UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DAVID W. LEYSHON, LAWRENCE J. KARAS,
YUAN-ZHANG HAN, and KEVIN M. CARROLL

Appeal 2008-4562
Application 10/387,849
Technology Center 1700

Decided: December 12, 2008

Before CHARLES F. WARREN, TERRY J. OWENS, and
MICHAEL P. COLAIANNI, *Administrative Patent Judges*.

OWENS, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

The Appellants appeal from a rejection of claims 1-20, which are all of the pending claims. We have jurisdiction over this appeal under 35 U.S.C. § 6(b).

The Invention

The Appellants claim a process for converting organosulfur impurities in a fuel stream to sulfones. Claim 1 is illustrative:

1. A process comprising contacting a fuel stream containing organosulfur impurities with an organic hydroperoxide in the presence of a catalyst obtained by a method comprising the steps of:

(a) impregnating an inorganic siliceous solid with a titanium source selected from the group consisting of:

(1) a solution of a titanium halide in a non-oxygenated hydrocarbon solvent; and

(2) a vapor stream of titanium tetrachloride;

(b) calcining the impregnated siliceous solid to form the catalyst; and

(c) optionally, heating the catalyst in the presence of water, wherein a substantial portion of the organosulfur impurities are converted into sulfones.

The References

Han	6,114,552	Sep. 5, 2000
Kocal	6,368,495 B1	Apr. 9, 2002

The Rejection

Claims 1-20 stand rejected under 35 U.S.C. § 103 over Kocal in view of Han.

ISSUES

Have the Appellants have shown reversible error in the Examiner's determination that: 1) it would have been prima facie obvious for one of

ordinary skill in the art to select the required combination of components from Kocal and to combine Kocal with Han, and 2) the Appellants' evidence is not effective for overcoming the prima facie case of obviousness?

PRINCIPLES OF LAW (PL)

Obviousness

1. For a prima facie case of obviousness to be established there must be "an apparent reason to combine the known elements in the fashion claimed." *KSR Int'l. Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1740-41 (2007).
2. In making an obviousness determination one "can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR*, 127 S. Ct. at 1741.
3. A reasonable expectation of success, not absolute certainty, is all that is required for a prima facie case of obviousness. *See In re O'Farrell*, 853 F.2d 894, 904 (Fed. Cir. 1988).

Evidence

4. It is not enough for the Appellants to show that the results for the Appellants' invention and the comparative examples differ. The difference must be shown to be an unexpected difference. *See In re Freeman*, 474 F.2d 1318, 1324 (CCPA 1973); *In re Klosak*, 455 F.2d 1077, 1080 (CCPA 1972).

FINDINGS OF FACT

1. Kocal discloses a process for removing thiophenes from petroleum fractions by oxidizing the thiophenes to sulfones which are then

catalytically decomposed to hydrocarbons and volatile sulfur compounds (abstract; col. 1, ll. 13-21; col. 5, ll. 62-65).

2. Kocal's suitable oxidizing agents include alkyl peroxides such as t-butyl hydroperoxide (col. 4, ll. 56-64).
3. Kocal discloses that "an oxidation catalyst can optionally be used in conjunction with any of the oxidizing agents" (col. 5, ll. 37-38).
4. Kocal discloses that "[s]uitable solid oxidation catalysts and methods for their preparation are known in the art and include various metals dispersed on inorganic metal oxide supports such as silica, alumina, titania, molecular sieves, and mixtures thereof" (col. 5, ll. 40-44).
5. Kocal's [c]atalytic metals that have been found to be the most effective in promoting the oxidation include titanium (col. 5, ll. 47-51).
6. Han discloses a titanium-containing catalyst that is useful for the liquid phase epoxidation of an olefin with an organic hydroperoxide in the presence of a solubilized transition metal catalyst (col. 1, ll. 5-7, 16-18).
7. Han's organic hydroperoxide can be t-butyl hydroperoxide (col. 6, ll. 55-64).
8. Han discloses that "[t]he catalyst is produced by the method comprising: (a) impregnating a high surface area inorganic siliceous solid having surface area greater than 1100 m^2/g with a titanium source; (b) calcining the impregnated solid; and (c) optionally, heating the catalyst in the presence of water. The titanium source can be either a solution of a titanium halide in a non-oxygenated hydrocarbon solvent or a vapor stream of titanium tetrachloride" (col. 2, ll. 20-27).

9. Han teaches that "[m]ost preferably, the titanium halide is titanium tetrachloride" (col. 3, ll. 37-38).

ANALYSIS

We affirm the Examiner's rejection.

The Appellants, in their Brief and Reply Brief, do not specifically address any particular claim. Hence, the claims stand or fall together, and we limit our discussion to one claim, i.e., claim 1. *See* 37 C.F.R. § 41.37(c)(1)(vii) (2007).

The Appellants argue that there is no specific teaching in Kocal to use, in combination, the disclosed silica catalyst support (col. 5, l. 40-43), titanium catalytic metal (col. 5, ll. 47-51), and organic hydroperoxide oxidizing agent (col. 4, ll. 61-63) (Br. 7-8).

Selecting silica from among Kocal's four disclosed catalyst supports (col. 5, ll. 43-44), titanium from among the eight disclosed catalytic metals (col. 5, ll. 47-51), and an organic hydroperoxide from among the four disclosed types of oxidizing agents (col. 4, ll. 61-64) would have required no more than ordinary creativity by one of ordinary skill in the art (PL 1, 2).[1] Such a person would have had a reasonable expectation that in combination, each of those components would perform its disclosed function (PL 3).

The Appellants argue that the titanium-silica prior art is extensive, and that there is no reason, other than hindsight, why a person of ordinary skill in the art would focus on Han (Br. 8; Reply Br. 3-4).

[1] Contrary to the Appellants' argument (Br. 8-9), the number of combinations of Kocal's components is not endless.

Kocal's disclosure of the suitability of solid oxidation catalysts that are known in the art and include a support that can be silica and a catalytic metal that can be titanium (col. 5, ll. 37-51) would have provided one of ordinary skill in the art with an apparent reason for using any known solid oxidation catalyst that includes those components (PL 1). Such a catalyst is that disclosed by Han (col. 2, ll. 18-28). Because 1) Han's catalyst has a combination of components which meets Kocal's requirements and is effective for oxidizing olefins, and 2) the same t-butyl hydroperoxide oxidizing agent can be used with the catalysts of Kocal (col. 4, ll. 61-63) and Han (col. 6, ll. 63-64), one of ordinary skill in the art would have had a reasonable expectation that Han's catalyst would be effective in Kocal's process for oxidizing organic sulfur-containing liquid hydrocarbons. Since prima facie obviousness requires only a reasonable expectation of success, not absolute certainty, the use of Han's catalyst in Kocal's process would have been prima facie obvious to one of ordinary skill in the art (PL 3).

The Appellants argue that the comparison in their Specification (Spec. 16:Table 1) between Comparative Examples 2A and 2B using catalysts 1A and 1B made by impregnating a silica support with a titanium (IV) diisopropoxide bis(acetylacetonate) solution, and Comparative Example 2J wherein no catalyst is used, versus the Appellants' inventive Examples 2C-2I using catalysts 1C-1F made by impregnating a silica support with titanium (IV) tetrachloride shows unexpected results (Br. 9-10; Reply Br. 2-4).

In the Appellants' Table 1 the organosulfur conversion is 31 and 39%, respectively, in Comparative Examples 2A and 2B, 10% in Comparative Example 2J, and 56-97% in the inventive examples (Spec. 16).

The Appellants' evidence is not effective for overcoming the prima facie case of obviousness because the Appellants have not established that the evidence shows unexpected results (PL 4). One of ordinary skill in the art would have expected that because the titanium (IV) diisopropoxide bis(acetylacetonate) compound used to impregnate the catalyst support in the comparative examples is bulkier than the titanium (IV) tetrachloride used to impregnate the catalyst support in the inventive examples, it would not fill the catalyst support pores as well as the titanium (IV) tetrachloride. Hence, one of ordinary skill in the art would have expected the catalytic surface area and, accordingly, the conversion, in the comparative examples to be lower than in the inventive examples. Because one of ordinary skill in the art would have expected the titanium (IV) diisopropoxide bis(acetylacetonate) to provide a titanium coating on at least the outer surface of the catalyst support, such a person would have expected the conversion to be higher in the comparative examples with a catalyst than in the comparative example with no catalyst. All of the Appellants' experimental results are consistent with those expectations.

The Appellants, therefore, have not established reversible error in the Examiner's rejection.

CONCLUSION OF LAW

The rejection of claims 1-20 under 35 U.S.C. § 103 over Kocal in view of Han is affirmed.

DECISION/ORDER

It is ordered that the Examiner's decision is affirmed.

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

AFFIRMED

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