THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

This opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.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. 18

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte GEORGE A. HADJIGEORGE

Appeal No. 94-1254
Application No. 07/783,592[1]

ON BRIEF

Before ABRAMS, FRANKFORT and PAK, *Administrative Patent Judges*.

FRANKFORT, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on appeal from the examiner's final rejection of claims 1, 2, 3 and 5 through 23, which are all of the claims remaining in this application. Claims 4 and 24 through 48 have been canceled.

[1] Application for patent filed October 28, 1991.

Appellant's invention relates to an improved riser reactor for catalytic cracking of a hydrocarbon feed. Claim 1, 3, 13, 21 and 23 are representative of the subject matter on appeal and a copy of those claims, as they appear in the Appendix to appellant's brief, is attached to this decision.

The prior art references of record relied upon by the examiner in rejecting the appealed claims under 35 U.S.C. 103 are:

Dean et al. (Dean)	4,427,537	Jan. 24, 1984
Baumann et al. (Baumann)	3,353,925	Nov. 21, 1967

Claims 1, 2, 3 and 5 through 23 stand rejected under 35 U.S.C. 103 as being unpatentable over Baumann in view of Dean.[2]

Reference is made to the examiner's answer (Paper No. 13, mailed August 3, 1993) for the examiner's complete reasoning in support of the above-noted rejection. Appellant's arguments there against are found in the brief (Paper No. 12, filed May 18, 1993).

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[2] With regard to the dependency of claims 5 and 6, we understand from appellant's brief (page 2) that these claims should properly be dependent from claim 3. However, a review of the file record reveals that claims 5 and 6 are still dependent from canceled claim 4. During any further prosecution of this application before the examiner, an amendment correcting this problem should be filed.

OPINION

In reaching our conclusion on the obviousness issues raised in this appeal, we have carefully considered appellant's specification and claims, the applied prior art, and the respective viewpoints advanced by appellant and the examiner. As a consequence of our review, we have made the determination that the examiner's rejection of the appealed claims under 35 U.S.C. 103 cannot be sustained. Our reasons follow.

In determining the propriety of a rejection under 35 U.S.C. 103, it is well settled that the obviousness of an invention cannot be established by combining the teachings of the prior art absent some teaching, suggestion or incentive supporting the combination. See In re Fine, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1599 (Fed. Cir. 1988); Ashland Oil, Inc. v. Delta Resins and Refractories, Inc., 776 F.2d 281, 293, 227 USPQ 657, 664 (Fed. Cir. 1985); ACS Hospital Systems, Inc. v. Montefiore Hospital, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). The law followed by our court of review, and thus by this Board, is that "[a] prima facie case of obviousness is established when the teachings from the prior art

itself would appear to have suggested the claimed subject matter to a person of ordinary skill in the art." In re Rinehart, 531 F.2d 1048, 1051, 189 USPQ 143, 147 (CCPA 1976). See also In re Lalu, 747 F.2d 703, 705, 223 USPQ 1257, 1258 (Fed. Cir. 1984). If the examiner fails to establish a prima facie case, the rejection is improper and will be overturned. See In re Fine, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1599 (Fed. Cir. 1988).

Baumann discloses an arrangement for a small scale catalytic cracking unit that includes a vertically arranged cylindrical transfer line reactor (10). Located at spaced elevations along the reactor are venturi-shaped contacting devices (94). As noted at column 4, lines 11-19, of Baumann these contacting devices

> insure cocurrent [sic] contacting between the solid and vaporous materials and in particular the mainly solids containing stream which passes downwardly along the walls and the main stream or suspension of solid catalyst passing up through the center of the transfer line reactor. By staging or spacing the contacting devices as shown in the drawing the possibility of forming a long back mixing solids path is eliminated.

Baumann further indicates that the preheated oil feed to the reactor (at 88) is atomized and vaporized and mixed with the catalyst particles so that the suspension of catalyst particles in

oil vapor passes upwardly in the reactor at a velocity between about 10 and 40 feet per second. The velocity in the throat (95) of the contacting devices (94) is said to be between about 15 and 60 feet per second. A specific example set forth in column 7, lines 12-62, describes the reactor (10) as having an internal diameter of 22 inches, while the throat diameter of the contacting devices (94) is about 16 inches. In addition, it is noted that the velocity of the upflowing catalyst-oil mixture is about 14 feet/sec. at the lower portion of the reactor and about 20 feet/sec. just above contacting device (94a). The velocity of the catalyst-oil suspension at the throat of the contacting devices is about 30 feet/sec. at the lowest contacting device (94) and increases to about 40 feet/sec. at the highest contacting device (94a).

Like the examiner, we note that Baumann does not disclose a riser reactor having venturi sections of the particular configuration and dimensions required in appellant's claims on appeal. Nor does Baumann teach or disclose such venturi sections which provide velocity increases for the oil-catalyst particle feed

mixture of about 400% to about 600%, as required in claims 3 and 23 on appeal.

The examiner turns to Dean, finding therein a disclosure of a riser reactor (e.g., 64) and a teaching (column 6, line 6, et seq.) that it is desirable to minimize the deleterious effects of a dense back mixing catalyst bed above the oil feed injection point by providing high vapor velocities. At column 9, lines 40-50, it is indicated that

> [i]t has been postulated here before in the prior art that the liquid oil outlet velocity should match the superficial velocity of the vaporized uncracked oil material in the riser reactor. It has been observed recently, however, that in fact the feed inlet velocity can be much higher than previously thought possible and up to as high as about 350 or 400 feet per second without encountering any noticeable adverse effects on the operation since the atomized oil feed expands extremely rapidly due to pressure drop and substantially instantaneously upon discharge in the riser cross-section.

It is the examiner's position (answer, page 4) that in view of the teachings in Dean it would have been "within the level of one of ordinary skill in the art" to modify the venturi devices of Baumann in order to provide for higher gas velocities, thereby avoiding catalyst back mixing and catalyst slip. In addition, the

examiner considers that appellants' specific venturi dimensions and the resulting fluid velocity increases are merely "optimization" of what is taught by Baumann and Dean.

After carefully reviewing the disclosures and teachings of Baumann and Dean, we must agree with appellant's assessment that these patents provide no teaching or suggestion which would have fairly led a person of ordinary skill in the art to modify the riser reactor of Baumann, and specifically the configuration of the venturis in Baumann, in the manner urged by the examiner. As appellant points out (brief, page 6), Dean makes no reference to venturis and provides no teaching or suggestion concerning increasing flow velocity of the oil-catalyst feed flow in a riser reactor using venturis. Dean merely provides a generalized teaching that higher vapor velocities can reduce catalyst slip, improve catalyst distribution and minimize the deleterious effects of a dense back mixing catalyst bed above the oil feed injection point. In particular, Dean teaches and suggests that the feed inlet velocity of the atomized oil feed can be increased to as high as about 350 to 400 feet per second without noticeable adverse effects

on the reactor operation. Thus, it is our assessment that, at best, Dean would have suggested to one of ordinary skill in the art that an increase in the velocity of the atomized oil feed into the reactor of Baumann (at 88) might be advantageous.

The examiner's proposal to somehow use the teachings of Dean to modify the configuration and dimensions of the venturis in the riser reactor of Baumann to achieve near plug-flow throughout the length of the reactor, in our opinion, is based purely on impermissible hindsight gained by first having read appellant's disclosure, and not on what the teachings from the prior art itself would have fairly suggested to one of ordinary skill in the art. It is well settled that a rejection based on § 103 must rest on a factual basis, with the facts being interpreted without hindsight reconstruction of the invention from the prior art. In making this evaluation, the examiner has the initial duty of supplying the factual basis for the rejection he advances. He may not, because he doubts that the invention is patentable, resort to speculation, unfounded assumptions or hindsight reconstruction to supply deficiencies in the factual basis. See In re Warner, 379 F.2d 1011,

1016, 154 USPQ 173, 177 (CCPA 1967). In the present case, lacking any teachings in the prior art itself which would appear to have suggested the claimed subject matter to a person of ordinary skill in the art, or any line of reasoning as to why such artisan would have otherwise found the claimed subject matter to have been obvious in light of the teachings of the references, we must refuse to sustain the examiner's rejection of claims 1, 2, 3 and 5 through 23 under 35 U.S.C. 103.

The decision of the examiner is reversed.

REVERSED

NEAL E. ABRAMS)
Administrative Patent Judge)
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CHARLES E. FRANKFORT)
Administrative Patent Judge) BOARD OF PATENT
) APPEALS AND
) INTERFERENCES
)
)
CHUNG K. PAK)
Administrative Patent Judge)

Appeal No. 94-1254
Application No. 07/783,592

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APPENDIX

1. A riser reactor which comprises:

a plurality of substantially vertically oriented venturis connected in series wherein the first venturi is connected to a cylindrical supply pipe and the last venturi is connected to a cylindrical discharge pipe, the venturis comprising an upstream section comprising:

(1) a cylindrical inlet substantially equaling the diameter, D_1, of the supply pipe; connected to

(2) a contracting portion having the configuration of a frustum of a cone, having a vertex angle of greater than about 0 to about 30 degrees; connected to

(3) a cylindrical throat having a diameter, D_2, equal to about 1/4 to 1/2 of the supply pipe diameter, D_1, the length of the throat being about 0 or greater than 0; the throat being connected with

(4) a downstream section having the configuration of a frustum of a cone diverging from the throat diameter to that of the discharge pipe at an angle of about or less than 30 degrees and greater than 0; and wherein the junctions connecting the inlets, throats, or outlets are formed by gradually curving surfaces.

3. A riser reactor which comprises:

a plurality of substantially vertically oriented venturis connected in series whereby the venturis have a maximum diameter, D_1, and a minimum diameter, D_2; and

means for connecting the venturis end to end in which the cross-sectional area of the venturis at D_1 is A_1 and the cross sectional area at D_2 is A_2 and the ratio of A_1/A_2 is between about 1.1 and about 113, wherein the first venturi is connected to a cylindrical supply pipe and the last venturi is connected to a cylindrical discharge pipe, and wherein each venturi orifice comprises an upstream section comprising:

(1) a cylindrical inlet substantially equaling the diameter, D_1, of the supply pipe; connected to

(2) a contracting portion having the configuration of a frustum of a cone, having a vertex angle of greater than 0 to about 30 degrees; connected to

(3) a cylindrical throat having a diameter, D_2, equal to about 1/4 to 1/2 of the supply pipe diameter, D_1, the length of the throat greater than or equal to 0; said throat being configured for temporarily increasing the velocity of a fluid hydrocarbon and catalyst particle feed mixture by about 400% to about 600%, the throat being connected with

(4) a downstream section having the configuration of a

frustum of a cone diverging from the throat diameter to that of the discharge pipe at an angle of about or less than 30 degrees; and wherein the junctions connecting the inlets, throats, or outlets are formed by gradually curving surfaces.

13. A riser reactor which comprises:

a plurality of reaction chambers substantially vertically oriented having internal diameters which gradually increase from each end towards the middle reaching a maximum diameter, D_1, at or before the middle whereby the angle between the shortest straight line connecting point 1 to point 2 and the vertical is greater than zero and less than 15 degrees where point 1 is the closest point on the internal wall of the reaction chambers to point 2 where its internal diameter is at a minimum and point 2 is the closest point on the internal wall of the reaction chambers to point 1 where the diameter of the reaction chambers is at its maximum; and,

means for connecting the chambers end to end said connecting means having one or more orifices each having a minimum diameter, D_2, in which the total cross-sectional area of the one or more orifices of the connecting means is A_2 and the cross sectional area of the reaction chambers at its maximum diameter, D_1, is A_1 and the ratio of A_1/A_2 is between about 1.1 and about 113.

21. A riser reactor for the cracking of hydrocarbons to produce gasoline range hydrocarbons having repetitive alternating gradual variation of internal diameter from largest, D_1, to

smallest, D_2, having a maximum vertex angle of 18 degrees, in which the cross-sectional area of the reactor at D_1 is A_1 and the cross-sectional area at D_2 is A_2 and the ratio of A_1/A_2 is between about 1.1 and about 113.

23. A riser reactor for contacting fluid feed and fluidized catalytic particulates which comprises:

a plurality of substantially vertical serially connected chambers; and,

means for temporarily increasing the velocity of the fluidized particulates passing through the chambers at one or more locations in the chambers by between about 400 and about 600% above the average velocity of the particulates through the chambers.