

The opinion in support of the decision being entered today was **not** written for publication and is **not** binding precedent of the Board.

Paper No. 24

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DARIA N. LISSY, SANJAY B. SHARMA,
and DAVID S. SHIHABI

Appeal No. 2002-2266
Application No. 09/366,477

ON BRIEF

Before KIMLIN, WALTZ, and TIMM, *Administrative Patent Judges*.
TIMM, *Administrative Patent Judge*.

DECISION ON APPEAL

This appeal involves claims 1-20 which are all the claims pending in the application. We have jurisdiction over the appeal pursuant to 35 U.S.C. § 134.

INTRODUCTION

As evidence of unpatentability, the Examiner relies upon the following prior art references:

| | | | |
|----------------------------------|-----------|--------------|---------------|
| Dwyer et al. (Dwyer) | 4,375,458 | Mar. 1, 1983 | |
| Chang et al. (Chang) | 5,498,814 | | Mar. 12, 1996 |
| Abichandani et al. (Abichandani) | 5,689,027 | | Nov. 18, 1997 |

Claims 1-20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of Abichandani and Chang. Dwyer is added as further evidence of obviousness for claims 4, 5, and 20.

Appellants state that claims 1-3 and 6-19 stand separately from claims 4, 5, and 20. With regard to the rejection of claims 1-20 over Abichandani and Chang, there is no sufficiently specific separate argument directed to claims 4, 5, and 20 (Brief at pp. 3-9). The claims are grouped separately only in so far as they are rejected separately (Brief at pp. 3-10; Reply Brief at p. 1). We, therefore, select claim 1 to represent the issues on appeal with regard to the rejection of claims 1-20. Claims 4, 5, and 20 will be addressed separately in so far as they are argued separately in connection with the additional rejection.

We affirm substantially for the reasons presented by the Examiner and add the following primarily for emphasis.

OPINION

The Rejection of Claims 1-20 over Abichandani and Chang

We have selected claim 1 to represent the issues on appeal for the rejection of claims 1-20 over Abichandani and Chang. Claim 1 reads as follows:

1. A plural stage toluene conversion process for preparing xylenes comprising:

i) contacting in a first stage toluene disproportionation zone a reaction stream comprising toluene and hydrogen with a first stage catalyst comprising catalytic acid molecular sieve which catalyst is substantially free of hydrogenation metal, under toluene disproportionation reaction conditions sufficient to provide a first stage effluent comprising para-xylene and ethylbenzene; and

ii) contacting said effluent from the first stage in a subsequent stage ethylbenzene abatement zone with a subsequent stage catalyst containing porous selectivated catalytic molecular sieve comprising a hydrogenation metal which catalyst is selectivated by treating with a selectivating agent which hinders entry of xylene isomers and permits entry of ethylbenzene into the pores of said subsequent stage catalyst molecular sieve, at reaction conditions sufficient to selectively convert said ethylbenzene to benzene and ethane in the presence of xylenes and toluene to provide a subsequent stage product containing para-xylene and having reduced ethylbenzene content relative to the effluent from said first stage.

Claim 1 is directed to a process for toluene disproportionation which produces xylenes and minimizes ethylbenzene production. It is a two-stage process. In the first stage, a catalyst, which is substantially free of hydrogenation metal, is used to convert toluene and hydrogen to para-xylene. The reaction produces ethylbenzene, an unwanted by-product. The ethylbenzene containing effluent from the first stage is fed to a second stage ethylbenzene abatement zone. In the second stage, a catalyst containing a hydrogenation metal is used to selectively convert ethylbenzene to benzene and ethane.

We agree with the Examiner's findings that Chang describes toluene disproportionation as required by the first step of claim 1 and suggests that ethylbenzene is an unwanted by-product (Answer at p. 4). We further agree with the Examiner that Abichandani describes the ethylbenzene abatement of the second step of claim 1 and further suggests that a toluene disproportionation product is an appropriate feedstock for the abatement step. Based on the express suggestions in each reference, the two-stage process would have been obvious to one of ordinary skill in the art.

Appellants argue that Chang teaches away from the two-stage process of the claim. According to Appellants, Chang explicitly discourages the use of a separate abatement step as Chang discloses incorporating a hydrogenation metal in the disproportionation catalyst; a catalyst component explicitly excluded by claim 1 (Brief at p. 5; Reply Brief at p. 2).

We do not agree that Chang "teaches away." One of ordinary skill in the art would not be persuaded, by a reading of Chang, that conducting ethylbenzene abatement in a separate step according to Abichandani would be unlikely to result in removal of ethylbenzene. *See In re Gurley*, 27 F.3d 551, 553, 31 USPQ2d 1130, 1131 (Fed. Cir. 1994) ("In general, a reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant."). The two references together, in fact, provide basis for a reasonable expectation that ethylbenzene will be removed as desired.

Chang describes two embodiments of disproportionation: (1) using a catalyst without the inclusion of hydrogenation metal (col. 9, l. 62 to col. 13, l. 6) and (2) using a catalyst including

hydrogenation metal to reduce ethylbenzene (col. 13, ll. 7-10 and 31-34). Chang recognizes the problem of ethylbenzene abatement and discusses two second stage ethylbenzene abatement processes; isomerization and superfractionation (col. 13, ll. 21-22). According to Chang, these processes are either impractical or expensive (col. 13, ll. 22-30).

Abichandani also notes that separation or removal of ethylbenzene from mixed xylene streams is frequently difficult and expensive (col. 2, ll. 37-40). Abichandani describes an alternative process of using a selectivated catalyst which may contain a hydrogenation metal to convert ethylbenzene with low xylene loss (col. 1, ll. 15-19 and col. 8, l. 56 to col. 6, l. 6). Abichandani specifically suggests using the effluent from a toluene disproportionation reaction as the feedstock for the selective ethylbenzene conversion process, i.e., Abichandani suggests a two step process of disproportionation followed by ethylbenzene abatement (col. 4, l. 65 to col. 5, l. 3).

Chang and Abichandani together suggest that at least four methods of reducing ethylbenzene were known: the two-stage processes in which ethylbenzene is separated by isomerization or superfractionation after disproportionation; the two-stage process of selective conversion of ethylbenzene after disproportionation as taught by Abichandani; and the one-stage process of the second embodiment of Chang. While Chang describes the two-stage processes including isomerization and superfractionation as inferior, Chang does not teach away from using the selective ethylbenzene conversion of Abichandani. In fact, Abichandani suggests the combination of the two steps (col. 4, l. 61 to col. 5, l. 3).

While the “teach away” test is a useful general rule, care must be taken not to adopt it in the abstract. *Gurley*, 27 F.3d at 553, 31 USPQ2d at 1132. “Although a reference that teaches away is a significant factor to be considered in determining unobviousness, the nature of the teaching is highly relevant, and must be weighed in substance”. *Id.* Upon weighing the teachings of Chang in substance, it is apparent that Chang does not “teach away” from the two-step process of claim 1.

Appellants argue that the Examiner has not shown any motivation or suggestion for combining the references (Brief at 8; Reply Brief at 2-3). We do not agree. The Examiner specifically pointed out that the suggestion is contained in aspects of both references (Answer at p. 4). In fact, Abichandani provides a road map for performing the two-stage operation in that this reference suggests performing the ethylbenzene selective conversion on a feedstream obtained from a toluene disproportionation reaction. Abichandani does not disclose the specifics of disproportionation and, therefore, one of ordinary skill in the art would have looked to known processes such as that described by Chang. This is a sufficient basis to support a conclusion of obviousness. *See In re Sastry*, 285 F.3d 1378, 1383, 62 USPQ2d 1436, 1439 (Fed. Cir. 2002).

Appellants argue that if one of ordinary skill in the art followed the teachings of the two references, one would arrive at a two-stage process in which the toluene disproportionation catalyst contains hydrogenation metal to remove ethylbenzene, as taught by Chang, and there is an additional downstream removal step, as taught by Abichandani (Brief at p. 7). Appellants are ignoring the fact that Chang describes two embodiments: one in which the catalyst is not

disclosed as containing hydrogenation metal and one in which the catalyst contains the hydrogenation metal such that the process becomes a one-stage process. It would have been obvious to one of ordinary skill in the art to combine the first embodiment of Chang, which requires a second stage removal of ethylbenzene, with the separate step of ethylbenzene removal taught by Abichandani.

Appellants further argue that the Examiner's reliance on *Ex parte Wu*, *In re Larson*, and *In re Kuhle* is misplaced (Brief at 8-9; Reply Brief at p. 4).¹ The Examiner relied on these cases for the proposition that eliminating a component along with its function would not impart patentable distinctness which is otherwise absent (Answer at p. 5). The cases support this proposition. *Wu*, 10 USPQ2d at 2032; *Larson*, 340 F.2d at 969, 144 USPQ at 350; *Kuhle*, 526 F.2d at 555, 188 USPQ at 9. In the present case, Chang recognizes this concept as this reference describes the catalyst without the hydrogenation metal and then describes a second embodiment in which the hydrogenation metal is added for the function of reducing ethylbenzene. One of ordinary skill in the art would recognize from the disclosure of Chang that the hydrogen metal with its ethylbenzene removal effect is an option, not a requirement, in the toluene disproportionation stage.

We conclude that the Examiner established a *prima facie* case of obviousness with respect to the subject matter of claim 1-20 over Abichandani and Chang.

¹*Ex parte Wu*, 10 USPQ2d 2031 (Bd. Pat. App. & Int. 1989); *In re Larson*, 340 F.2d 965, 144 USPQ 347 (CCPA 1965); *In re Kuhle*, 526 F.2d 553, 188 USPQ 7 (CCPA 1975).

Once a *prima facie* case of obviousness is established, the burden of coming forward with evidence and argument in rebuttal is shifted to Appellants. *See In re Piasecki*, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984). Rebuttal may take the form of a comparison with the prior art showing that any differences are not merely normal expected variations but would have been unexpected by those of ordinary skill in the art. *See In re Mayne*, 104 F.3d 1339, 1342, 41 USPQ2d 1451, 1454 (Fed. Cir. 1997); *In re Freeman*, 474 F.2d 1318, 1324, 177 USPQ 139, 143 (CCPA 1973).

Appellants argue that the transfer of the hydrogenated metal to the downstream process step leads to an unexpected advantage in that xylene losses are reduced (Brief at p. 9).

Appellants point to no objective evidence nor any statement in the specification indicating that the reduction in xylene loss was unexpected. The assertion is merely an attorney argument and such cannot take the place of evidence. *In re Lindner*, 457 F.2d 506, 508, 173 USPQ 356, 358 (CCPA 1972). The evidence, on balance, supports the conclusion of obviousness.

The Rejection of Claims 4, 5, and 20 over Abichandani, Chang and Dwyer

Claims 4, 5, and 20 stand further rejected as obvious over Abichandani and Chang and further in view of Dwyer. These claims require that the catalyst for each stage have a particular crystal size. Claim 4 requires a crystal size of at least 0.5 microns in each stage. Claims 5 and 20 require that the crystals have a major dimension of at least about 1 micron in each stage.

Appellants argue that the ethylbenzene conversion reactions disclosed in Dwyer at column 7, lines 18-27 are different than that claimed (Brief at p. 10). We agree with the Examiner's determination that the selection of the crystal size would have been within the ordinary skill in the art (Final Rejection at p. 3-4; Answer at pp. 4-5).

For toluene disproportionation, Chang specifies that the crystal size is preferably greater than 0.1 micron (col. 12, ll. 34-35). Dwyer indicates a size of at least 1 micron for a ZSM-5 type catalyst useful for toluene disproportionation (col. 6, ll. 44-48). Therefore, the crystal sizes for toluene disproportionation discussed in the prior art encompass those of the claims (claim 4: at least 0.5 microns; claims 5 and 20: at least about 1 micron).

For ethylbenzene conversion, Abichandani specifies a crystal size of between ***about*** 0.1 and 1 microns (col. 4, ll. 35-36). This range overlaps or abuts the claimed ranges (claim 4: at least 0.5 micron; claims 5 and 20: at least ***about*** 1 micron).

Where, as here, the ranges are encompassed by the prior art, overlap or abut, a *prima facie* case of obviousness is established. *See In re Peterson*, 315 F.3d 1325, 1329, 65 USPQ2d

1379, 1382 (Fed. Cir. 2003); *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936-37 (CCPA 1976); *In re Geisler*, 116 F.3d 1465, 1469, 43 USPQ2d 1362, 1365 (Fed. Cir. 1997).

We conclude that the Examiner has established a *prima facie* case of obviousness with respect to the subject matter of claims 4, 5, 20 over Abichandani, Chang and Dwyer which has not been sufficiently rebutted by Appellant.

CONCLUSION

To summarize, the decision of the Examiner to reject claims 1-20 under 35 U.S.C. § 103(a) is affirmed.

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

AFFIRMED

EDWARD C. KIMLIN
Administrative Patent Judge

THOMAS A. WALTZ
Administrative Patent Judge

CATHERINE TIMM
Administrative Patent Judge

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