

Appeal No. 96-3486
Application No. 08/291,565

THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today
(1) was not written for publication in a law journal and
(2) is not binding precedent of the Board.

Paper No. 23

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DANIEL DURAND, GIL MABILON
and ISABELLE GUIBARD

Appeal No. 96-3486
Application No. 08/291,565¹

ON BRIEF

Before WINTERS, WILLIAM F. SMITH, and LORIN, Administrative
Patent Judges.

LORIN, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the

¹ Application for patent filed August 16, 1994.
According to appellants, this application is a
continuation-in-part of application 07/243,490, filed May
16, 1994, now abandoned.

final

rejection of claims 1-6 and 8-29, all the claims pending
in

the application. Claims 1, 25, 26, 27 and 28 are

illustrative of the subject matter on appeal and read as
follows:

1. A process for producing a catalyst that contains at least one refractory inorganic oxide, which is α -alumina, γ -alumina, Δ -alumina, eta-alumina, theta-alumina, kappa-alumina, rho-alumina, chi-alumina, silica, a silica-alumina, a zeolite, a silica-magnesia, titanium oxide, zirconium oxide, or a mixture thereof; at least one iron oxide; at least one cerium oxide; at least one catalytically active metal A from Group VIB, VIIB, VIII, or IB of the Periodic System; and optionally at least one compound of metal B from Group IA, IIA, IVB, or rare earths having atomic numbers 57-71 inclusive, all deposited in the form of a porous layer on a ceramic or metal substrate, said process comprising:

(a) in an atomizing device having an inlet and an outlet, atomizing an aqueous suspension of at least one powder of said refractory inorganic oxide, at least one soluble cerium salt, at least one soluble iron salt, optionally at least one portion of at least one insoluble compound and/or at least one soluble salt of said metal B, and optionally at least one portion of at least one metal A that has been previously deposited by impregnation of at least one of a precursor thereof on at least one of the solid constituents that are present, so as to recover a powder, and optionally calcining the resultant powder;

(b) transferring the resultant powder from step (a) back into suspension while optionally adding said compound of metal B, as well as,

- optionally at least one bonding agent and optionally at least one mineral acid or organic acid;
- (c) coating a ceramic or metal substrate with the suspension obtained in step (b);
- (d) calcining the coated substrate from step (c);
- (e) impregnating said coated and calcined substrate with any remainder or all of said precursor of metal A; and
- (f) heat-activating said coated, calcined, and impregnated substrate obtained from (e).

25. A catalyst produced according to the process of claim 1.

26. In the catalytic conversion and/or elimination of pollutants present in the exhaust gases of internal combustion engines, the improvement comprising passing said gases in contact with a catalyst according to claim 25.

27. In a process for producing a catalyst containing a ceramic or metal substrate having deposited thereon a porous layer of at least one refractory inorganic oxide, which is α -alumina, γ -alumina, Δ -alumina, eta-alumina, theta-alumina, kappa-alumina, rho-alumina, chi-alumina, silica, a silica-alumina, a zeolite, a silica-magnesia, titanium oxide, zirconium oxide, or a mixture thereof; at least one iron oxide; and at least one cerium oxide; at least one metal A, and, optionally, at least one compound of metal B; said process comprising forming a powder and applying said powder to said substrate, the improvement in forming said powder which comprises atomizing an aqueous suspension of at least one powder of said refractory inorganic oxide, at least one soluble cerium salt, at least one soluble iron salt, optionally at least one portion of at least one insoluble compound and/or at least one soluble salt of said metal B, and optionally at least one portion of at least one metal A that was previously deposited by impregnation of at least one precursors [sic] thereof on at least one of the solid constituents that are present so as to recover a powder.

28. An atomized powder as produced by the process of claim 27.

The references relied upon by the examiner are:

Brunelle et al. (Brunelle)	4,378,307	Mar. 29, 1983
Koberstein et al. (Koberstein)	5,024,985	June 18, 1991

Claims 1-6 and 8-29 are rejected under 35 U.S.C. §

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as unpatentable over Brunelle and Koberstein. We reverse and make new grounds of rejection under 37 CFR § 1.196(b).

The Claimed Invention

The final rejection, the brief and examiner's answer all summarize the invention as being directed to a process for preparing a catalyst. But as seen from claims 1, 25, 26, 27 and 28 on appeal, the present invention is also directed to the atomized powder and catalyst produced by that process, and the use of the catalyst in catalytic conversion and/or elimination of pollutants present in exhaust gases of internal combustion engines.

As seen in claims 1 and 27, a porous layer of at least four substances: a refractory inorganic oxide, an iron oxide; a cerium oxide; and a catalytically active metal such as platinum, rhodium, or palladium, is deposited on a ceramic or metal substrate to produce a catalyst. The refractory inorganic oxide, according to the supporting specification (sentence bridging pages 1 and 2), serves as a carrier for the catalytically active phase on the substrate and is selected from a group limited to certain crystalline aluminas, zeolite, silica-magnesia, titanium or zirconium oxides, or mixtures thereof. The cerium and iron oxides (page 2, lines 5-19) act to stabilize the catalyst during operation. To this extent, the claimed methods cover conventional subject matter.² The inventive feature resides, more particularly, in the manner by which these substances are combined.

The supporting specification states that a "new technique has now been discovered for introducing such oxides, particularly iron and cerium oxides, into the

² See claim 1 of Brunelle, cited in both the supporting specification (page 2, line 16) and the final rejection.

catalyst, while enhancing their beneficial effects on activity" (page 2, lines 26-29). It goes on to say that "[t]he invention more particularly defined is directed to step (a) [see claim 1]: atomizing an aqueous suspension containing at least one mixture of a powder of a refractory inorganic oxide with a solution of at least one cerium oxide precursor salt and at least one iron oxide precursor salt and, optionally, other compounds, soluble or insoluble, that are part of a composition suitable to form a porous layer . . . to be deposited on the substrate. . ." (page 4, lines 16-25).

Atomization, though a conventional³ method for making powder, contrasts with the prior art techniques for achieving an incorporation of the refractory inorganic oxide, and cerium and iron salts. According to appellants

(specification, page 2, lines 20-24), the prior art techniques include impregnating the refractory inorganic oxide. This difference in technique has an implication on the performance of the catalyst. Tests (specification,

³ Specification, page 8, lines 31-33: "In order to achieve the atomization step (a) of the process according to the invention, every conventional apparatus can be used."

Table 1, page 23) on a catalyst prepared by applying an atomized powder of inorganic oxide, cerium and iron salts, to a substrate, show it is more effective in converting carbon monoxide, nitrogen oxides, and hydrocarbon pollutants of exhaust gases than, for example, a catalyst prepared by first grinding these materials or impregnating them into the support.

The Prior Art

Brunelle teaches the preparation of a catalyst comprising a refractory oxide support, and an active phase comprising cerium, iron, and at least one metal selected from platinum and palladium. Two alternative methods are disclosed (column 4, lines 46-50):

1. impregnation of the support with a solution of cerium and iron compounds, followed by impregnation with a solution of precious metals, or
2. "by introduction of the metals comprising the active phase during the actual production of the support."

The examiner states that "[a]pplicant is practicing the

second option" (Final Rejection, page 6).

To fully understand what Brunelle means by this "second option," one must refer to an earlier discussion (column 3) of seven different techniques for preparing the support. Each of these "actually produce" the support. Among them is a technique ((5)) involving atomization and calcination of an aqueous suspension of ultrafine boehmite, pseudo-boehmite and/or amorphous alumina. In other words, because Brunelle teaches introducing the metals during actual production of the support, and because atomization and calcination of an aqueous suspension is one of the ways to actually produce the support, it would follow, according to the examiner, that Brunelle teaches introducing the metals into aqueous suspension and then atomizing the result.

The examiner correctly recognizes that "Brunelle does not teach the surface-coating of an inert ceramic or metallic substrate with the atomized powder as applicant now claims" (Final Rejection, page 7). In fact, while Brunelle may suggest atomizing an aqueous suspension of cerium and iron compounds, the suspension does not include any of the

refractory oxides listed in appellants' claims; ultrafine boehmite, pseudo-boehmite and/or amorphous alumina are employed instead. To overcome this inconsistency, Koberstein is relied upon.

Koberstein teaches atomizing a refractory oxide of the type claimed, albeit with a cerium salt only. Koberstein prepares a catalyst by spray-drying an aqueous suspension of an aluminum oxide, such as boehmite or Δ -alumina, and a cerium compound, and coating a substrate. Though not a part of the suspension, the support can be doped with iron oxide.

The examiner concludes that

it would have been obvious at the time the invention was made . . . to follow the combined teachings of Brunelle and Koberstein and obtain the atomized particles (powders) containing alumina-ceria-ferric oxide by adding soluble Ce and Fe components to an alumina suspension, followed by spray-drying, as taught by both references, and coat an inert ceramic or metallic substrate or structure with the powder, followed by calcination and impregnation with noble metals and activation of the catalyst. (Final Rejection, page 7).

Declaration under 37 CFR § 1.132

For the purposes of this appeal, we do not pass on the prima facie case of obviousness because, even if the case were made, the declaration evidence would rebut it.

At the outset, as was pointed out in In re Piasecki, 745 F.2d 1468, 1742-73, 223 USPQ 785, 788 (Fed. Cir. 1984):

When prima facie obviousness is established and evidence is submitted in rebuttal, the decision-maker must start over. Though the burden of going forward to rebut the prima facie case remains with the applicant, the question of whether that burden has been successfully carried requires that the entire path to decision be retraced. An earlier decision should not, as it was here, be considered as set in concrete, and applicant's rebuttal evidence then be evaluated only on its knockdown ability. Analytical fixation on an earlier decision can tend to provide that decision with an undeservedly broadened umbrella effect. Prima facie obviousness is a legal conclusion, not a fact. Facts established by rebuttal evidence must be evaluated along with the facts on which the earlier conclusion was reached, not against the conclusion itself. Though the tribunal must begin anew, a final finding of obviousness may of course be reached, but such finding will rest upon evaluation of all facts in evidence, uninfluenced by any earlier conclusion reached by an earlier board upon a different record. In re Rinehart, 531 F.2d 1048, 1052, 189 USPQ 143, 147 (CCPA 1976).⁴

⁴ "If rebuttal evidence of adequate weight is produced, the holding of prima facie obviousness, being but a legal inference from previously uncontradicted evidence, is dissipated. Regardless of whether the prima facie case

All the evidence of nonobviousness must be carefully weighed in deciding whether a prima facie case of obviousness has been overcome.

The Declaration⁵ under 37 CFR § 1.132 (Paper No. 19, filed February 23, 1996) seeks to distinguish the claimed invention over the prior art on two grounds:

- a) as demonstrated in Experiment I, the use of Brunelle's pseudo-boehmite instead of a crystalline alumina yields a catalyst with inferior efficiency toward reducing carbon monoxide pollutants; and
- b) as demonstrated in Experiment II, the pollutant-conversion performance of a catalyst possessing a coating made from an atomized suspension of cerium nitrate and gamma-type alumina, followed by ferric nitrate impregnation, as suggested by Koberstein, is less effective than one prepared in accordance with the claimed methods; that is, when the iron compound is incorporated along with the cerium salt and crystalline alumina oxide into the aqueous suspension that is subsequently atomized.

would have been characterized as strong or weak, the examiner must consider all of the evidence anew." In re Piasecki, 745 F.2d 1468, 1742-73, 223 USPQ 785, 788 (Fed. Cir. 1984).

⁵ This refers to the second declaration. Due to an apparent copying error, the first declaration was filed (Paper No. 16, filed January 16, 1996) absent results for Experiment I. Examiner's response (Advisory Action, Paper No. 17, mailed February 5, 1996) to this Declaration was based on incomplete information.

The examiner's response⁶ to this evidence is largely dismissive. In fact, even though appellants' brief places extensive reliance on the Declaration evidence to overcome the prima facie case, the examiner's answer never addresses it. This is improper. As emphasized by the court in Connell v. Sears, Roebuck & Co., 722 F.2d 1542, 1549, 220 USPQ 193, 199 (Fed. Cir. 1983):

It is inappropriate and injudicious to disregard any admissible evidence in any judicial proceeding. Hence all relevant evidence on the obviousness issue must be considered before a conclusion is reached. Stratoflex, Inc. v. Aeroquip Corp., 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983).

In other words, evidence under 37 CFR § 1.132 must be

⁶ "The declaration and accompanying comments are not persuasive to overcome the rejection. As explained in the final rejection, both the references teach as alternative embodiment - the preparation of the catalyst by spray drying a suspension containing the support and soluble salts of Ce and Fe. One could have taken this teaching and compared with other possible alternative method of preparation of the catalyst and established the comparative advantages of the catalyst prepared by the prior art method." Advisory Action, Paper No. 20, mailed March 6, 1996.

considered and, here, should have been. As mandated by the court in Rinehart, 531 F.2d at 1052, 189 USPQ at 147 and Piacecki, 745 F.2d at 1742-43, 223 USPQ at 788, we have evaluated all the evidence anew.

Experiment I compares the effect pseudo-boehmite and gamma-type alumina have on catalytic activity. Keeping all other constituents and conditions the same, the gamma-type alumina of Example 1 of the supporting specification was substituted for pseudo-boehmite. The results show that pseudo-boehmite increases the temperature at which 50% of the initial CO is converted to CO₂ by 32°C. This is indicative of decreased efficiency for catalysts employing Brunelle's boehmite.

Experiment II is directed at Koberstein, which teaches atomizing a refractory oxide of the type claimed, although only in combination with a cerium salt. It compares results for a catalyst prepared by atomizing the claimed suspension of cerium and ferric nitrates and gamma-type alumina against a catalyst prepared the same way but, as Koberstein teaches, adding the iron salt through a post-

impregnation step instead. Appellants show that the former catalyst, illustrating the claimed method, exhibits greater efficiency in converting carbon monoxide, nitrous oxides and hydrocarbons. Experiment II therefore demonstrates the critical function iron salts play in improving the catalyst's performance and that this function is enhanced by including them in the suspension.

Brunelle does not teach or suggest atomizing with any of the refractory oxides listed in the claims. Koberstein teaches this but does not suggest also including iron salts. Therefore, in order to apply Brunelle, which is limited to boehmite and amorphous alumina, and Koberstein, which is limited to a crystalline alumina/cerium salt combination, against the claimed invention, one must take the position that, in the preparation of catalysts using the atomization technique, the type of refractory inorganic oxide is immaterial - the result of using one is equivalent to using any other - and not affected by the presence or absence of iron salts in the atomized powder. In light

of the aforementioned results from the Experiments, which support the criticality of the selection of refractory inorganic oxides and use of iron salts in the atomized powder, this position necessarily fails.

The prior art teaches atomizing aqueous suspensions of amorphous alumina, cerium and iron salts (Brunelle), and cerium and crystalline alumina (Koberstein). After reviewing the results of both Experiments, it is fair to conclude that appellants' invention involves selecting the right refractory inorganic salt to atomize and combining it with at least one cerium salt and one iron salt. The evidence demonstrates a criticality in combining the cerium salt, iron salt and one of the prescribed refractory inorganic oxides. Only the appellants, not the prior art, could have forecast this relationship. After balancing all the evidence of obviousness against that of nonobviousness, and taking into consideration the experimental data, assuming arguendo that examiner established a prima facie case of obviousness, we find the evidence of nonobviousness clearly sufficient to overcome any such

prima facie case of

obviousness. Consequently, the rejection of claims 1-6 and 8-29 before us, directed to the methods, the atomized powder, the catalysts made thereby and the use of the catalyst in the conversion of pollutants present in exhaust gases of internal combustion engines, is reversed.

New Grounds of Rejection under 37 CFR § 1.196(b)

Under the provisions of 37 CFR § 1.196(b), we make the following new grounds of rejection.

Claim 28 is rejected under 35 U.S.C. § 112, fourth paragraph, as being in improper dependent form. This claim does not include every limitation of the claim from which it depends and could be infringed without also infringing the basic claim (see MPEP § 608.01(n)). Specifically, this claim is directed to "[a]n atomized powder as produced by the process of claim 27." The method of claim 27, however, does not produce an atomized powder but rather a catalyst containing a substrate and a porous layer. Since claim 28 does not include the

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substrate and porous layer, it does not include every limitation of the basic claim.

Claims 15 and 29 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite.

"The gas" in claim 15 lacks antecedent basis in claim 1. A mistake in claim dependency is probably the reason. See claim 14.

Claim 29 is incomplete. The phrase in question reads "the atomized free to form." The specification would support inserting "flowing powder" after the word "free."

This decision contains new grounds of rejection pursuant to 37 CFR § 1.196(b) (amended effective Dec. 1, 1997, by final rule notice, 62 Fed. Reg. 53,131, 53,197 (Oct. 10, 1997), 1203 Off. Gaz. Pat. & Trademark Office 63, 122 (Oct. 21, 1997)). 37 CFR § 1.196(b) provides that "[a] new ground of rejection shall not be considered final for purposes of judicial review."

37 CFR § 1.196(b) also provides that the appellant, WITHIN TWO MONTHS FROM THE DATE OF THE DECISION, must exercise one of the following two options with respect to

the new ground of rejection to avoid termination of proceedings (37 CFR § 1.197(c)) as to the rejected claims:

- (1) Submit an appropriate amendment of the claims so rejected or a showing of facts relating to the claims so rejected, or both, and have the matter reconsidered by the examiner, in which event the application will be remanded to the examiner. . . .
- (2) Request that the application be Reheard under § 1.197(b) by the Board of Patent Appeals and Interferences upon the same record. . . .

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

REVERSED - 37 CFR § 1.196(b)

SHERMAN D. WINTERS)	
Administrative Patent Judge)	
)	
)	
)	
)	BOARD OF PATENT
WILLIAM F. SMITH)	APPEALS
Administrative Patent Judge)	AND
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)	

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APPEAL NO. 96-3486 - JUDGE LORIN
APPLICATION NO. 08/291,565

APJ Lorin

APJ Winters

APJ William F.

Smith

DECISION: **REVERSED/37 CFR 1.196(b)**
Prepared By: S. DAVIS

DRAFT TYPED: 03 Dec 99

FINAL TYPED: