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D E C I S I O N
of 30 June 2000

Case Number: T 0700/98 - 3.2.4

Application Number: 91310232.3

Publication Number: 0485179

IPC: F01N 3/20

Language of the proceedings: EN

Title of invention:
Heater and catalytic converter

Patentee:
NGK INSULATORS, LTD.

Opponent:
(I) Bayerische Motoren Werke Aktiengesellschaft
(II) Emitec Gesellschaft für Emissionstechnologie mbH

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step - no for the main request"
"Inventive step - yes for the first auxiliary request"

Decisions cited:
-

Catchword:



Case Number: T T 0700/98 - 3.2.4

D E C I S I O N
of the Technical Board of Appeal 3.2.4
of 30 June 2000

Appellant:
(Opponent II)

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Decision under appeal:

Interlocutory decision of the Opposition Division
of the European Patent Office posted 26 May 1998
concerning maintenance of European patent
No. 0 485 179 in amended form.

Composition of the Board:

Chairman: C. A. J. Andries

Members: H. A. Berger

J. C. M. De Preter

Summary of Facts and Submissions

I. Oppositions were filed by opponent II against the patent as a whole and by opponent I against the granted claims 9, 10, 11 and 13. Both oppositions were based on Article 100(a) EPC. The interlocutory decision of the opposition division was dispatched on 26 May 1998 to maintain the European patent No. 0 485 179 in amended form.

On 13 July 1998 the opponent II (now appellant) lodged an appeal against the decision and simultaneously paid the appeal fee. The statement of grounds of appeal was received on 28 September 1998.

The opponent I is party as of right to the appeal proceedings according to Article 107 EPC.

II. The following prior art documents cited among others during the opposition proceedings are relevant in the appeal proceedings:

D1: EP-A-0 002 791
D2: WO-A-89/10471
D4: US-A-4 645 751
D5: FR-A-1 363 723
D6: DE-U-90 03 204
D11: DE-A-3 912 596
D13: DE-A-3 928 760
D14: EP-A-0 399 302.

III. In response to a communication of the board the party as of right brought forward arguments against claims 9, 10, 11 and 13.

Oral proceedings were held on 30 June 2000, during which the respondent submitted new sets of claims, as the basis for the main and first to third auxiliary requests.

IV. The independent claim 1 which is common for the main and first to third auxiliary requests reads as follows:

"A heater installed in conjunction with a catalytic converter to receive the exhaust gas from an automobile engine, comprising a honeycomb structure (10) having passages for flow through of a gas to be heated, and at least two electrodes (11) for passage of electric current through the honeycomb structure to heat it, fixed to the honeycomb structure, characterised in that an adsorbent mainly composed of zeolite is coated on the honeycomb structure, wherein when the heater is downstream of the catalytic converter it contains a catalyst supported thereon."

The independent claim 9 of the main request reads as follows:

"A catalytic converter for purification of automobile exhaust gas installed to receive the exhaust gas from an automobile engine, comprising, in the exhaust gas flow path, at least one main monolith catalyst (3), and a honeycomb heater (2) comprising a honeycomb structure (10) having a large number of passages and at least two electrodes (11) for passing electric current through the honeycomb structure fixed thereto, characterised in that an adsorbent (1) composed mainly of zeolite, is also in the exhaust gas flow path, and when, among the adsorbent (1), the honeycomb heater (2) and the main monolith catalyst (3), the adsorbent or the honeycomb

heater is most downstream in the exhaust gas flow path, the adsorbent or respectively the honeycomb heater contains a catalyst supported thereon, and wherein either both the adsorbent and the honeycomb heater are upstream of the main monolith catalyst or both the adsorbent and the honeycomb heater are downstream of the main monolith catalyst."

Independent claim 9 of the first auxiliary request:

The preamble of this claim is the same as that of claim 9 of the main request. The characterising portion reads as follows:

"characterised in that an adsorbent (1) composed mainly of zeolite is also in the exhaust gas flow path, a catalyst is supported on the adsorbent (1) and when the honeycomb heater (2) is the most downstream in the exhaust gas flow path the honeycomb heater contains a catalyst supported thereon, and wherein either both the adsorbent and the honeycomb heater are upstream of the main monolith catalyst or both the adsorbent and the honeycomb heater are downstream of the main monolith catalyst."

Claims 7 and 8, which are common to all requests, and which concern a catalytic converter are related to claim 1 which in the new version also comprises a catalytic converter. Claims 7 and 8 therefore are dependent on claim 1.

- V. The appellant (opponent II) argued that there are several prior art documents which may be considered as the starting point in assessing inventive step.

With regard to claim 1 the starting point may be document D6 which, in the opinion of the appellant discloses a heater with a honeycomb structure (Fig. 1, reference signs 16 and 17) in which the adsorbent is heated by the air from the engine (Fig. 5, and page 23, third paragraph, and Fig. 4, and page 22, last paragraph). The skilled person would simplify the system and would provide electrical heating as proposed in document D2, particularly since the possibility of the use of such a heater is already described on page 8, second paragraph of document D6. Because of the political regulations in the field of exhaust gas emission the skilled person is forced to reduce the noxious gases and is therefore forced to improve the catalytic exhaust gas system. If such a heater is provided in the system of document D6 it would be obvious to use the honeycomb structure as the carrier for the zeolite adsorbent since the system of document D6 already comprises a heat exchanger with zeolite coated thereon, and since the skilled person would avoid additional structures in the exhaust gas system in order to prevent pressure loss. Furthermore, document D5 already proposes the combination of a heater and an adsorbent. In this field of automobile engines it is normal practice to test by simple experiments the effectiveness of the components in a system and there is no reason not to try the adsorbent in the exhaust gas system in combination with the already known honeycomb heater.

The appellant came to the conclusion that the subject-matter of claim 1 is therefore not inventive.

With regard to claim 9 the appellant considered document D5 as the starting point in assessing

inventive step and argued that the technical idea of the invention is composed of two parts. Firstly, to arrive as soon as possible at the reaction temperature of the catalyst and to provide a heater therefor and secondly, to collect the hydrocarbons when the temperature of the catalyst is below its reaction temperature and to provide an adsorbent therefor. Document D5 already discloses an adsorbent in combination with a catalyst and an electrical heater and document D2 describes an electrical honeycomb heater in combination with a main catalyst. Furthermore, document D13 discloses an adsorbent with a main catalyst. Since an advantageous synergetic effect of the plurality of possible arrangements of the components stated in claim 1 is not proved with respect to the prior art systems, the result of the components provided in this system must be considered only as an addition of the known effects of the individual components and there is no inventive step in merely adding all the elements with their known individual effects in order to improve the overall effect.

The appellant is of the opinion that the subject-matter of claim 9 of the main and first to third auxiliary requests therefore does not involve an inventive step.

In a further approach of assessing inventive step the appellant started from document D2 and argued that the system described therein already comprises a catalyst on a honeycomb heater as a start catalyst upstream of a main catalyst. It is clear from Figure 4 that during the starting period a time gap still exists in which the temperature of the catalyst is below its reaction temperature and in which the noxious gases are directly blown out into the atmosphere. Knowing the effect of

the adsorbent from document D1, D5, D6 or D13 it would be obvious to add to the system of document D2 an adsorbent in order to fulfill the legal requirements on exhaust gas emission.

The appellant reasoned that also following this approach the subject-matter of claim 9 of the main and first to third auxiliary requests does not involve an inventive step.

- VI. The party as of right according to Article 107 EPC (opponent I) argued that the person skilled in the art knows from document D2 to arrange an electrical honeycomb-heater with a catalyst thereon straight in front of a main catalyst and also knows about the problem that during the low temperature period at a cold start of the engine when the catalyst is not functioning the exhaust gas is vented into the atmosphere without purification. The party as of right drew the board's attention to document D1 and D13, each of which not only describes this problem but also proposes a solution thereto, namely the use of an adsorbent. This adsorbent is able to store harmful components of the exhaust gas during the warming up phase of the main catalyst. The skilled person obliged by the legal requirements to improve the system for exhaust gas cleaning would therefore use the adsorbent already known in this technical field, particularly since the system with an adsorbent, a heater and a catalyst comprises a simple aggregation of components with an effect which can easily be anticipated by the known effects of the individual components. Furthermore, the skilled person is not confronted with a hindrance in combining the converter of document D2 with the adsorbent of document D1 or D13 and document

D5 already gives a hint to combine an adsorbent, a main catalyst and an electrical heater.

The party as of right came to the conclusion that claim 9 of the main request therefore is not patentable and since document D1 already discloses an adsorbent with a catalyst thereon claim 9 of the first, second and third auxiliary requests are not patentable too.

VII. The respondent disagreed with the above arguments and explained the meaning of claim 1. He pointed out that the heater cited in claim 1 is an element separate from the catalytic converter. It comprises two electrodes and therefore delivers heat in addition to the heat of the engine, which is most important during engine start. The respondent drew the board's attention to Tables 1 and 2 of the patent specification and explained the results obtained by the possible arrangements of the adsorbent, the heater and the main catalyst. In the opinion of the respondent claims 1 and 9 of the main and the auxiliary requests are inventive.

VIII. *Requests*

The appellant (opponent II) requested that the decision under appeal be set aside and the patent be revoked.

The party to the appeal proceedings as of right according to Article 107 EPC (opponent I) requested that the decision under appeal be set aside and that claims 9, 10, 11, 13, 17 and 18 are revoked.

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

Claims 1 to 18 of the main request filed during the oral proceedings on 30 June 2000;

or claims 1 to 17 of the first auxiliary request filed during the oral proceedings on 30 June 2000;

or claims 1 to 16 of the second auxiliary request filed during the oral proceedings on 30 June 2000;

or claims 1 to 12 of the third auxiliary request filed during the oral proceedings on 30 June 2000.

Reasons for the Decision

1. The appeal is admissible.
2. *Claim 1 of the main and first to third auxiliary requests*
 - 2.1 Amendments

Claim 1 differs from claim 1 as granted by an amendment in the first line of the granted claim, namely by the following words in bold letters:

"A heater **installed** in conjunction with a catalytic converter **to receive the exhaust gas from an automobile engine**, comprising".

This amendment is disclosed on page 1, first and second paragraphs; page 8, last paragraph to page 9, first paragraph of the originally filed description (page 3, lines 6 to 14 and page 5, lines 1 to 4 of the patent).

It further differs from the granted claim 1 by the following additional feature at the end of claim 1:

"wherein when the heater is downstream of the catalytic converter it contains a catalyst supported thereon."

This feature is disclosed on page 11, second paragraph of the originally filed description (page 5, lines 35 to 40 of the patent) and in Table 2.

The protection conferred by the granted claim 1 is limited by these additional features.

The amendments of claim 1 of the main and first to third auxiliary requests therefore do not contravene Article 123 EPC.

2.2 Novelty

None of the prior art documents discloses a heater with all the features of claim 1. Document D14 (state of the art according to Article 54(3)(4) EPC) which discloses a heater with an adsorbent thereon does not mention the installation of the heater in conjunction with a catalyst converter to receive the exhaust gas from an automotive engine. The subject-matter of claim 1 therefore is new in the meaning of Article 54 EPC.

2.3 Closest prior art

The appellant considers document D6 as the closest prior art, which is therefore taken as the starting point for assessing inventive step.

2.4 Problem and solution

The technical problem with regard to claim 1 is the improvement of the purification of exhaust gas during the starting period of the engine.

This problem is solved by the provision of an adsorbent composed mainly of zeolite on the honeycomb structure of the heater, which is installed in conjunction with a catalytic converter.

2.5 Inventive step

2.5.1 Document D6 discloses a heat exchanger installed in conjunction with a catalytic converter to receive the exhaust gas from an automotive engine, comprising a structure (Figures 3 and 5, heat exchanger 115, 315) having passages for flow through of an exhaust gas. An adsorbent mainly composed of zeolite (see claim 11 of document D6) is coated on that structure (see page 21, third paragraph and page 24, lines 5 to 14). The heat delivering fluid is heated by the engine and its flow through the heat exchanger is controlled by valves. The purpose of the heat exchanger control is to delay the heating of the adsorbent and therewith to delay the desorption of the adsorbed gas components. This heat exchanger therefore is not comparable with an electrical heater in the meaning of the present invention, which in addition to the engine heat delivers heat from another outside (with respect to the engine and its exhaust system) source. Furthermore, the heat exchanger of document D6 does not comprise a honeycomb structure but is composed of tubes as shown in the figures, even in Figure 1. There is no hint given in this document D6 to replace the heat exchanger by an electrical honeycomb heater. On the contrary, because of the idea to delay heating of the adsorbent, the skilled person is guided away from providing the

heat exchanger with additional heat from an external source, let alone from modifying the heat exchanger into a honeycomb heater coated with an adsorbent.

The appellant argued that it would have been obvious for a person skilled in the art to provide a separate additional heater either upstream or downstream of the main catalyst in document D6 since the function and the advantage of a heater - as such - would have been common knowledge in this specific technical field.

Even if this were true, such a heater would be a heater known in this technical field, for example a heater as known from document D2 or D5, where the heating means simply heat either a start catalyst of the same composition as the main catalyst (see document D2) or a main catalyst (see documents D5 and D2, page 8, lines 19 to 22). This common knowledge, being the simple idea of using the advantages of heating in general, can however not be considered as an obvious suggestion towards a separate heater having an adsorbent mainly composed of zeolite which is coated on a honeycomb structure of that heater.

Since there is no clear teaching in the cited state of the art towards the use of the separate and specific claimed heater, a person skilled in the art therefore would not have modified the installation according to document D6 in such a way as to obtain the claimed combination, specific heater - catalytic converter.

- 2.5.2 Also starting from the devices according to either document D2 or document D5, the person skilled in the art is not guided in an obvious way to the claimed combination of the specific heater with a catalytic

converter.

Document D2 which discloses a heater installed in conjunction with a catalyst converter according to the precharacterising part of claim 1 does not propose the use of an adsorbent as a coating on the honeycomb heater, let alone of an adsorbent composed of zeolite. This heater is coated with catalytic material and is heated during a cold start in order to bring the catalytic material as soon as possible to its reaction temperature.

Document D5 discloses an exhaust gas purification system with an adsorbent/catalyst. The adsorbent/catalyst however is not composed of zeolite. Although this adsorbent/catalyst is heated by an electrical winding the heater however is provided in the downstream region of the system which is intended to function as the main catalyst. The aim in this system is to heat the material in this region in order to activate its catalytic function before desorbing of noxious gases from the material upstream thereof begins.

Even if the teaching of document D6 to delay heating of an adsorbent upstream of a main catalyst were to be applied to the devices according to each of these documents D2 or D5, it would not result in the claimed combination of the specific heater with a catalytic converter, since it would not be logical with regard to the teaching of document D6 to combine the adsorbent directly with the heater start-catalyst or the heated main catalyst.

Document D5 on the other hand, although suggesting

heating of the main catalyst which is also disclosed in document D2 (page 8, lines 19 to 22), proposes to locate the heater at the downstream end of the main catalyst. This teaching however is in contradiction to the requirement of document D2 proposing a heated start catalyst upstream of a main catalyst. A person skilled in the art therefore would not be guided to combine these contradictory teachings of documents D5 and D2.

Therefore, neither document D6, nor document D2, nor document D5, nor the combination of these documents could lead to the subject-matter of claim 1.

2.6 The heater installed in conjunction with a catalytic converter of claim 1 therefore is patentable.

3. *Claim 9 of the main and first auxiliary requests*

3.1 Novelty

None of the prior art documents discloses a catalytic converter with all the features of claim 9 of the main or first auxiliary request. The subject-matter of claim 9 therefore is new in the meaning of Article 54 EPC.

3.2 Closest prior art

The closest prior art is known from document D2, since neither document D6 nor document D5 disclose an electrical heater with a honeycomb structure, which therefore do not even disclose a converter with all the features of the preamble of claim 9 of the main and first auxiliary requests.

Document D6 describes a catalytic converter with an adsorbent and a main catalyst but proposes the use of a valve system for controlling the exhaust gas flow and therewith the heating of the adsorbent structure and of the main catalyst by the hot exhaust gases and does not show any basis for an electrical heater in addition to the main catalyst. Document D5 discloses a catalyst functioning below a particular temperature as an adsorbent and proposes to heat the downstream side of the system by an electrical heater in order to quickly arrive at the reaction temperature of the catalytic material. This heating of the downstream side is comparable with the heating of the main catalyst. A heater on the main catalyst however is already known from document D2 as indicated above.

Therefore, the closest prior art is the system of document D2 which comprises a catalytic converter with all the features of the preamble of claim 9 of the main and first auxiliary requests, i.e. a catalytic converter for purification of automobile exhaust gas installed to receive the exhaust gas from an automobile engine (see Figure 1 of document D2), comprising, in the exhaust gas flow path, at least one main monolith catalyst (page 6, lines 6 to 16 and page 9, lines 16 to 19), and a honeycomb heater (see claim 1 of document D2) comprising a honeycomb structure having a large number of passages and at least two electrodes for passing electric current through the honeycomb structure fixed thereto.

3.3 Problem and solution

The board cannot agree with the arguments of the appellant that the technical problem is divided into

two parts, i.e. firstly the problem that the HC-components do not react in the main catalyst because of the low temperature after starting of the engine and secondly the problem that the ignition of the catalyst occurs too late with regard to the desorption of the adsorbent. Starting from document D2 as the closest prior art in assessing inventive step, the technical problem with regard to claim 9 of the main and the first auxiliary requests is to improve the purification of exhaust gas during the starting period of the engine, particularly since document D2 already shows in Figure 4 for normal cases in which the battery is not to be overstressed a time gap between the starting point of the engine and the begin of the reaction of the catalyst.

This problem is solved according to claim 9 of the main request by the provision of an adsorbent composed mainly of zeolite in the exhaust gas flow path, and according to claim 9 of the first auxiliary request by the provision of an adsorbent with a catalyst supported on the adsorbent. The adsorbent and the honeycomb heater are both upstream or downstream of the main monolith catalyst and are therefore not part of, but separate from, the main catalyst.

4. *Inventive step of the converter of claim 9 of the main request*

4.1 Claim 9 of the main request differs from the catalytic converter of document D2 by the features of its characterising portion, i.e. in that an adsorbent composed mainly of zeolite, is also in the exhaust gas flow path, and when, among the adsorbent, the honeycomb heater and the main monolith catalyst, the adsorbent or

the honeycomb heater is most downstream in the exhaust gas flow path, the adsorbent or respectively the honeycomb heater contains a catalyst supported thereon, and wherein either both the adsorbent and the honeycomb heater are upstream of the main monolith catalyst or both the adsorbent and the honeycomb heater are downstream of the main monolith catalyst.

4.2 Document D13 already describes the problem of purification of the exhaust gas at cold starting temperature of the engine (see column 1, lines 5 to 21) and proposes to provide an adsorbent mainly composed of zeolite upstream of the main monolith catalyst. The provision of an adsorbent upstream of the main catalyst for solving cold start purification problems is furthermore disclosed in document D6. The skilled person knowing from document D2 (Figure 4) the existence of a time gap between the engine cold start point and the begin of the reaction of the catalyst (temperature T_z) even of the start catalyst, would find a possible solution for this problem by the teaching of document D13 or D6, and would provide an adsorbent upstream of the catalysts. The electrical heating before starting of the engine, which would also solve this problem and which is also disclosed in document D2 (Figure 4: T_{k3}), would overstress the battery of the automobile, which has to be avoided particularly at low ambient temperature and would therefore not be an acceptable solution of the problem and would be avoided by the skilled person.

4.3 The argument of the respondent with regard to the system of document D2 that the skilled person would not think of an adsorbent for adsorbing the noxious gas components during the start period, since it would

delay the heating of the catalyst which mainly is heated by the exothermic reaction of the noxious components, cannot be accepted since firstly this delay is obviously low, secondly little or no noxious gas components pass the adsorbent so that no need exists for such a quick heating of the catalyst, and thirdly the only known possibility of increasing purification during this start period is the provision of an adsorbent if overstressing of the battery is to be avoided. The skilled person trying in simple experiments the functioning of the known adsorbent upstream of the honeycomb heater and the main catalyst of document D2 would easily arrive at the advantageous result.

4.4 The catalytic converter of claim 9 of the main request therefore does not involve an inventive step (Article 56 EPC).

4.5 Since the subject-matter of claim 9 is not patentable (Article 52 EPC) the main request as a whole cannot be allowed.

5. *Amendments of claim 9, the dependent claims and the description of the first auxiliary request*

5.1 Claim 9:

Claim 9 of the first auxiliary request differs from claim 9 as granted by an amendment in the first line of the granted claim, namely by the following words in bold letters:

"A catalytic converter for purification of automobile exhaust gas **installed to receive the exhaust gas from**

an automobile engine, comprising ...".

This amendment is disclosed on page 8, last paragraph to page 9, first paragraph of the originally filed description (page 5, lines 1 to 4 of the patent).

It further differs from granted claim 9 besides the simple change of the wording "characterised by ..." to "characterised in that ... is ...", by the following additional features at the end of claim 9:

"a catalyst is supported on the adsorbent (1) and when the honeycomb heater (2) is the most downstream in the exhaust gas flow path the honeycomb heater contains a catalyst supported thereon, and wherein either both the adsorbent and the honeycomb heater are upstream of the main monolith catalyst or both the adsorbent and the honeycomb heater are downstream of the main monolith catalyst."

These features are disclosed in the originally filed claim 14 and the description, page 10, line 16 to page 11, line 21 (claim 10 and page 5, lines 26 to 40 of the granted patent) in conjunction with Figures 1(a) to 1(f).

The protection conferred by granted claim 9 is limited by these additional features.

5.2 The dependent claims and the description:

Since granted claim 10 is now part of claim 9, the granted claims 11 to 18 have been renumbered to claims 10 to 17.

The amendments of the description, pages 3 and 4 concern the adaptation to the new claims 1 and 9.

5.3 The amendments of the claims and the description according to the first auxiliary request do not contravene Article 123 EPC.

6. *Inventive step of the subject-matter of claim 9 of the first auxiliary request*

6.1 The essential feature differing from claim 9 of the main request is the provision of a catalyst on the adsorbent. Claim 9 of the first auxiliary request differs from the catalytic converter of document D2 by the features of its characterising portion, i.e. in that an adsorbent composed mainly of zeolite, is also in the exhaust gas flow path, a catalyst is supported on the adsorbent and when the honeycomb heater is the most downstream in the exhaust gas flow path the honeycomb heater contains a catalyst supported thereon, and either both the adsorbent and the honeycomb heater are upstream of the main monolith catalyst or both the adsorbent and the honeycomb heater are downstream of the main monolith catalyst.

6.2 Although the provision of an adsorbent upstream of the honeycomb heater and the main catalyst is obvious for the skilled person as is explained with regard to claim 9 of the main request (see sections 4.1 to 4.4 above), a skilled person would have a priori no further reason to add a catalyst on the adsorbent, since firstly the effect and the intention of the provision of the adsorbent is clear from documents D13 and D6, secondly sufficient catalytic material is already present downstream of the adsorbent in the system of document

D2, and thirdly no information is available that an improvement could be expected. Document D5 which describes a heater at the downstream side of the catalytic material which functions at cold temperature as an adsorbent would hint towards an electrical heater located directly on the downstream end of the main catalyst in order to come to its reaction temperature before desorption of the adsorbent at the other end of the main catalyst begins. This teaching cannot be combined with the teaching of document D2 (see section 2.5.2 above). Documents D6 and D13 propose a separate adsorbent which is heated by engine heat, for instance by the exhaust gases, whereby desorption of the adsorbed gas occurs when the catalyst is at its reaction temperature. There is however no catalyst on the adsorbent, so that even the use of such an adsorbent in the converter according to document D2 would not result in the claimed combination.

It is true that document D1 already discloses the provision of an adsorbent with a catalyst thereon in an exhaust gas path, but this is an adsorbent/catalyst element which functions as the main catalyst. Also the adsorbent/catalyst of document D5 functions at a particular temperature as the main catalyst. There is no hint given in these documents to combine this adsorbent/catalyst element with a honeycomb heater and another separate main catalyst.

Documents D4 and D11 which also disclose an adsorbent mainly composed of zeolite with catalytic material thereon again give no indication to this combination with a heater and a main catalyst. Document D4 mainly deals with the regeneration and document D11 with the fabrication of adsorbents. According to a passage in

the description of document D11 (see page 4, lines 32 and 33) it might be obvious to combine the zeolite-adsorbent/catalyst element with a main catalyst, however there is no basis in this and all the other cited documents to provide it in connection with an electrical heater, let alone a particular honeycomb heater. The cited documents might lead with regard to document D2 to systems with an adsorbent, a honeycomb heater with a catalyst thereon functioning as a start catalyst and a main catalyst placed in this order, but since the adsorbent is placed upstream of the start catalyst, this heated start catalyst is already at its reaction temperature when desorption of the adsorbent begins. The skilled person therefore would not consider to provide in addition to these components, adsorbent, start catalyst and main catalyst, a catalyst on the adsorbent which according to the prior art appeared to be superfluous.

Stating in such a complex system as that of the exhaust gas system that it is obvious to mix all known features, since their functions - as such - are known, without however knowing the result of their combination on the exhaust gases cannot be followed by the board. Obviousness, in this specific case, cannot be the result of a random combination of known features guided more or less by the knowledge of the claimed features (could approach), but obviousness should be based on a logic chain of arguments, linking features to each other on the basis of a hint in the state of the art (would approach). This approach cannot be set aside by the general idea that political regulations with respect to exhaust gases force a skilled person to do

something in order to reduce the noxious gases. These regulations are certainly the origin of a problem to be solved. However they do not provide a solution, which could guide a skilled person.

- 6.3 The advantage of the composition of an adsorbent/catalyst, a heater and a main catalyst compared with an adsorbent without catalytic material thereon (compare examples 6 and 7) can be seen from Table 2 of the impugned patent.
- 6.4 The subject-matter of claim 1 of the first auxiliary request is therefore inventive in the meaning of Article 56 EPC.
7. The first auxiliary request is allowable.
8. Since the first auxiliary request is accepted, there is no need to deal with the second and third auxiliary requests.
9. Claim 1, claim 9 as well as the dependent claims 2 to 8 and 10 to 17, the description and the drawings of the first auxiliary request therefore can form the basis for the maintenance of the patent (Articles 52 and 102(3) EPC).

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 17 filed as the first auxiliary request at the oral proceedings on 30 June 2000;

Description: Pages 3 to 13 as submitted at the oral proceedings on 30 June 2000;

Drawings: Figures 1 (a) to 1 (f) and 2 as submitted at the oral proceedings on 30 June 2000.

The Registrar:

The Chairman:

G. Magouliotis

C. Andries