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D E C I S I O N
of 19 December 2001

Case Number: T 0531/99 - 3.2.4

Application Number: 94301982.8

Publication Number: 0618353

IPC: F01N 3/28

Language of the proceedings: EN

Title of invention:

Heater unit

Patentee:

NGK INSULATORS, LTD.

Opponent:

Emitec Gesellschaft für Emissionstechnologie mbH

Headword:

-

Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step - (yes)"

"Closest prior art - section 4.1"

Decisions cited:

T 0606/89

Catchword:

-



Case Number: T 0531/99 - 3.2.4

D E C I S I O N
of the Technical Board of Appeal 3.2.4
of 19 December 2001

Appellant: Emitec Gesellschaft für
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Decision under appeal: Interlocutory decision of the Opposition Division
of the European Patent Office posted 23 February
1999 concerning maintenance of European patent
No. 0 618 353 in amended form.

Composition of the Board:

Chairman: C. A. J. Andries
Members: T. Kriner
C. Holtz

Summary of Facts and Submissions

- I. The appellant (opponent) lodged an appeal, received at the EPO on 3 May 1999, against the interlocutory decision of the Opposition Division dispatched on 23 February 1999 which maintained the European patent No. 0 618 353 in amended form. The appeal fee was paid simultaneously and the statement setting out the grounds of appeal was received at the EPO on 30 June 1999.
- II. Opposition was filed against the patent as a whole and based on Article 100(a) EPC. The Opposition Division held that the grounds for opposition cited in Article 100(a) EPC did not prejudice the maintenance of the patent in the amended version submitted as a first auxiliary request.
- III. The following documents have been considered in the appeal proceedings:
- E2: WO-A-92/02714
- E7: US-A-5 079 210.
- IV. Oral proceedings took place on 19 December 2001.

The appellant requested that the decision under appeal be set aside and the patent in suit be revoked.

The respondent (patentee) requested that the decision under appeal be set aside and the patent be maintained on the basis of the following documents:

Claims: 1 to 8 according to the main request

filed with letter of 16 November 2001;

Description: pages 2 (with insert), 4 and 8 filed at the oral proceedings on 19 December 2001;
pages 3, 5 to 7 and 9 to 13 filed with letter of 16 November 2001;

Drawings: Figures 1(A) to 35 as granted.

V. Claim 1 of the main request reads as follows:

"A heater unit comprising a honeycomb heater comprising (a) a metallic honeycomb structure (12) having a pair of opposite end faces and a periphery joining said end faces and a large number of passages extending between said end faces parallel to the direction of a gas flowing through the heater unit and (b) at least one electrode (22) for electrification of the honeycomb structure, attached to the honeycomb structure, and the heater unit further having a metallic casing for holding the honeycomb structure therein via at least one metallic supporting member (16), wherein:

- (i) said supporting member is connected to the honeycomb structure at said periphery thereof,
- (ii) an insulation portion is provided at least either at the area where the honeycomb structure (12) and the supporting member (16) are connected or at the area where the supporting member (16) and the casing (19) are connected,
- (iii) the supporting member (16) has a structure such as to be able to absorb the displacement of the honeycomb structure (12) which appears in a direction substantially perpendicular to said gas flow direction, and has a function of fixing the honeycomb structure

(12) against its displacement in the gas flow direction, and

(iv) said area where the honeycomb structure (12) and the supporting member (16) are connected and an end of said supporting member (16) remote from said area where the honeycomb structure (12) and the supporting member (16) are connected are spaced from each other in the gas flow direction."

VI. In support of his requests the appellant relied essentially on the following submissions:

Claim 1 referred to an aggregation of features concerning on the one hand the support of a metallic honeycomb structure within a casing, and on the other hand the heating of such a metallic honeycomb structure. The skilled person who was entrusted with the design of a heater unit of the claimed kind was aware that the honeycomb heater of such a device had to be supported in its casing such that it resisted the high mechanical loads when used in an exhaust system, and that the heater body could be evenly heated over its complete volume. Consequently he would look for ways to achieve both of these objects and therefore would consider E2 and E7.

E2 referred to a heater unit which was perfectly heated. However the honeycomb heater of this unit was not supported in such a way that it was sufficiently protected against mechanical loads resulting from vibrations and thermal expansion. E7 on the other hand disclosed a honeycomb structure which was perfectly supported in its casing, but which was not heated.

Starting from the prior art according to Figures 6 to 8

of E2, the object underlying the patent in suit was to improve the support of the honeycomb heater. In order to achieve this object, the skilled person would replace the supporting elements 61, 62, 63, 64, 71, 73 or 81, 82 shown in Figures 6 to 8 by the intermediate cylinder 3 shown in E7.

Starting from the device according to E7, the object to be solved by the patent in suit was to heat the honeycomb structure such that the catalyst could be rapidly brought to its working temperature. In order to achieve this object, the skilled person would provide the heating arrangement as disclosed in E2.

Since it was obvious to combine the teachings of E2 and of E7, and since the combination of these teachings would directly lead to the claimed heater unit, the subject-matter of claim 1 did not involve an inventive step.

VII. The respondent disputed the appellant's views. His arguments can be summarised as follows:

The argumentation of the appellant was based on hindsight.

The patent in suit addressed the problem of radial displacement and of radial expansion of a heated honeycomb body. By contrast E2 either failed to address the problem of radial displacement or a radial displacement was suppressed by the support structure shown in this document.

The purpose of the additional supporting members 61, 62, 63, 64, 73, 72 or 81, 82 shown in Figures 6 to 8 of

E2 was a stabilization of the inner supporting members of the honeycomb body against vibrations, such that a short circuit via the gaps 9 within the honeycomb body was excluded (see page 8, lines 24 to 36; page 15, lines 7 to 10 and 22, 23; and page 16, lines 5 to 16). The support structure 3 according to E7 was however connected to the outer periphery of the honeycomb body and was therefore not suitable to stabilize inner members and to safeguard gaps 9 of this body. Hence, the skilled person would not replace the additional supporting members of E2 by the intermediate supporting cylinder shown in E7.

E7 could not be considered as representing the most relevant state of the art because this document did not refer to a heater unit but to a catalyst which had another structure and another purpose than a heater unit. Since heater units existed already before the publication date of E7, there was no reason to start the further development of a heater unit on the basis of a non-heated catalyst.

With respect of these findings it was not obvious to combine the teachings of E2 and of E7.

Reasons for the Decision

1. The appeal is admissible.

2. *Amendments*

The features of claim 1 of the present request are disclosed in the originally filed claim 1 (which corresponds to claim 1 as granted) and in the

originally filed Figure 5 and its description.

The features of claims 2 to 8 are disclosed in the originally filed claims 2, 3, 9, 5, 6, 10 and 8.

The present description and drawings are the originally filed description and drawings brought into line with the present claims.

Thus the present version does not contravene Article 123 EPC. This was not contested by the appellant.

3. *State of the art*

3.1 E2 discloses a heater unit comprising a honeycomb heater (6, 46) comprising a metallic honeycomb structure (formed by metal sheets 7, 8; 47, 48) having a pair of opposite end faces and a periphery joining said end faces and a large number of passages extending between said end faces parallel to the direction of a gas flowing through the heater unit and at least one electrode (11, 12; 51, 52) for electrification of the honeycomb structure, attached to the honeycomb structure, and the heater unit further having a metallic casing (1; 41) for holding the honeycomb structure therein via at least one metallic supporting member (4, 5, 13 to 16; 44, 45, 53 to 56; 61 to 64; 71, 73; 81, 82), wherein:

(i) said supporting member is connected to the honeycomb structure at said periphery thereof (via elements 4, 5; 44, 45),

(ii) an insulation portion (20) is provided at least

at the area where the supporting member and the casing are connected (see Figure 2), and

- (iii₁) the supporting member has a function of fixing the honeycomb structure against its displacement in the gas flow direction (at least via elements 61 to 64; 71, 73; 81, 82).

The supporting member shown in E2 is however 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.

Consequently E2 cannot disclose that

- (iii₂) the supporting member has a structure such as to be able to absorb the displacement of the honeycomb structure which appears in a direction substantially perpendicular to said gas flow direction which would require that a displacement (which has to be absorbed) of the honeycomb structure is possible.

Moreover E2 does not disclose that

- (iv) said area where the honeycomb structure and the supporting member are connected and an end of said supporting member remote from said area where the honeycomb structure and the supporting member are connected are spaced from each other in the gas flow direction.

3.2 E7 refers to a catalyst comprising a metallic honeycomb structure (1) having a pair of opposite end faces and a periphery joining said end faces and a large number of passages extending between said end faces parallel to the direction of a gas flowing through the heater unit and a metallic casing (2) for holding the honeycomb structure therein via at least one metallic supporting member (3), wherein:

- (i) said supporting member is connected to the honeycomb structure at said periphery thereof,
- (iii) the supporting member has a structure such as to be able to absorb the displacement of the honeycomb structure which appears in a direction substantially perpendicular to said gas flow direction, and has a function of fixing the honeycomb structure against its displacement in the gas flow direction, and
- (iv) said area (31b) where the honeycomb structure and the supporting member are connected and an end (32) of said supporting member remote from said area where the honeycomb structure and the supporting member are connected are spaced from each other in the gas flow direction.

E7 however does not refer to a heater unit wherein the honeycomb structure is a honeycomb heater, and which comprises at least one electrode for electrification of the honeycomb structure, attached to the honeycomb structure. Consequently, E7 additionally does not disclose that an insulation portion is provided at least either at the area where the honeycomb structure and the supporting member are connected or at the area

where the supporting member and the casing are connected.

3.3 Since neither E2 nor E7 shows a heater unit having all features of the present claim 1, the subject-matter of this claim is novel.

4. *Inventive step*

4.1 In accordance with the case law of the Boards of Appeal of the European Patent Office, the closest prior art for the purpose of objectively assessing inventive step is generally that which is directed to the same purpose or effect as the invention to be examined, and which requires a minimum of structural and functional modifications (see for example T 606/89 mentioned in the "Case Law of the Boards of Appeal of the EPO", 3rd edition 1998, page 111 of the English version, section 3.1: Determination of closest prior art - general).

Consequently, in the present case, the closest prior art is represented by E2 since this document is the only document cited by the appellant which is directed to a heater unit and therefore has the same purpose as the device claimed in the patent in suit. Since the heater unit according to E2 comprises the necessary electrical equipment for heating the honeycomb heater and provisions for a proper heating circuit, it additionally requires the minimum of structural and functional modifications to reach the subject-matter of the present claim 1.

The appellant's opinion that E7 could also be regarded as representing the most relevant state of the art is not convincing. This document refers to a catalyst

which is not heated, which even cannot be heated as such in an appropriate manner without having a completely new configuration to create a proper heating circuit, and therefore has not only another purpose to that of the claimed heater unit, but also a completely different configuration. Moreover, starting from E7 it would require a thorough modification of the catalyst for the purpose of its electrical heating to reach the subject-matter of the patent in suit. Therefore it is not likely and certainly not obvious that the skilled person intending to improve a heater unit would start from a non-heated catalyst as shown in E7, particularly since heating units were already well known at the publication date of E7.

- 4.2 On the basis of a heater unit according to E2, the problem to be solved may be generally regarded as being to improve the support of the honeycomb heater within its casing, as stated by the appellant.

This problem is solved by the provision of a supporting member which has a structure such as to be able to absorb the displacement of the honeycomb structure which appears in a direction substantially perpendicular to said gas flow direction, and which is arranged such that said area where the honeycomb structure and the supporting member are connected and an end of said supporting member remote from said area where the honeycomb structure and the supporting member are connected are spaced from each other in the gas flow direction.

- 4.3 Although E7 shows a supporting member which has these features and which is suitable to improve the support of a honeycomb structure within a casing, the skilled

person would not use this supporting member in a heater unit according to E2 in order to solve the problem set out above, even if claim 1 were based on a mere aggregation of features as stated by the appellant.

The support structure of E2 is designed to avoid any displacement of the complete honeycomb body within its casing (see section 3.1 above), and the supporting elements 61, 62, 63, 64, 71, 73 or 81, 82 shown in Figures 6 to 8 are provided to avoid in particular internal vibrations within the honeycomb body to maintain the isolating gaps 9 (see page 8, lines 24 to 36 and abstract lines 8, 9). Since a collapse of an isolating gap would result in an electrical short circuit, the suppression of internal vibrations is essential for the heater unit of E2. Accordingly, the skilled person would not substitute a supporting member which is not suitable to avoid internal vibrations for the supporting member of E2. The supporting member according to E7 is intended to hold a honeycomb structure exclusively at its periphery, and is therefore not suitable for suppressing internal vibrations. Consequently the skilled person would not consider the use of such a supporting member in a heater unit of E2 in order to improve the support of the honeycomb structure within its casing.

4.4 Apart from the above argumentation, it should furthermore be emphasized that claim 1 requires not only at least one electrode which has to be attached to the honeycomb structure, but also a metallic supporting member 16 which also has to be connected to the honeycomb structure, as well as to the casing. As confirmed by the respondent during the oral proceedings, both the electrode(s) and the metallic

supporting member are different constructional features in the embodiment of the patent in suit. By contrast, the heater unit of E2 consists of only a single constructional feature which fulfills both functions, namely supporting (supporting structure 13, 14) and electrically connecting (11, 12 which are the ends of the supporting structure 13, 14) the honeycomb structure. This difference also results in two different concepts, namely on the one hand the radially fixed honeycomb structure according to E2, and on the other hand the radially displaceable honeycomb structure according to the patent in suit.

5. The Board therefore comes to the conclusion that the subject-matter of claim 1 according to the respondent's present request cannot be derived in an obvious manner from the cited prior art and accordingly involves an inventive step (Article 56 EPC). This claim together with its dependent claims 2 to 8 and the amended description and drawings therefore form a suitable basis for maintenance of the patent in amended form.

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 in the following version:

Claims: 1 to 8 of the main request filed with letter of 16 November 2001;

Description: pages 2 (with insert), 4, 8 filed at the oral proceedings on 19 December 2001; pages 3, 5 to 7, 9 to 13 filed with letter of 16 November 2001;

Drawings: Figures 1(A)- 35 as granted.

The Registrar:

The Chairman:

G. Magouliotis

C. Andries