

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opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.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. 20

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte PETER M. ADORNATO,
AMOS A. AVIDAN
and DAVID L. JOHNSON

Appeal No. 96-0112
Application 07/877,913¹

ON BRIEF

Before METZ, PAK and WALTZ, Administrative Patent Judges.

PAK, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on an appeal from the examiner's final rejection of claims 1 through 20, which

¹ Application for patent filed May 4, 1992.

are all of the claims pending in the application.

Claim 1 is representative of the subject matter on appeal and reads as follows:

1. In a catalytic cracking process wherein a feed comprising non-distillable hydrocarbons is catalytically cracked in a riser reaction zone, operating at riser cracking conditions, including a riser vapor residence time, by contact with a source of hot, regenerated cracking catalyst to produce catalytically cracked vapors and spent cracking catalyst, cracked vapors are withdrawn as products, and spent cracking catalyst is regenerated in a catalyst regeneration means to produce hot regenerated cracking catalyst which is recycled to contact said feed, the improvement comprising:

cracking in the base of a vertical riser reactor having a length, for at least 1 second of vapor residence time and for at least the first 50 % of the length of the riser reactor from the base, a heavy feed containing at least 10 wt% non-distillable hydrocarbons by contact with hot regenerated cracking catalyst at a cat:feed weight ratio of a least 4:1 and wherein the amount and temperature of the hot regenerated catalyst are sufficient to produce a catalyst/feed mixture temperature sufficient to promote both catalytic cracking and undesired thermal cracking of said feed in said riser; and

quenching, after at least 1.5 seconds of vapor residence time, said catalyst mixture in a quench zone within said riser within the first 80% of the length of the riser reactor from the base, [sic, with] an inert quench fluid in an amount sufficient to quench the temperature in the riser at least 5°F.

The sole reference relied on by the examiner is:

Owen

5,073,249

Dec. 17, 1991
(Filed Nov. 21, 1989)

The appealed claims stand rejected under 35 U.S.C. § 103 as unpatentable over the disclosure of Owen.

We have carefully reviewed the entire record before us, including all of the arguments advanced by appellants and the examiner in support of their respective positions. This review leads us to conclude that only the examiner's § 103 rejection of claims 1 through 7, 9 through 15 and 18 is well-

founded. Accordingly, we will sustain the examiner's § 103 rejection of claims 1 through 7, 9 through 15 and 18, but reverse the examiner's § 103 rejection of claims 8, 16, 17, 19 and 20. Our reasons for this determination follow.

As a preliminary matter, we note that appellants state that "[t]he claims do not stand or fall together." See Brief, page 3. However, appellants argue separately only appealed claims 8, 16, 17, 19 and 20 with a reasonable degree of specificity². See Brief, pages 3, 5 and 6. Accordingly, we have grouped the appealed claims as follows:

Group I - claims 1 through 7, 9 through 15 and 18; and

Group II - claims 8, 16, 17, 19 and 20.

The appealed claims in each group will stand or fall together with the broadest claim therein. See 37 CFR 1.192(c)(5) (1993); now 37 CFR 1.192(c)(7)(1997); In re Nielson, 816 F.2d 1567, 1572, 2 USPQ2d 1525, 1528 (Fed. Cir. 1987).

The claimed subject matter is directed to a catalytic cracking process for a hydrocarbon feedstock containing non-distillable hydrocarbons. See, e.g., claim 1. The catalytic cracking process involves cracking the hydrocarbon feedstock at particular reaction conditions in a riser reactor and

² Claim 18, unlike claims 8, 16, 17, 19 and 20, is not directed to using a particular quenching fluid injection for producing the aspirating or educting effect within a riser reactor, which is responsible for reducing pressure at the base of the riser reactor. Note also that the mere reiteration of limitations of claims 4 through 6 does not constitute a substantive separate argument that complies with the requirements of 37 CFR § 1.192(c)(5)(1993); now 37 CFR § 1.192(c)(7)(1997).

quenching the resultant product in the riser reactor at an area located in about 50% to 80% of the riser reactor length from the base of the riser reactor, which is equivalent to at least 1.5 seconds of vapor residence time in the riser reactor. See, e.g., claim 1 in conjunction with the specification, page 10.

The examiner has rejected claims 1 through 20 under 35 U.S.C. § 103 as unpatentable over the disclosure of Owen. Appellants do not contest that Owen discloses the claimed catalytic cracking conditions, including the claimed hydrocarbon feedstock. Appellants only argue that:

1) The disclosure of Owen would not have rendered quenching at the particular location of a riser reactor as recited in claim 1 prima facie obvious to one of ordinary skill in the art within the meaning of 35 U.S.C. § 103 (see Brief, page 4);

2) The prima facie case of obviousness established by the examiner is rebutted by showing that quenching at the particular location of a riser reactor as recited in claim 1 imparts unexpected results (see Brief, page 5); and

3) The disclosure of Owen would not have rendered the injection of a quenching fluid in a manner recited in claims 8, 16, 17, 19 and 20 to produce the aspirating or educting effect within a riser reactor prima facie obvious to one of ordinary skill in the art within the meaning of 35 U.S.C. § 103 (see Brief, pages 5 and 6).

We agree with the examiner that the Owen reference would have rendered quenching at the claimed location of a riser reactor prima facie obvious to one of ordinary skill in the art. As indicated

by the examiner at page 3 of the Answer, Owen discloses (column 3, lines 42-45) that:

In many FCC units better feed vaporization is achieved by using a higher temperature in the base of the riser reactor, and quenching the middle of the riser or the riser outlet.

In contrast to appellants' argument, this statement is more than mere "dicta". It specifically teaches that employing a higher temperature in the base of a riser reactor followed by quenching at the middle of the riser reactor (50 % of the riser reactor length from the base of the riser reactor) enhances feed vaporization in many fluidized catalytic cracking processes. Inasmuch as this approach is one of the known methods for improving a catalytic cracking process, a person having ordinary skill in the art would have been led to employ a higher temperature in the base of a riser reactor, together with quenching at the middle of the riser reactor, with a reasonable expectation of improving hydrocarbon feed vaporization in a catalytic cracking process. This is especially true in this situation since the quenching location is a function of a desired reaction residence time (desired cracking time), i.e., a function of the desired product (products cracked to a desired level).

According to appellants at page 5 of the Brief, Figure 2 generated by a computer program shows that the claimed subject matter imparts unexpected results over that of the closest prior art. To support their position, appellants refer to an affidavit filed under 37 CFR § 1.132 by Mr. Adornato, one of the inventors in the instant application (hereinafter referred to as “the Adornato affidavit”). Having carefully reviewed the specification examples, Figure 2 and the Adornato affidavit, we find ourselves in full agreement with the examiner that appellants have not satisfied their burden of establishing that the claimed subject matter as a whole imparts unexpected results.

First, it is not enough for appellants to show that the results predicted through a computer program for appellants’ invention and the comparative examples are different. Appellants have the burden of showing that the differences are significant and unexpected. See In re Freeman, 474 F.2d 1318, 1324, 177 USPQ 139, 143 (CCPA 1973) (the burden of showing unexpected results rests on appellants who rely on them); In re D’Ancicco, 439 F.2d 1244, 1248, 169 USPQ 303, 306 (CCPA 1971) (the difference in results must be significant and of practical advantage). This appellants have not done. The significance of the predicted results, for instance, cannot be determined since appellants do not indicate the margin of error applicable to the prediction based

on the computer program. The predicted results are also not shown to be unexpected since they are said to be expected from “our understanding of chemistry involved”. See page 2 of the Adornato affidavit. There is nothing in the record to conclude that the results predicted are derived from reaction variables or program models, which are not known to or not expected by one of ordinary skill in the art to affect the desired level of cracking. Indeed, neither the specification nor the Adornato affidavit states that this difference is “unexpected”. See In re Geisler, 116 F.3d 1465, 1470, 43 USPQ2d 1362, 1365 (Fed. Cir. 1997).

Second, the showing in Figure 2, as explained in the Adornato affidavit and pages 16 and 17 of the specification, is not reasonably commensurate in scope with the degree of protection sought by appealed claim 1. See In re Grasselli, 713 F.2d 731, 743, 218 USPQ 769, 778 (Fed. Cir. 1983); In re Clemens, 622 F.2d 1029, 1035, 206 USPQ 289, 296 (CCPA 1980). While the showing in Figure 2 is based on the specific cracking conditions (e.g., specific catalyst and temperature known to affect cracking), specific size (length and width) of a riser reactor, specific residence time, specific quenching temperature and specific hydrocarbon feedstock described in page 16 of the specification, appealed claim 1 is not so limited. In spite of the fact that these reaction variables are known to affect the types of the product obtained, see, e.g., Owen, columns

1 through 7, appellants have not offered any evidence or any sound scientific reasoning to conclude that the predicted results based on limited specific reaction variables can reasonably be extrapolated to support the plethora of reactions conditions, including multifarious feedstocks, covered by the appealed claim.

Thus, having considered all of the evidence of record, we determine that the evidence of obviousness regarding the subject matter defined by claims 1 through 7, 9 through 15 and 18, on balance, outweighs the evidence of nonobviousness. Hence, we agree with the examiner that the subject matter defined by claims 1 through 7, 9 through 15 and 18 would have been obvious to one of ordinary skill in the art. Accordingly, we affirm the examiner's decision to reject claims 1 through 7, 9 through 15 and 18 under 35 U.S.C. § 103.

The rejection of claims 8, 16, 17, 19 and 20 under 35 U.S.C. § 103 over the disclosure of Owen, however, is on a different footing. Claims 8, 17, 19 and 20 require injection of a quenching fluid at a velocity of at least 200 feet per second in a downstream direction relative to fluid flow in the riser reactor. According to page 20, lines 10-23, of the specification, injecting the quenching fluid in this manner provides some eduction effect. Claim 16 also requires injecting a quenching fluid in such a manner to reduce the pressure at the base and upstream of the quench point by at least 0.5 psia (educting effect). Further, claims 8 and 20 specifically require occurrence of either the educting or aspirating effect. Nowhere does Owen, however, describe the claimed injection technique or the

Appeal No. 96-0112
Application 07/877,913

desire for obtaining the educting or aspirating effect. The examiner does not provide any evidence or scientific reasoning to indicate that the claimed injection technique would have been suggested to one of ordinary skill in the art. Accordingly, we reverse the examiner's decision to reject claims 8, 16, 17, 19 and 20 under 35 U.S.C. § 103.

In summary:

(1) The rejection of claims 1 through 7, 9 through 15 and 18 under 35 U.S.C. § 103 over the disclosure of Owen is affirmed; and

(2) The rejection of claims 8, 16, 17, 19 and 20 under 35 U.S.C. § 103 over the disclosure of Owen is reversed.

The decision of the examiner is affirmed-in-part.

OTHER ISSUES

While we have reversed the examiner's stated rejection of claims 8, 16, 17, 19 and 20, both the examiner and appellants should carefully consider the following issues before the claims we have reversed are allowed to issue.

In the first instance, in ¶3. of Mr. Adornato's declaration he states:

The model, e.g., response of the FCC riser reactor to quench at different elevations in the riser is believed reliable because it predicts results which are consistent with three commercial FCC units. Thus, it is a proven, commercially used tool.

The tenor of this statement could have two possible meanings. The paragraph could be construed to

mean that the program used to simulate the claimed FCC process has been used to simulate other FCC processes which other FCC processes were subsequently actually run and which actual runs confirmed the computer's prediction and are now in use in three commercial FCC units. The paragraph could also be construed to mean that the program used to simulate the claimed FCC process was actually tested by actually running an FCC process according to the program and the actual testing confirmed the program's predictions and the claimed FCC process is now in use in three commercial FCC units. If the latter is intended then a question arises under 35 U.S.C. § 102 whether or not the claimed invention was "known or used by others... in this country or a foreign country before the invention thereof by applicant for patent" (35 USC 102(a)) or whether the invention was "in public use or on sale in this country, more than one year prior to the date of application for patent in the United States" (35 USC 102(b)). Accordingly, applicants should file a clear statement of what was intended. If the former was intended then applicants should also positively state to the best of their knowledge and belief that the claimed FCC process was not in public use or on sale more than one year prior to the filing of their application nor was it known or used by others before the filing date of their application for patent.

Secondly, throughout their disclosure, appellants speak of optimizing the various reaction parameters by using the computer program referenced in the Adornato declaration. However, as we stated in our opinion, Owen clearly suggests that the various reaction parameters which appellants optimize are known in the art to affect the product obtained. Thus, the variables can be said to be

"result effective variables". It has been consistently held that the optimization of result effective variables is entirely within the skill of the ordinary routineer in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). Moreover, there is evidence in the nature of U.S. Patent Number 4,419,221 to Castagnos, Jr., et al. and an article by Hatch et al. (1981) (copies attached to this opinion) which further underscores that the variables which appellants' have optimized by their computer simulation are known to effect the product obtained, the yield and the distribution.

Specifically, Castagnos, Jr., et al. discloses a method for controlling a fluidized catalytic cracking process to obtain a desired product distribution (column 1, lines 5 through 8). A hydrocarbon feedstock is contacted with a catalyst in a reaction zone under conditions to convert the feedstock into 1) desired products and 2) coke on the surface of the catalyst particles (column 1, lines 15 through 22). The reaction products and the spent catalyst are discharged to a separation zone where the catalyst and reaction products are separated (column 1, lines 25 through 28). Yield of the desired products may be controlled by selecting various reaction parameters such as the charge stock, the catalyst, the temperature, the pressure, the catalyst-to-oil contact time, the catalyst-to-oil ratio, etcetera (column 1, lines 56 through 61, emphasis added).

Appeal No. 96-0112
Application 07/877,913

Hatch et al. (1981) at page 24 thereof describe under the heading "Catalytic Cracking" that:

Fluid catalytic cracking (FCC) is characterized by a remarkable versatility and flexibility. **Various yields are maximized through manipulation of numerous process variables.** This accounts for its dominant position to gasoline production from a barrel of crude oil. (Emphasis added).

Thus, there is little doubt that the skilled chemical engineer with substantial petroleum refining experience would have understood that gasoline yields of an FCC process could be optimized by optimization of known result effective variables.

Still further, there is evidence in the nature of U.S. Patent Number 4,978,440 to Krambeck et al. that the location of steam injectors for quenching is a matter of choice known to persons of ordinary skill in the petroleum refining art, including at or towards the top of the riser. See specifically column 5, line 65 through column 6, line 61 and column 9, line 63 through column 10, line 8. Because Krambeck et al. is assigned to Mobil Oil Corporation, the assignee of appellants' application on appeal, we have not furnished a copy of the reference to appellants with this decision.

Appeal No. 96-0112
Application 07/877,913

Additionally, at page 18, lines 35 through 39 of appellants' disclosure, it is recited that the steam injectors utilized in claims 8, 16, 17, 19 and 20 are "commonly used in refineries and extensively discussed in Perry's Engineer's Handbook, Sixth Edition, Sections 6-31 to 6-35 of which are incorporated by reference."

Thus, from all the above, it could be considered that all the facets of appellants' claimed invention are either result effective variables whose optimization would have been within the skill of the routineer in the art, or are well-known expedients in the refining art and are being used for their art-accepted purpose to achieve an expected result-optimization of a particular product or yield. Thus, a question of obviousness under 35 USC 103 may be engendered when the above-noted prior art is considered together. It is also possible that only through appellants' manipulation of variables and application of the totality of these well known expedients that the claimed invention was achieved. On this record, as now developed, we shall not conjecture on this issue but find the better course of action is to leave the resolution of these issues to the appellants and the examiner upon return of this application to the examining group.

Appeal No. 96-0112
Application 07/877,913

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

AFFIRMED-IN-PART

ANDREW H. METZ)
Administrative Patent Judge)
)
)
CHUNG K. PAK) BOARD OF PATENT
Administrative Patent Judge) APPEALS AND
) INTERFERENCES
)
)
THOMAS A. WALTZ)
Administrative Patent Judge)

Appeal No. 96-0112
Application 07/877,913

CHARLES J. SPECIALE
MOBIL OIL CORP.
OFFICE OF PATENT COUNSEL
3225 GALLOWS RD.
FAIRFAX, VA 22037