 to 4.



A catalytic converter according to the present claim 5 is disclosed for example in each of the originally filed Figures 1 and 2. Since such a heater unit includes a honeycomb heater, the subject-matter of claim 5 has not been extended by the amendment described above.

Therefore, the amendments of claim 5 meet the requirements of Articles 123(2) and (3) EPC.

3. *Novelty*

3.1 State of the art according to D2

3.1.1 D2 discloses a heater unit comprising:

a honeycomb heater comprising a metallic honeycomb structure (6) having a large number of parallel passages extending along an axial direction, and at least one electrode (11, 12) for passing electric current through the honeycomb structure, attached to the honeycomb structure;

a metal casing (1) for holding the honeycomb heater, and supporting means (4, 5, 13, 14, 15, 16) for supporting the honeycomb heater in the casing and preventing displacement of the honeycomb heater with respect to the casing along the axial direction, said supporting means comprising at least one metallic supporting member connecting the honeycomb heater to the casing, there being an insulation portion (20) provided between the supporting member and the casing.

However, the supporting means shown in D2 is not provided for absorbing displacement of the honeycomb heater with respect to the casing in a direction substantially perpendicular to the axial direction.

Furthermore, the heater unit according to D2 does not have connecting means as defined in feature (b) of claim 1, buffer means as defined in features (c) of claim 1, and gas flow-controlling means provided at the inlet and/or at the side of the honeycomb heater so that an amount of the exhaust gas flows outside of the honeycomb heater, which amount is in the range 2 to 20% of the total flow amount of the exhaust gas.

- 3.1.2 The Respondent's argumentation according to which the supporting means shown in D2 inevitably absorbed displacement of the honeycomb heater, and the heater unit comprised a gas flow-controlling means as defined in claim 1 is not convincing.

The supporting member shown in D2 is neither intended nor suitable for absorbing a displacement of the honeycomb structure in the radial direction of the heater unit. On the contrary, as to be inferred from the description (see for example page 6, lines 11 to 18, and page 8, lines 24 to 26), this supporting member serves to fix the honeycomb structure such that a displacement in any direction is suppressed. Even thermal expansions of the heater (which do not necessarily result in a displacement or dislocation of the honeycomb structure with respect to the casing) are not absorbed by the supporting means. The skilled person concludes from the description on page 7, lines 5 to 19 that the thermal expansions of the honeycomb heater are absorbed by the gaps within the heater and by the gap between the heater and the casing.

Furthermore, the Board does not share the Respondent's opinion that the gap between the honeycomb heater and

the casing forms a gas flow-controlling means. According to D2 this gap serves exclusively for electrically isolating the heater and the casing (see for example page 12, lines 13 to 20). Another purpose of the gap is not disclosed in D2. In particular there is no indication that the gap serves as a channel for exhaust gas, let alone as a flow-controlling channel for controlling a gas flow through the gap in such a way that a certain amount of gas flows outside of the heater.

There is also no reason for not considering the feature concerning the flow controlling means. The Respondent stated that it was not possible to verify a by-pass flow of 2 to 20% in the claimed heater unit. However, this statement was not supported by any evidence. Since the Respondent himself additionally stated that it was not likely that a gas flow through the gap shown in D2 was outside the range of 2 to 20%, it appears that the skilled person is at least able to correlate the size of a gap and the amount of gas flowing through this gap. This assumption is also supported by table 1 of the patent in suit which shows the connection between the size of the gap (between the heater and the casing) and the amount of gas flowing outside the heater.

3.2 Disclosure of D1 and D3 to D8

3.2.1 D5 (see in particular Figure 22), D6 (which forms part of the state of the art with respect to all designated Contracting States according to Article 54(3) and (4) EPC, and which explicitly refers to D2; see column 4, lines 3 to 5) and D8 (see in particular Figure 12) all refer to heater units which essentially correspond to the one disclosed in D2.

The Respondent referred to Figure 22 of D5 to demonstrate that at least the most radial, on the periphery of the honeycomb body located supporting means absorbed radial displacement of the radial outside portion of the metallic honeycomb structure. However, even if this was the case, this could not lead to the conclusion that this supporting means may be considered as supporting means for absorbing radial displacement of the honeycomb heater in the meaning of the patent in suit. Indeed, at the place of fixation of the supporting means to the casing, no radial displacement at all is possible.

3.2.2 D1 which forms part of the state of the art with respect to all designated Contracting States according to Article 54(3) and (4) EPC, discloses a heater unit having most of the features of claim 1 of the patent in suit, except the one referring to the gas flow-controlling means, since the heater unit according to D1 comprises a ceramic mat (20) or the like to prevent the gas passage through the gap between the honeycomb heater and the casing (see page 7, lines 28 to 29).

3.2.3 D7 discloses a catalyst (not a heater) comprising a honeycomb body (1) which is held within a metal casing (2) by supporting means (3) comprising at least one metallic supporting member connecting the honeycomb body to the casing, wherein said supporting means appear to be suitable to absorb displacement of the honeycomb body with respect to the casing in a direction substantially perpendicular to the axial direction, and to prevent displacement of the honeycomb body with respect to the casing along the axial direction.

3.2.4 Documents D3 and D4 are less relevant than the documents cited above.

D3 refers to a heater unit without any of the features (a), (b) or (c) of claim 1, wherein the gap between the honeycomb heater (16, 130) and the casing (12, 120) is filled by a fibrous mat (14) or insulation (142), and D4 refers to a honeycomb heater (10) comprising a sealed heat-non-generating portion (12).

3.3 With respect to the above findings, the subject-matter of claim 1 is novel.

4. *Inventive step*

4.1 Starting from the state of the art disclosed in D2, the object to be achieved by the patent in suit is to provide a heater unit which, in a good balance, enables the purification of exhaust gas and the prevention of the honeycomb heater from deformation (see patent specification, page 2, lines 41 to 44).

4.2 In accordance with claim 1 as granted, this object is achieved by the following features:

- (i) the supporting means are suitable for absorbing displacement of the honeycomb heater with respect to the casing in a direction substantially perpendicular to the axial direction (that portion of feature a of claim 1 which is not disclosed in the most relevant state of the art), or feature b of claim 1, or feature c of claim 1; and
- (ii) the heater unit comprises gas flow-controlling means provided at the inlet and/or at the side of

the honeycomb heater so that an amount of the exhaust gas flows outside of the honeycomb heater, which amount is in the range 2 to 20% of the total flow amount of the exhaust gas.

- 4.3 The provision of feature (i) is suggested by D7 and may be regarded as obvious. However, there is no suggestion for the provision of gas flow-controlling means as defined in feature (ii). The present documents do not even mention a flow outside of a honeycomb heater. On the contrary, D1 and D3 disclose means for preventing such a by-pass flow.

Consequently the provision of such gas flow-controlling means in a heater unit according to D2 is not obvious and the subject-matter of claim 1 involves an inventive step.

- 4.4 The Respondents argumentation according to which a combination of the teachings of D2 and D5 would lead in an obvious way to the subject-matter of claim 1 is not convincing. With respect to the purpose of the gap between the heater and the casing of the heater unit, D5 does not disclose more than D2. In particular there is no indication in D5 that the gap is arranged in such a way that it provides a by-pass channel for exhaust gas. Figures 13 and 15 merely show the position of the heater within several exhaust systems. However, these figures do not show whether or not the gap between the heater and the casing is connected at both ends to the exhaust pipes.

5. Claim 5 refers to a catalytic converter comprising a heater unit according to any one of claims 1 to 4. Since claims 2 to 4 include all features of claim 1,

the catalytic converter comprises in any case at least a heater unit according to claim 1. Hence, the subject-matter of claim 5 is inevitably novel and based on an inventive step.

## Order

### For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent on the basis of the following documents:

**Claims:** 1 to 5 as filed during the oral proceedings on 8 April 2003;

**Description:** Pages 2 to 13 as granted;

**Drawings:** Figures 1 to 46 as granted.

The Registrar:

The Chairman:

G. Magouliotis

C. Andries