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**Datasheet for the decision
of 25 May 2007**

Case Number: T 0995/06 - 3.3.05

Application Number: 97307691.2

Publication Number: 0835684

IPC: B01D 53/94

Language of the proceedings: EN

Title of invention:

Emission control

Patentee:

JOHNSON MATTHEY PUBLIC LIMITED COMPANY

Opponent:

Ecocat Oy

Headword:

-

Relevant legal provisions:

EPC Art. 100(b)

Keyword:

"Sufficiency of disclosure: no (both requests)"

Decisions cited:

T 0292/85

Catchword:

-



Case Number: T 0995/06 - 3.3.05

DECISION
of the Technical Board of Appeal 3.3.05
of 25 May 2007

Appellant: JOHNSON MATTHEY PUBLIC LIMITED COMPANY
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 5 April 2006
revoking European Patent No. 0835684 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: B. Czech
Members: H. Engl
S. Hoffmann

Summary of Facts and Submissions

I. This appeal lies against the decision of the opposition division to revoke European patent EP 0 835 684 on the ground of lack of novelty.

II. The independent claims of the granted patent read as follows:

"1. An emission control system for internal combustion engines which emit carbonaceous soot particles, comprising a first catalyst effective to oxidise NO to NO₂ and a second catalyst, effective at least to oxidise hydrocarbons, carbon monoxide and volatile organic fractions, each catalyst being supported on a honeycomb flow-through monolith comprising a plurality of cells, each defined by a cell wall, whereby soot particles trapped on or within said second catalyst monolith are combusted in the NO₂-containing gas from said first catalyst, and wherein the first catalyst is supported on a flexible metal monolith whereby flexing and/or vibration of the honeycomb cell walls serves to minimise the collection of soot particles thereon."

"6. An internal combustion engine which emits carbonaceous soot particles during at least part of the operating cycle, fitted with an emission control system according to any of claims 1 to 5."

"7. A light-duty diesel engine, fitted with an emission control system according to any one of claims 1 to 5."

"8. A process for the purification of exhaust gases from an internal combustion engine which emits carbonaceous soot particles which process comprising the steps of passing said gases over a first catalyst effective to oxidise NO to NO₂ and subsequently passing the gas enriched with NO₂ over a second catalyst effective at least to oxidise HC, CO and VOF in order to cause combustion of soot particles trapped on or within said oxidation catalyst, which first and second catalysts each being supported on a honeycomb flow-through monolith comprising a plurality of cells, each defined by a cell wall characterised in that the first catalyst is supported on a flexible metal monolith whereby flexing and/or vibration of the honeycomb cell walls serves to minimise the collection of soot particles thereon."

III. The opposition was based on the grounds of Article 100(a) and (b) EPC. In the contested decision, the opposition division concluded that the subject-matter of claims 1, 6 and 8 lacked novelty in view of document D6: DE A 30 12 182. More particularly, the opposition division considered that D6 disclosed an emission control system comprising two honeycomb catalysts, a first one for oxidising NO to NO₂, and a second one for combusting trapped soot particles in the NO₂ containing gas from the first catalyst and for oxidising hydrocarbons, CO and volatile organic fractions. Considering that D6 disclosed a metal sheet rolled into a tube-like shape, and since the feature "*flexible metal monolith*" had to be construed in its broadest meaning, the opposition division held that D6 disclosed a "*flexible metal monolith*" within the meaning of the claims. Under the heading "*II. Additional information*",

the opposition division indicated in an obiter dictum that it considered the requirement of sufficiency of disclosure to be fulfilled, since "*a skilled person would be able to select or construct a flexible metal monolith and to use the vibrations of an engine or other vibrations to achieve a flexing and/or vibration of the honeycomb cell walls to minimise the collection of soot particles thereon*".

- IV. In its statement of grounds of appeal the appellant (patent proprietor) submitted arguments in support of novelty of the claimed subject-matter over D6. Concerning the grounds of opposition of Articles 100(a) (inventive step) and 100(b) EPC, it referred to its written reply to the notice of opposition.
- V. In its reply, the respondent (opponent) submitted that the subject-matter of claim 1 lacked novelty over D6. It additionally referred to its notice of opposition.
- VI. On 18 May 2007 the appellant filed a new set of nine claims as an auxiliary request. These claims differ from the claims as granted only in that in claims 1 and 8 the expression "*flexing and/or vibration*" is replaced by "*flexing and vibration*".
- VII. Oral proceedings took place on 25 May 2007, during which the respondent confirmed that it maintained its objection under Article 100(b) EPC. The parties presented their arguments concerning both the issue of novelty over D6 and the issue of sufficiency of disclosure.

VIII. The arguments of the appellant, insofar as they are relevant for the decision, may be summarised as follows:

At the oral proceedings, the appellant argued that "*flexible metal monoliths*" were a well known technology. It also presented a model of what it considered to be a "*flexible metal monolith*", consisting of spirally wound corrugated metal sheets. This monolith showed some flexibility in the longitudinal direction of the monolith, *i.e.* the wound-up layers could to a certain degree be shifted relative to each other along the winding axis. The appellant argued that document D6 was silent about flexible monoliths and did not directly and unambiguously disclose a first catalyst monolith consciously designed to be flexible. The first catalyst monolith of D6 consisted of overlying corrugated and flat metal sheets wound up as a tight coil into a tube-like shape to produce a metal honeycomb. Forming a tube from a material made the material stronger relative to the material in its unrolled form.

On sufficiency of disclosure the appellant essentially argued that the patent taught that the first catalyst monolith was designed to have a flexibility such as to minimise soot collection. Flexibility could be achieved by certain design features, such as thinner walls and not brazing the monolith. The opposed patent thus taught the skilled engineer, in combination with his or her common general knowledge, at least one embodiment of a flexible monolith, whereby, in use, flexing and/or vibration of the honeycomb cell walls served to minimise the collection of soot particles thereon. According to T 292/85 it was not necessary to disclose further variants of the claimed invention as long as

these were available to the skilled person through common general knowledge.

IX. The respondent essentially argued as follows:

Referring to the reasons given in the contested decision, it argued that D6 was novelty-destroying since it disclosed an emission control system with all the features of present claim 1, including a first catalyst supported on a honeycomb monolith, obtained by rolling up corrugated metal sheets, and which monolith was thus implicitly flexible to some extent. On the other hand, the respondent also argued that the opposed patent contained no definition of a "*flexible metal monolith*". More particularly, there was no example and no general teaching on how to make a flexible metal monolith whereby flexing of the honeycomb cell **walls** would have the desired effect of minimizing collection of soot particles thereon. The only specific indication in the patent concerning measures to be taken for obtaining the required flexing and/or vibration of the cell walls of the first monolith was to use the natural vibration modes of the engine. Vibration of the entire monolith would always occur upon operation of the engine, but the patent was silent about how to manufacture a metal monolith with cell **walls** that would flex upon operation of the engine. The respondent stated that it did not know how to design a metal monolith with flexible cell walls and having a sufficient mechanical stability. It was aware of methods for producing rolled structures of corrugated sheets having a certain freedom of moving longitudinally, *i.e.* of the type presented by the appellant. However, in said structure, it was not the

cell walls which were flexible, but the entire structure. Consequently, in the respondent's view, the opposed patent lacked disclosure of essential design elements and could not be carried out by the skilled person.

- X. The appellant requested that the decision under appeal be set aside and the patent be maintained as granted or, in the alternative, on the basis of the claims filed as auxiliary request on 18 May 2007.

The respondent requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.

Main request

2. The subject-matter claimed
- 2.1 Independent claims 1 and 8 as granted both refer to a "**flexible metal monolith, whereby flexing and/or vibration of the honeycomb cell walls serves to minimise the collection of soot particles thereon**" (emphasis added by the board).
- 2.2 Concerning the expression "*flexible metal monolith*", the board notes that it does not literally appear in the application as filed. The only passage in the entire application as filed where "*flexing*" is addressed is on page 2, lines 19 to 23, of the description and reads as follows: "*The monolithic*

support used for the first catalyst is preferably a metal monolith which desirably provides flexing and/or vibration of the honeycomb cell walls for the purpose of displacing any soot particles captured within the monolith. The monolith may be consciously designed to encourage such flexing and/or vibration, possibly using the natural vibration modes of the diesel engine."

2.3 The metal monolith model presented by the appellant at the oral proceedings comprised metal sheets rolled up spirally was shown to be deformable by applying manual force in its axial direction. However, no evidence has been provided showing

- that metallic honeycomb monoliths of the this specific type, i.e. with some flexibility of the entire monolith in its axial direction, were generally known under the designation "*flexible metal monolith*", nor
- that the skilled reader would have understood that the expression "*flexing of the honeycomb cell walls*" as used in the application as filed referred to these particular monoliths, nor
- that the **cell walls** of such monoliths would flex upon operation of the combustion engine such as to displace soot particles captured in the monolith and thereby minimise the collection of soot particles thereon.

2.4 Under these circumstances, the expression "*flexible metal monolith*" in claims 1 and 8 as granted can only be considered to refer, in one alternative, to metallic monoliths wherein the honeycomb cell **walls**, rather than the entire monolithic body, may **flex** such as to

minimise the collection of soot particles thereon, *i.e.* wherein the cell **walls** deform in a direction essentially perpendicular to their respective planes, *i.e.*, perpendicular to the axis of the honeycomb monolith in the case of a rolled-up metal sheet (see point 2.3 herein above).

3. *Sufficiency of the disclosure*

3.1 According to the patent in suit, flexibility of the cell **walls** is essential for preventing soot build-up in the first honeycomb monolith, and hence for the performance of the invention (see claims 1 and 8 and section [0008] of the description). It is therefore decisive to know by which concrete structural features the required flexibility of the cell walls of the metal monolith can be achieved. This is all the more so important as the opposed patent explains the necessary degree of flexibility only in terms of the desired result, expressed in form of a functional feature, namely "*to minimise the collection of soot particles thereon*".

3.2 The board notes, as did the respondent, that the opposed patent contains no example for a metal monolith as prescribed by claims 1 and 8. In particular, as far as relating to the use of systems comprising first and second catalysts (see paragraphs [0019] and [0023] of the description), the examples of the patent do not even mention flexible cell walls. Although it is briefly stated in paragraph [0008] of the description that "*the monolith may be consciously designed to encourage said flexing and/or vibration*", no concrete suggestion or guidance for such design is given. One

will appreciate that in a monolith having in the order of 100 or 200 cells/in² (see description, paragraphs [0009] and [0019]), the linear cross-sectional dimension of a cell will be in the order of a few millimetres. Bearing also in mind that the monolith carries catalyst material which may include a wash coat (see e.g. paragraph [0019] of the description), designing a flexible metal monolith honeycomb structure with cell walls of that dimension which are capable of flexing as required by the claims is, in the board's view, not a trivial task. The board thus accepts the respondent's statement in this respect that although monoliths of the type shown by the appellant were known, it was not derivable from the patent in suit, even when taking into account common general knowledge, how to fabricate a metal monolith showing "*flexing [] of the honeycomb cell walls serving to minimise the collection of soot particles thereon*", whilst being of sufficient mechanical stability. Under these circumstances, the board considers that the burden of proof was on the appellant to establish that the skilled person would have been able to carry out the claimed invention, i.e., to fabricate a monolith.

- 3.3 However, questioned on this point during oral proceedings, the appellant, despite the presence of one of the inventors, did not provide explanations on how the claimed feature "*flexing and/or vibration of the honeycomb cell walls serving to minimise the collection of soot particles thereon*" could be put into practice. It merely argued that flexible metal monoliths of the type shown during the oral proceedings and their fabrication methods were known to the skilled person.

3.4 Document D6 discloses a catalytic system for the treatment of gases, in particular of exhaust gases from internal combustion engines, consisting of two catalyst converters arranged in series (see page 20, second paragraph, first sentence; claim 1; Figure 1). The catalytic converters comprise a support ("*Grundträger*"), which is preferably a monolith, e.g. a honeycomb, and is preferably made of heat resistant ceramic material or of metal (e.g. Kanthal or FeCrAlloy). Such metal converters may be manufactured from corrugated sheet rolled up into a tube-like shape (see page 42, last paragraph; page 43, second paragraph). According to D6 the cells ("*zellenförmige Kanäle*") of a honeycomb monolithic support of sufficient strength may have a wall thickness in the range of from 0.05 to 0.64 mm (page 44, last paragraph). However, this paragraph does not explicitly refer to the particular monoliths made from corrugated metal sheets. In the absence of further corroborating evidence, it can thus not be derived from D6 that in a metal monolithic support body with a cell wall thickness in the given range and obtained by rolling up corrugated sheet material flexing of the honeycomb cell walls would occur and serve to minimise the collection of soot particles thereon as required by claim 1.

3.5 The appellant has argued that the skilled person, applying common general knowledge, would know how to obtain a flexible metal monolith; e.g. by making the cell walls thinner, by providing fewer cells per square inch, or by avoiding welding or brazing of the layers of metal foil together. In the absence of corroborating evidence, the board cannot accept that applying these measures to achieve flexing cell walls belonged to the

common general knowledge, in particular since using thinner foils, increasing the numbers of cells and avoiding welding/brazing would lead to mechanically weaker structures. Using fewer cells per square inch would, moreover, reduce the active surface of the monolith.

- 3.6 The appellant furthermore referred to decision T 292/85 (OJ 1989, 275) according to Headnote I. of which "*an invention [] is sufficiently disclosed if at least one way is clearly indicated enabling the person skilled in the art to carry out the invention. Then the non-availability of some particular variants or unsuitability of some unspecified variants of a functionally defined component feature of the invention is immaterial to sufficiency as long as there are suitable variants known to the skilled person through the disclosure or common general knowledge which provide the same effect for the invention. The disclosure need not include specific instructions as to how all possible components variants within the functional definition should be obtained.*" In the present case the board however considers that not only are particular variants unavailable, but the application fails to disclose at least one way for carrying out the claimed invention as far as it relates to the alternative comprising the provision of "*a flexible metal monolith whereby flexing [] of the honeycomb cell walls serves to minimise the collection of soot particles thereon.*"

- 3.7 The positive assessment of sufficiency of disclosure in the decision under appeal (see part III. thereof) is not substantiated and appears to be based on an

understanding of claim 1 which does not take into account the feature "*flexing of the honeycomb cells walls ...*" (see point 4.1 of the Reasons).

Under these circumstances the board concludes that the opposed patent does not enable the skilled person to put into practice the features of the claims calling for "*a flexible metal monolith whereby flexing ... of the honeycomb cell walls serves to minimise the collection of soot particles thereon.*"

3.8 The patent in suit is thus objectionable under Article 100(b) EPC since it does not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

3.9 The main request thus cannot be granted.

Auxiliary request

4. Since the feature "*wherein the first catalyst is supported on a flexible metal monolith whereby flexing [] of the honeycomb cell walls serves to minimise the collection of soot particles thereon*" is also present in the amended claims 1 and 8 according to the auxiliary request, the above argumentation equally applies to the claims according to this request. Upon being questioned by the board at the oral proceedings, the appellant did not put forward any further argument as to why a different reasoning concerning sufficiency should apply having regard to the independent claims of the auxiliary request. Said auxiliary request thus cannot be granted either.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar

The Chairman

C. Vodz

B. Czech