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**Datasheet for the decision
of 13 February 2025**

Case Number: T 1499/23 - 3.3.05

Application Number: 15780731.4

Publication Number: 3131660

IPC: B01D53/94

Language of the proceedings: EN

Title of invention:
ZONED CATALYST COMPOSITES

Patent Proprietor:
BASF Corporation

Opponent:
Umicore AG & Co. KG

Headword:
ZONED CATALYST COMPOSITES/BASF

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
Novelty - (no)
Inventive step - effect not made credible within the whole
scope of claim

Decisions cited:

Catchword:



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Case Number: T 1499/23 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 13 February 2025

Appellant: BASF Corporation
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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 9 June 2023
revoking European patent No. 3131660 pursuant to
Article 101(3) (b) EPC.**

Composition of the Board:

Chairman G. Glod
Members: J. Roider
O. Loizou

Summary of Facts and Submissions

I. The appeal lies from the decision of the opposition division to revoke European patent EP 3 131 660 B1.

II. The following documents, which had already been cited in the opposition proceedings, are relevant here:

D12 WO 2013/088152 A1
D15 US 2012/0124974 A1

III. Claim 1 of the main request reads:

- [1] *A zoned catalyst composite for an exhaust stream of an internal combustion engine comprising:*
- [1.1] *a monolithic carrier comprising a plurality of longitudinal passages;*
- [1.2] *a zone that begins from one end of the carrier and extends axially along the longitudinal passages*
- [1.3] *such that the zone has a flat profile,*
- [1.4] *the zone comprising a catalytic material that is effective to convert and/or trap one or more components in the exhaust stream;*
- [1.5] *wherein the distance of the zone from the one end of the carrier varies in the range of 0 to 15 % from passage-to-passage as measured by digital x-ray or optical microscopy;*
- [1.6] *wherein the zone comprises up to one inch (2.54 cm) of the carrier's length."*

IV. The amendment to claim 1 of auxiliary request 1 adds feature [1.7] at the end of claim 1 of the main request:

[1] to Identical to features [1] to [1.6] of the
[1.6] main request.

[1.7] *" , wherein the zone is formed from a washcoat that comprises the catalytic material in combination with a rheology system having one or more organic compounds comprising a polymeric thickener, a surfactant, and/or a dispersant."*

V. The amendment to claim 1 of auxiliary request 2 changes the category of claim 1 of the main request to a process of making a zoned catalyst composite and adds feature [1.7*] at the end of it:

[1] *"A process of making a zoned catalyst composite for an exhaust stream of an internal combustion engine comprising:"*

[1.1] Identical to
to features [1.1] to [1.6]
[1.6] of the main request.

[1.7*] *, characterized by using a washcoat that comprises the catalytic material in combination with a rheology system having one or more organic compounds comprising a polymeric thickener, a surfactant, and/or a dispersant for forming the zone."*

VI. Compared with claim 1 of auxiliary request 2, claim 1 of auxiliary request 3 differs only in the deletion of

"or" at the end of the claim:

[1.7**] , characterized by using a washcoat that comprises the catalytic material in combination with a rheology system having one or more organic compounds comprising a polymeric thickener, a surfactant, and/or a dispersant for forming the zone.

VII. The key arguments of the appellant (patent proprietor) can be summarised as follows:

Main request, Article 54(1) and (2) EPC

In paragraphs [0001] and [0018], the patent in suit provided a definition of the feature "flat profile". D12 referred only generally to length tolerances on page 8, last paragraph. The tolerances in D12, page 8, 2nd paragraph related to tolerances of the zone length when comparing different catalysts in a production series. The coverage with catalyst inside the passages was not disclosed in D12. The burden lay on the opponent to prove lack of novelty.

Auxiliary request 1, Article 54(1) and (2) EPC

The rheology system made it possible to achieve the flat profile. D12 was completely silent regarding the composition of the slurry.

Auxiliary request 2, Article 56 EPC

The teachings of D12 and D15 could not be combined. D12 and D15 related to different catalyst technologies, so the skilled person would not consider a process of making a product according to D15 suitable for the process of making a product according to D12.

Auxiliary request 3, Article 56 EPC

The rheology system required all three substances and thus provided the flat profile (see patent in suit paragraphs [0034] and [0036]), which was not rendered obvious by D15.

VIII. The key arguments of the opponent (respondent) are reflected in the reasons for the decision.

IX. Substantive requests:

(a) The appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of the main request, filed on 24 May 2022, or, in the alternative, on the basis of one of the auxiliary requests 1-3 as annexed to the statement of grounds of appeal.

(b) The respondent requested that the appeal be dismissed.

Reasons for the Decision

1. Claim interpretation

The appellant argued that, contrary to the finding of the opposition division in the decision under appeal, feature [1.3] was clear. The impugned decision moreover contained a misinterpretation of feature [1.5].

This is not convincing.

The term "flat" in the feature "flat profile" is a

relative term, which requires an interpretation of the boundaries.

Even if the description paragraphs [0001] and [0018] were to be consulted, as argued by the appellant (statement of grounds of appeal, paragraph 1.2), this would not lead to a different conclusion because, according to the description, the feature "flat profile" means that the zone extends from one end of the carrier over a distance which is substantially uniform. However, the expression "substantially uniform" is still ambiguous.

The open-ended wording of feature [1.4] ("*comprises*") implies that the zone is not identical to the area in which the passages are covered with catalytic material (features [1.2] and [1.4]). Adopting the opposition division's interpretation, it is assumed that the length of the zone is defined as the mean length of the catalyst coverage of the passages. The range from 0 to 15% (feature [1.5]) refers to the deviation of the length of catalyst coverage of a passage from the mean (first sentence of paragraph 3.4 of the reasons of the impugned decision).

Hereinafter, this latter feature is referred to as the "variability" feature.

2. Main request, novelty, Article 54(1) and (2) EPC

Document D12 discloses the subject-matter of claim 1.

2.1 Example DOC 2 (page 15) relates to a zoned diesel oxidation catalyst (hence feature [1]) made from a first diesel oxidation catalyst (DOC), which in turn

was made from a brick with a diameter of 266.7 mm and a length of 101.6 mm (D12: page 14, lines 32-33 with page 15, line 10).

According to D12, a brick is a monolithic carrier with a honeycomb structure (D12: page 10, line 32 to page 11, line 2). It was uncontested that feature [1.1] is therefore disclosed.

According to example DOC 2, for the production of the 10 mm-wide catalytic upstream zone at the entry of the diesel oxidation catalyst for higher oxidation activity of hydrocarbons (D12: page 7, lines 23-25), a DOC already containing a first catalytic coating was dipped into a Pt:Pd catalyst slurry (D12: page 14, lines 32-33 with page 15, line 10), thus anticipating features [1.2], [1.4] and [1.6]. When the DOC with the above cylindrical geometry (\emptyset 266.7 mm x 101.6 mm) is dipped about 10 mm into a Pt:Pd catalyst slurry, the upstream zone at the entry has a flat profile (feature [1.3]).

According to D12, the length of the upstream zone preferably does not deviate by more than 10%, preferably by more than 5% or even by more than 1%, from the mean length of the upstream zone (D12: page 8, lines 14-20).

The invention disclosed in D12 is illustrated by the examples (D12: page 14, line 29). There is no indication that the examples deviate from the characteristics disclosed in D12, page 8, lines 14-20.

The variability of the present claim is 15% and thus significantly exceeds the maximum variability of 10% according to D2, example DOC 2.

2.2 The appellant argued that the variability in D12 referred to the stripe of catalytic material visible on

the DOC on the outer circumference after the immersion into the slurry. The deviation from the mean in D12, page 8, 2nd paragraph referred to the variation of the width of the stripe if the DOCs are produced in series, which could be derived from the paragraph bridging pages 8 and 9.

This is not convincing. D12, page 8, 2nd paragraph does not relate to the production of a series of DOCs. It refers to the tolerances the upstream zone must meet, as apparent from the direct article "the". Moreover, the upstream zone is not only the stripe on the outer circumference after the immersion into the slurry. The upstream zone is the key feature in D12. It provides a higher oxidation activity for hydrocarbons than the remainder of the diesel oxidation catalyst (page 7, lines 23-25). This could not be ensured if the catalyst coverage was only provided on the outside of DOC or differed significantly from passage to passage. It is therefore immediately evident that D12 aims at providing catalyst coverage inside the channels up to the level of dipping the DOC into the slurry.

- 2.3 The appellant further argued that D12 did not disclose what happened inside the DOC and unspecifically referred to the skilled person's knowledge in 2013. It argued that the method in D12 resulted in a longitudinal gradient coating, whereas the washcoat according to the subject-matter of claim 1 did not. It also referred to D12, claims 15-17, which describe various methods of making the upstream zone. The burden lay on the opponent to prove that the inside of the DOC was flat.

According to example DOC 2, the DOC is dipped into the slurry. There is nothing in D12 to suggest that the

washcoat of example DOC 2 has the variability alleged by the appellant. On the contrary, D12 explicitly discloses that the upstream zone preferably does not deviate by more than 10%, preferably by more than 5% or even by more than 1%, from the mean length of the upstream zone (D12: page 8, lines 14-20).

The appellant's argument relies on the fact that the explicit objective of D12 was actually not achieved, which is an allegation in its favour for which it bears the burden of proof (Case Law of the Boards of Appeal of the EPO, 10th edition, 2022, I.C.3.5.1)). However, such proof is not provided.

- 2.4 The appellant also argued that the variability of any length in D12 was $\pm 10\%$, and preferably $\pm 5\%$.

The interpretation of example DOC 2 is not based on a disclosure that generally specifies the variability for length dimensions disclosed in D12, page 8, line 31 to page 9, line 2.

It is, rather, based on the variability of the length of the upstream zone specifically discussed in lines 14-22 of page 8 in D12.

D12 in example DOC 2 discloses directly and unambiguously all the features of claim 1. The subject-matter of claim 1 thus lacks novelty.

3. Auxiliary request 1, novelty, Article 54(1) and (2) EPC

The amendment includes a product-by-process feature incorporating a rheology system with an extremely broad scope. The system only requires the presence of one of the three substances with no minimum or maximum concentration during the coating process. It is not

convincing that such a rheology system will have a discernible effect on the washcoat across the whole range.

Since the appellant is relying on the fact that the added product-by-process feature confers novelty on the product over the whole claimed range, it bears the burden of proof. However, such proof is not provided.

The subject-matter of claim 1 thus lacks novelty for the same reasons as for claim 1 of the main request.

4. Auxiliary request 2, inventive step, Article 56 EPC

The subject-matter of claim 1 of auxiliary request 2 concerns a process of making a zoned catalyst.

4.1 The appellant considers D12 to be the most suitable starting point for an inventive-step objection. As set out above (point 2.1), it also discloses a process for making a zoned catalyst.

4.2 Technical problem

The problem the patent aims to solve is, according to the appellant, to provide a method for producing a zoned catalyst with improved catalytic activities, such as enhanced light-off, while at the same time reducing soot load and pressure drop (statement of grounds of appeal, paragraph III.2.5).

4.3 Proposed solution

It is proposed to solve the problem by the features of claim 1, which differs from D12 by the rheology system having one or more organic compounds comprising a

thickener, a surfactant and/or a dispersant.

Contrary to the appellant's view, it does not differ with respect to features [1.3] (flat profile) and [1.5] (variability feature) for the reasons already set out for the main request.

4.4 Success of the solution

Paragraphs [0035] and [0036] of the patent in suit state:

"[0035] The washcoat for the zone is formed from a catalytic material in conjunction with a rheology modifier and/or mixture of modifiers. The rheology modifier is made up of compounds that impact the viscosity and shear thinning properties of the washcoat having a certain solids loading, and that likewise suppress capillary action of the washcoat in the passages of the substrate. [...]

[0036] The rheology modifier may have, for example, one or more organic compounds comprising a polymeric thickener, a surfactant, and/or a dispersant. This combination will be referred to as a rheology system herein. [...]"

When the zoned catalyst is produced by dipping the honeycomb structure into the slurry, the penetration depth of the slurry can be more effectively controlled if the capillary action is suppressed.

However, there is no indication, nor is it convincing, that the mere presence of the organic compounds mentioned in paragraph [0036] in any concentration and any ratio will produce the effect described in paragraph [0035], which is a prerequisite for solving the problem posed.

Furthermore, the process according to claim 1 is not limited to a coating process in which capillary forces play a part, nor to a honeycomb structure in which capillary forces can be observed.

Therefore it is not credible that the problem is solved over the whole range claimed.

4.5 Reformulation of the technical problem

The technical problem as stated by the appellant must hence be reformulated to a less ambitious problem, which is to provide an alternative process for producing a zoned catalyst.

4.6 Obviousness

D15 discloses that the washcoat comprising Pt and Pd may include a polymeric thickener and surfactants (D15: paragraph [0052]) to produce a zoned catalyst of the present type (D15: paragraph [0008]).

To solve the not very ambitious technical problem of providing an alternative, the skilled person would, starting from D12, consider a slurry comprising a thickener as one of many possible alternatives.

The appellant argued that D12 concerned a flow-through catalyst with the catalytic active material on the walls. D15 disclosed a wall flow filter. The appellant argued that in this type of filter the catalytic material was mainly deposited inside the walls and only partly on their surface. Particularly, D15 did not disclose depositing the catalyst on the walls. Therefore the disclosure in D15, paragraph [0052] would not be considered by the skilled person.

This is not convincing.

If the slurry in D15 is applied so as to allow the catalyst to penetrate into the walls, the slurry must have passed through the passages of the carrier. Paragraph [0008] of D15 explicitly discloses that the second washcoat (the one including thickener and surfactant) is disposed on the walls of the passages of the wall flow monolith. There is no reason apparent why the skilled person would not have considered the disclosure in paragraph [0052] of D15. Concerning the application of the slurry, D12 and D15 are not incompatible.

4.7 Therefore the subject-matter of claim 1 lacks an inventive step in view of D12 in combination with D15 (Article 56 EPC).

5. Auxiliary request 3, inventive step, Article 56 EPC

Claim 1 of auxiliary request 3 is based on claim 1 of auxiliary request 2 whereby the "/or" in the last line was deleted.

5.1 As emphasised by the respondent, due to the wording "having *one or more organic compounds comprising*", feature [1.7**] does not require that all three substances mentioned (polymeric thickener, surfactant, dispersant) have to be present.

This amendment therefore does not remedy the deficiency under Article 56 EPC of auxiliary request 2, so the same objection applies.

5.2 Consequently the subject-matter of claim 1 of auxiliary request 3 also lacks an inventive step in view of D12 in combination with D15 (Article 56 EPC).

6. In summary, none of the requests is allowable.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



C. Vodz

G. Glod

Decision electronically authenticated