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D E C I S I O N
of 3 November 2005

Case Number: T 0521/03 - 3.2.04

Application Number: 96905098.8

Publication Number: 0812382

IPC: F01N 3/28

Language of the proceedings: EN

Title of invention:

Device for catalytic purification of exhaust gases

Patentee:

Volvo Car Corporation

Opponent:

Bayerische Motoren Werke Aktiengesellschaft

Headword:

-

Relevant legal provisions:

EPC Art. 56, 114

Keyword:

"Admission of late-filed materials - yes"

"Inventive step - no, all requests"

Decisions cited:

T 0101/87

Catchword:

-



Case Number: T 0521/03 - 3.2.04

D E C I S I O N
of the Technical Board of Appeal 3.2.04
of 3 November 2005

Appellant:
(Opponent)

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Respondent:
(Proprietor of the patent)

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Decision under appeal:

Interlocutory decision of the opposition
division of the European Patent Office posted
11 March 2003 concerning the maintenance of the
European patent No. 0812382 in amended form.

Composition of the Board:

Chairman: M. Ceyte
Members: M. Poock
C. Heath

Summary of Facts and Submissions

I. This appeal is directed against the decision of the opposition division dated 11 March 2003 that European patent No. 0 812 382 could be maintained in the form of the second auxiliary request.

The appellant (opponent) filed the notice of appeal and the statement setting out the grounds of appeal on 6 May 2003 and paid the prescribed appeal fee simultaneously.

II. The following documents are relevant for this decision:

- D3: "Produktfreigabebezeichnung Nr. 1 318 092:
Zusammenbau vorderes Abgasrohr mit
Katalysator";
- D4: "Vorfregabebezeichnung Nr. 1 318 093,
Zusammenbau Katalysator";
- D4': "Ausschnittskopie Fig. 2 der D4";
- D8: "Simulation of a thermodynamic analysis No.
97613";
- D9: DE-A-2 311 475;
- D9': GB-A-1 405 068;
- D10: EP-A-0 420 462.

Documents D3 and D4 were filed with the notice of opposition, D4' and D9 with the statement setting out the grounds of appeal. Document D8 was filed by the respondent (patent proprietor) in the opposition proceedings and was disregarded by the opposition division as being late filed and not relevant. Document D9' was cited for the first time in the decision under appeal.

III. With the summons to oral proceedings, the board expressed its preliminary view that the subject-matter of claim 1 in the form accepted by the opposition division appeared to be new but to lack an inventive step over the obvious combination of D3/D4 and D9 or D10.

Oral proceedings took place on 3 November 2005 in which the appellant withdrew the novelty objection.

IV. The appellant (opponent) requested:

- that the decision under appeal be set aside and that the European patent 0 812 382 be revoked;
- that documents D4', D9, D9' be admitted into the appeal proceedings; and
- that document D8 be disregarded.

The respondent (patent proprietor) requested:

- that the appeal be dismissed and that the patent be maintained on the basis of the main request filed with letter faxed on 3 October 2005 or on the basis of the first to fifth auxiliary requests filed with the letter faxed on 3 October 2005,
- that document D8 be admitted into the appeal proceedings; and
- that documents D4', D9, D9' be disregarded.

V. The appellant argued essentially that starting from the arrangement of D3/D4 it would be obvious to the person skilled in the art to include the angled inlet channel

of D9, D9' or D10 and thus to arrive at the subject-matter of claim 1 of the main or auxiliary requests.

VI. The respondent disagreed and argued that the subject-matter of claim 1 involved an inventive step for the following reasons:

- (a) D3/D4 did not disclose the characterising features of claim 1. With regard to its last feature, he referred to D8 which showed that the exhaust gas flow is evenly distributed over an inlet channel. He admitted that there is no proof that D8 is a simulation carried out on an inlet channel which is connected to a catalyser unit and having corresponding dimensions to the ones known from D3/D4.
- (b) The problem underlying the claimed invention was to provide an improved arrangement in which the light-off time is shortened and the back-pressure is reduced. Since none of the documents D9, D9' or D10 addressed this problem, the person skilled in the art had no reason to consider them.

VII. Claim 1 of the main request reads as follows (the board labelled each feature in square brackets):

"1. Arrangement for catalytic purification of exhaust gases [feature a], comprising an inlet channel (4) for supplying exhaust gases to a first catalyser unit (1) and further to a second catalyser unit (2, 3) arranged downstream of the first catalyser unit (1) [feature b], whereby the cross-sectional area of the first catalyser unit

(1) is less than the cross-sectional area of the second catalyser unit (2) [feature b1], characterized in that the inlet channel (4) is angled with respect to the longitudinal axis of symmetry of at least the first catalyser unit (1) [feature c] in a manner wherein the inlet channel (4) extends along a line which crosses said longitudinal axis of symmetry of the first catalyser unit (1) at the frontal surface of the first catalyser unit (1) [feature c.1] so that the exhaust gases are directed at an angle to the first catalyser unit (1) when said exhaust gases reach the first catalyser unit (1) [feature c.1.1]".

Claim 1 of the first and second auxiliary request respectively differs from this claim only in the following features:

First auxiliary request: feature c.1 which reads:

"in a manner wherein the inlet channel (4) is angled at the frontal surface of the first catalyser unit (1),".

Second auxiliary request: feature c.1 which reads:

"in a manner wherein the cross-sectional area through the inlet channel (4) is less than the cross-sectional area for the frontal surface of the first catalyser unit (1), onto which the exhaust gases are incident,".

Claim 1 of the third auxiliary request differs from claim 1 of the second auxiliary request only in the added feature c.1.2 which reads:

"wherein a turbulent flow in front of the first catalyser (1) is avoided and instead a laminar flow of the exhaust gases through the inlet channel (4) is obtained up until they reach the first catalyser unit (1) and wherein said laminar flow goes through a transition to a turbulent flow when the exhaust gases reach said first catalyser unit (1)."

Claim 1 of the fourth auxiliary request differs from claim 1 of the third auxiliary request only in feature c which reads:

"characterized in that the inlet channel (4) is angled with respect to the longitudinal axis of symmetry of at least the first catalyser unit (1) with an angle which is between 10° - 40° and".

Claim 1 of the fifth auxiliary request differs from claim 1 of the fourth auxiliary request only in feature c which reads:

"characterized in that the inlet channel (4) is angled with respect to the longitudinal axis of symmetry of at least the first catalyser unit (1) with an angle which is between 10° - 40° and in a manner wherein the inlet channel (4) is angled both in the height direction and the sideways direction with respect to the longitudinal direction of the first catalyser unit (1)".

Reasons for the Decision

1. The appeal complies with the requirements of Articles 106 to 108 and Rule 64 EPC and is therefore admissible.
2. *Documents D4', D8, D9, D9'*
 - 2.1 These documents were filed after the expiry of the nine-month opposition period.
 - 2.2 In the summons to oral proceedings, the opposition division expressed its preliminary opinion according to which the subject-matter of claim 1 appeared to lack novelty in view of D3/D4. In response, the respondent (patent proprietor) amended the claims substantially and filed document D8 to support his view that the subject-matter of these amended claims involves an inventive step.

Thus, D8 was filed in response to comments from the opposition division and as supporting evidence for the patent proprietor's submission that the claimed subject-matter was inventive. Therefore it cannot be considered as being "late-filed" (see e.g. T 101/87, not published in the OJ EPO, point 2).
 - 2.3 Documents D4' and D9 were filed in response to substantial amendments made in the claims and for illustrating or supporting the appellant's arguments that contrary to the reasoning set out in the contested decision, the claimed subject-matter lacks an inventive

step. Therefore, also these documents cannot be disregarded as "late-filed" (see T 101/87, *supra*, point 2).

In this respect, it is observed that D4' is a cross-sectional view of Figure 2 of D4, and D9 is a German patent specification. Both documents were filed together with the statement of grounds of appeal and can be readily understood. Considering them thus would not delay the appeal proceedings.

- 2.4 For these reasons, the board in exercising its discretion under Article 114(2) EPC decided to admit documents D4', D8 and D9 into the proceedings.
- 2.5 Document D9', a family document of D9, is cited in the decision under appeal to support the opposition division's view that the characterising features were known. Thus, D9' is already in the proceedings and the board does not have to decide on its admission.
3. *Inventive step (main request)*
 - 3.1 Problem and solution

The closest prior art arrangement is known from D3/D4. There, the prolongation of the straight portion of the longitudinal axis of the inlet channel crosses the longitudinal axis of the first catalyser unit M1 in point II which is before the frontal surface of the first catalyser unit M1. The curved portion of the longitudinal axis of the inlet channel of D3/D4 tangentially merges into the longitudinal axis of the first catalyser unit M1.

The problem underlying the claimed invention is to provide an improved arrangement in which the light-off time is shortened and the back-pressure is reduced (see patent specification, paragraph 0005).

Starting from the arrangement known from D3/D4, the solution to this problem is achieved according to claim 1 by the feature that the inlet channel extends along a line which crosses said longitudinal axis of symmetry of the first catalyser unit at the frontal surface of the first catalyser unit (feature c.1).

According to the patent specification, this has the advantage that turbulent flow in front of the first catalyser unit is avoided (see col. 4, lines 16-19) but is ensured in the channels of the first catalyser unit for its rapid heating (see col. 4, lines 33-44).

3.2 Obviousness of the solution

If the person skilled in the art tries to find a solution to the technical problem stated above, it can be expected that he would consider documents D9, D9' and D10, as they relate to similar arrangements for the catalytic purification of exhaust gases.

These documents demonstrate that feature c.1 is a matter of normal design procedure. They disclose an inlet channel (D9, D9': 22; D10: 28) extending along a straight longitudinal line which crosses the longitudinal axis of the catalyser unit (D9, D9': 12; D10: 22) at its frontal surface according to feature c.1.

This ensures that the gas flow is more evenly distributed over all channels of the catalyser unit (D9: page 3, paragraphs 1, 2; D9': page 1, lines 58-70; D10: col. 2, lines 32-36 and col. 6, lines 6-14), that its back-pressure is reduced (D9: page 3, paragraph 2; D9': page 3, lines 31-50, D10: col. 1, lines 53, 54), that the efficiency of the system is increased (see D9: pages 3, paragraphs 1, 2 and page 8, paragraphs 2, 3; D9': page 3, lines 45-48; D10: col. 1, line 55 - col. 2, line 9) and that the light-up time is reduced (D10: col. 2, lines 7-9). Thus, in essence the same technical problem is addressed in these documents.

The board concludes that it is therefore obvious to use these features in the arrangement known from D3/D4 and thus to arrive at an arrangement as defined in claim 1.

Consequently, the subject-matter of claim 1 of the main request does not involve an inventive step (Article 56 EPC).

4. *Inventive step (auxiliary requests)*

4.1 First and second auxiliary request

Claim 1 of these requests differs from that of the main request only by feature c.1.

Also this feature is known for the solution of the problem stated above from documents D9, D9' and D10. Figs. 1 and 3 of D9, D9' and, for example, fig. 8 of D10 clearly show that the inlet channel is angled at the frontal surface of the first catalyser unit. The

documents also show that the inlet channel cross-sectional area is less than the cross-sectional area for the frontal surface of the first catalyser unit onto which the exhaust gases are incident (see also D10, col. 6, lines 21-27).

In view of the findings regarding the main request, the board concludes that it is also obvious to use these features in the arrangement known from D3/D4 and thus to arrive at an arrangement as described in claim 1.

4.2 Third auxiliary request

Claim 1 of this request differs from claim 1 of the second auxiliary request only by its last feature, i.e. feature c.1.2 which is not structural but describes an effect.

As already pointed out with respect to claim 1 of the second auxiliary request, is it obvious to combine features a, b, b1, c, c.1 and c.1.1.

According to column 4, lines 16-19 of the description of the patent in suit, this combination provides that the turbulent flow in front of the first catalyser is avoided and instead a laminar flow of the exhaust gases through the inlet channel is obtained until they reach the first catalyser unit and that the laminar flow goes through a transition to a turbulent flow when the exhaust gases reach the first catalyser unit. Thus, the achieved effects are identical to the effects described in feature c.1.2 of claim 1.

The board therefore concludes that with the obvious combination of the structural features a, b, b1, c, c.1 and c.1.1, an arrangement is provided that has all features of claim 1 and in particular achieves the effects described in feature c.1.2.

4.3 Fourth and fifth auxiliary request

Compared to the third auxiliary request, only feature c was amended, i.e. the angle of the inlet channel with respect to the longitudinal axis of the first catalyser unit (fourth and fifth auxiliary request) and its direction (fifth auxiliary request) is specified.

However, the board has no reason to alter the foregoing conclusions, because the amended features are also known from documents D3/D4, which are manufacturing drawings to scale. In D4, the angle between the longitudinal axis of the inlet channel and the catalyser unit can be measured to be 39,5°. Fig. 1 of D3 is a side view and fig. 2 is a plan view of the arrangement for catalytic purification of exhaust gases. In these views, it can be seen that the inlet channel is angled both in the height direction (see fig. 1) and the sideways direction (see fig. 2) with respect to the longitudinal direction of the first catalyser unit.

Thus, these features do not add anything which could be regarded as non-obvious.

4.4 Therefore, also the subject-matter of claim 1 according to the auxiliary requests does not involve an inventive step (Article 56 EPC).

5. *Arguments of the respondent*

5.1 The board does not share the respondent's view that D3/D4 did not disclose features c and c.1.1 of claim 1.

5.1.1 As can be clearly seen in D3/D4, at least the left hand portion of the curved inlet channel is angled with respect to the longitudinal axis of symmetry of catalyser units M1 and M2.

Thus, feature c is disclosed in D3/D4.

5.1.2 Whether the gas flow is parallel to the first catalyser unit or directed at an angle thereto depends on its flowing state and the geometry of the inlet channel.

In this respect, it has to be taken into consideration that the exhaust from the engine is not a constant, invariable gas flow. It varies depending on the operation of the engine and the exhaust gas velocity, amount and pressure.

The short length of the cylindrical portion at the right end of the inlet channel therefore cannot ensure that such a variable gas flow is completely and evenly re-directed in the direction of the longitudinal axis of the catalyser unit. The board is convinced that at least a portion of the gas flow (e.g. in the lower half of the cylindrical portion next to the inner curvature of the inlet channel) is directed at an angle to the first catalyser unit M1 when said exhaust gases reach the first catalyser unit (such as shown, for example in D4').

Thus, also feature c.1.1 is known from D3/D4.

- 5.1.3 The respondent referred to D8 to demonstrate that the exhaust gas flow according to D3/D4 is evenly distributed over the inlet channel so that it exits parallel to the axis of the first catalyser unit. The board does not share this view.

Firstly, D8 shows the simulation of the flow in a curved pipe but not the real situation in a curved pipe which is connected to an inlet channel. It matters, however, whether the pipe outlet is open or connected to, for instance, a catalyser unit. In the latter case the flow in front of the catalyser unit is turbulent (see patent in suit, description paragraph 0004), which causes the gas flow to impinge on the frontal surface of the catalyser unit at an angle, in contrast to what is shown in D8.

Secondly, it does not appear that it has been taken into consideration for the simulation of D8 that the exhaust from the engine is not a constant, invariable gas flow.

Thirdly, the cylindrical portion at the right end of the channel is much longer in D8 than in D3/D4. The length, however, is decisive for re-directing the gas flow.

Therefore, it cannot be deduced from D8 how the real gas flow is in a curved pipe which is connected to an inlet channel.

5.2 The board does not share the respondent's view that the documents D9, D9' or D10 addressed a different problem and would not be considered by the person skilled in the art.

These documents refer, as explained in more detail above (see point 3.2 above), to the same technical field, address in essence the same technical problem and provide in essence the same solution to this problem as the subject-matter of claim 1. Therefore, it can be expected that these documents would be considered by the person skilled in the art when he tries to find a solution to the technical problem stated above.

5.3 The appellant argued that the effect described in feature c.1.2 of claim 1 according to the third auxiliary request was not known from D9, D9' or D10.

However, whether this effect is known or not from these documents does not matter in this case, because the only decisive fact is whether this effect is achieved or not by the obvious combination of the structural features of claim 1 (see point 4.2 above).

5.4 Therefore, the board had no reason to alter the above findings in points 3 and 4.

6. Having regard to the above considerations, the objections put forward by the appellant under Article 100(a) EPC prejudice the maintenance of the patent in suit.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. European patent 0 812 382 is revoked.

The Registrar:

The Chairman:

G. Magouliotis

M. Ceyte