

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. 14

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte V.N. MALLIKARJUNA RAO

Appeal No. 1997-1959
Application 08/351,908

ON BRIEF

Before KIMLIN, WARREN and WALTZ, *Administrative Patent Judges*.

WARREN, *Administrative Patent Judge*.

Decision on Appeal

This is an appeal under 35 U.S.C. § 134 from the decision of the examiner finally rejecting claims 1 through 17. Claim 1 is illustrative of the claims on appeal:

1. A process for the hydrogenolysis of 2,2-dichlorohexafluoropropane to 2,2-dihydrohexafluoropropane and 2-chloro-2-hydrohexafluoropropane which comprises

reacting said starting material with hydrogen at an elevated temperature of about 300°C or less in the presence of a catalyst containing a catalytically effective amount of palladium supported on a support selected from the group consisting of fluorinated alumina, aluminum fluoride and mixtures thereof.

The appealed claims as represented by claim 1¹ are drawn to a process for preparing 2,2-dihydro-hexafluoropropane (CF₃CH₂CF₃, HFC-236fa) and 2-chloro-2-hydrohexafluoropropane (CF₃CHClCF₃, HCFC-226da) by the hydrodechlorination of 2,2-dichlorohexafluoropropane (CF₃CCl₂CF₃, CFC-216aa), which comprises at least the step of reacting 2,2-dichlorohexafluoropropane with hydrogen at the stated temperature in the presence of palladium supported on fluorinated alumina, aluminum fluoride and mixtures thereof. The product obtained by the claimed process can contain at least 90% of the fluorine atoms contained in 2,2-dichlorohexafluoropropane and less than 5 mole percent of said product contains 5 fluorine substituents (claim 8).

The references relied on by the examiner are:

Smith et al. (Smith)	2,942,036	June 21, 1960
Kellner et al. (Kellner I)	4,873,381	Oct. 10, 1989
Kellner et al. (Kellner II)	4,980,324	Dec. 25, 1990

The examiner has rejected appealed claims 1 through 10, 13 and 15 through 17 under 35 U.S.C. § 103 as being unpatentable over Kellner I in view of Smith and appealed claims 11, 12 and 14 under 35 U.S.C. § 103 as being unpatentable over Kellner I in view of Smith for the reasons given in the rejection of claims 1 through 10, 13 and 15 through 17 and further in view of Kellner II. We affirm these grounds of rejection and thus the decision of the examiner.

Rather than reiterate the respective positions advanced by the examiner and appellant, we refer to the examiner's answer and to appellant's brief for a complete exposition thereof.

Opinion

We have carefully reviewed the record on this appeal and based thereon find ourselves in agreement with the examiner that the claimed process for preparing 2,2-dihydro-hexafluoropropane (CF₃CH₂CF₃) and 2-chloro-2-hydrohexafluoropropane (CF₃CHClCF₃) by the hydrodechlorination of 2,2-dichlorohexafluoropropane (CF₃CCl₂CF₃) comprising at least reacting 2,2-

¹ Appellant has grouped the appealed claims into 2 groups (brief, page 3) and the examiner has so considered the appealed claims (answer, pages 2 and 7-8). Thus, we decide this appeal based on appealed claims 1 and 8, which are representative of the respective groups. 37 CFR § 1.192(c)(7) (1995).

dichlorohexafluoropropane with hydrogen in the presence of palladium supported on fluorinated alumina, aluminum fluoride and mixtures thereof at the stated temperature encompassed by appealed claims 1 and 8 would have been obvious over the combined teachings of Kellner I and Smith to one of ordinary skill in this art at the time the claimed invention was made.

As pointed out by the examiner in the answer, one of ordinary skill in this art would have found in the combined teachings of Kellner I and Smith the reasonable expectation of hydrodechlorinating a fluorochlorocarbon structurally similar to the fluorochlorocarbons of the references with hydrogen in the presence of a supported palladium hydrodechlorination catalyst. with the reasonable expectation that at least one if not all of the chloro substituents would be preferentially replaced by hydrogen. *In re Dow Chemical Co.*, 837 F.2d 469, 473, 5 USPQ2d 1529, 1531 (Fed. Cir. 1988) (“Both the suggestion and the expectation of success must be founded in the prior art, not in applicant’s disclosure.”). We find that Kellner I discloses the hydrodechlorination of 1,1,1,2-tetrafluorochloroethane (CF_3CHClF) with hydrogen in the presence of a catalyst consisting essentially of palladium supported on aluminum fluoride or fluorinated alumina to obtain 1,1,1,2-tetrafluoroethane ($\text{CF}_3\text{CH}_2\text{F}$) (e.g., col. 2). We find that Smith discloses the hydrodechlorination of 1,2,2-trichloropentafluoropropane ($\text{CF}_3\text{CCl}_2\text{CClF}_2$) with hydrogen in the presence of a catalyst consisting of palladium supported on activated carbon to obtain, depending on the amount of hydrogen used, 1,1,1,3,3-pentafluoropropane ($\text{CF}_3\text{CH}_2\text{CHF}_2$), 1,1,1,3,3-pentafluoropropene ($\text{CF}_3\text{CH}=\text{CF}_2$), or 1,1,1,3,3-pentafluoro-2-chloro-propene ($\text{CF}_3\text{CCl}=\text{CF}_2$) (e.g., cols. 1 and 2). Indeed, as pointed out by the examiner, one of ordinary skill in this art would have recognized from these teachings that a supported palladium hydrogenation catalyst will hydrodechlorinate a secondary dichloro substituted carbon as well as a terminal fluorochlorocarbon.

Thus, we agree with the examiner’s conclusion that, *prima facie*, one of ordinary skill in this art would have found in the combined teachings of Kellner I and Smith the reasonable suggestion to hydrodechlorinate the analogous, known compound 2,2-dichlorohexafluoropropane ($\text{CF}_3\text{CCl}_2\text{CF}_3$), which contains a secondary chloro substituted carbon, with hydrogen in the presence of a supported palladium catalyst, such as palladium supported on aluminum fluoride or fluorinated alumina as taught by Kellner I, in the reasonable expectation of obtaining the analogous, known products 2,2-dihydro-

hexafluoropropane (CF₃CH₂CF₃) and/or 2-chloro-2-hydrohexafluoropropane (CF₃CHClCF₃).² See *Dow Chem.*, 837 F.2d at 473, 5 USPQ2d at 1531-32; cf. *In re Brouwer*, 77 F.3d 422, 425-26, 37 USPQ2d 1663, 1665-66 (Fed. Cir. 1996). Accordingly, we find that, *prima facie*, one of ordinary skill in this art following the combined teachings of the references with respect to hydrodechlorination processes would have arrived at the claimed process which uses palladium supported on aluminum fluoride or fluorinated alumina as the hydrodechlorination catalyst as encompassed by appealed claim 1. With respect to appealed claim 8, we find that, *prima facie*, one of ordinary skill in this art following the combined teachings of Kellner I (e.g., col. 2) and Smith (e.g., cols. 1-3) would have optimized such known hydrodechlorination process result effective variables as concentration of palladium in the catalyst, fluorine content of the catalyst support, temperature and hydrogen feed by routine experimentation in order to optimize the yield of the amount and type of product(s), as pointed out by the examiner (answer, page 8). See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Accordingly, since a *prima facie* case of obviousness has been established over the combined teachings of Kellner I and Smith, we have again evaluated all of the evidence of obviousness and nonobviousness based on the record as a whole, giving due consideration to the weight of appellant's arguments and the evidence in the specification. See generally, *In re Johnson*, 747 F.2d 1456, 1460, 223 USPQ 1260, 1263 (Fed. Cir. 1984); *In re Piasecki*, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984).

We have carefully considered all of appellant's arguments and the evidence in the specification. Appellant argues that the applied prior art would not have suggested to one of ordinary skill in this art "the yield of *saturated products and/or products which have the same fluorine content as the starting material* when using catalysts of palladium on an aluminum fluoride or fluorinated alumina support with three-carbon chlorofluorocarbons . . . particularly

² We take notice that appellants has not alleged that the reactant and the products are novel compounds and indeed, have acknowledged that these three compounds are known in their specification (e.g., page 1, lines 25-35, page 2, lines 6-10, page 3, lines 25-27, and page 4, lines 3-9).

where chlorine is positioned on an internal carbon atom of a type which is not even present in two carbon reactants such as [1,1,1,2-tetrafluorochloroethane (CF₃CHClF)]” (brief, pages 5-6; emphasis in original deleted; italic emphasis supplied). Appellant thus “submits that while palladium is a well known hydrogenolysis and hydrodechlorination catalyst component, its effect can vary in particular applications based upon the use of different supports; and that the results obtained with different substrates is highly unpredictable” (*id.*, page 6). In this respect, Appellant contends that the claimed three-carbon reactant, 2,2-dichlorohexafluoropropane (CF₃CCl₂CF₃) is not analogous to the two-carbon reactant of Kellner I, 1,1,1,2-tetrafluorochloroethane (CF₃CHClF), because there is no secondary dichloro substituted carbon, and thus Kellner I would not have suggested to one of ordinary skill in this art that the former would be expected to react in a manner analogous to the latter in the presence of palladium on an aluminum fluoride or fluorinated alumina support (*id.*, pages 7-8).

Appellant further contends that Smith would not have reasonably suggested that 2,2-dichlorohexafluoropropane (CF₃CCl₂CF₃) can be efficiently hydrodechlorinated to the claimed products by the use of palladium on an aluminum fluoride or fluorinated alumina support taught in Kellner I (*id.*, pages 8-9). Appellant points out in this respect that Smith discloses the use of an activated carbon supported palladium catalyst in the hydrodechlorination of 1,2,2-trichloropentafluoropropane (CF₃CCl₂CClF₂), a three-carbon fluorochlorocarbon in contrast to the two-carbon fluorochlorocarbon of Kellner I, which “contains both internal and end-carbon chlorine substituents” (original emphasis deleted) and results in the formation of olefinic products “depending on reaction conditions,” where no olefinic products are reported by Kellner I (*id.*, pages 9-10). Appellant alleges that the specification Comparative Runs No. 6 and 7 (pages 5-6), which use palladium on a carbon support, along with Smith “suggest that during the catalytic hydrodechlorination of a three-carbon chlorofluorocarbon significant amounts of olefins can be formed, and that the comparative experiment further suggests that where [2,2-dichloro-hexafluoropropane (CF₃CCl₂CF₃)] is the starting material . . . significant amount of hydrofluorocarbons containing less fluorine substituents than the starting materials can be formed” (brief, page 9; see also, pages 6 and 11). With respect to the specific product requirements set forth in claim 8, appellant alleges that the same are not suggested by Smith because the specification Comparative Runs No. 6 and 7 establish that “very different results [are]

obtained when using different palladium supports,” pointing out that “if olefins are formed at a temperature of 150°C [as in Smith], then it is likely that larger amounts of olefins might well be formed at higher temperatures under otherwise the same reaction conditions” as demonstrated in Smith (*id.*, page 11).

In response to appellant’s arguments, the examiner submits that “[t]here is no evidence of record that the starting material of the instantly claimed process is responsible for an unexpected and unobvious result” when using catalysts of palladium on an aluminum fluoride or fluorinated alumina support taught in Kellner I, and because both Kellner I and Smith teach palladium based catalysts, one of ordinary skill in this art would have expected similar results when using these catalysts (answer, pages 7-8). The examiner further contends that the conditions of Smith were not used in the specification Comparative Runs, with respect to which the specification “simply states that ‘an olefin and/or a saturated product containing one less fluorine than the starting compound can be produced’” (answer, page 8; see specification, page 6, lines 23-30), and that “optimum conditions would vary for catalysts using different supports but the determination of those optimum conditions are well within the skill of the ordinary artisan” (*id.*, page 8).

We must agree with the examiner that appellant’s arguments and evidence in the specification are not persuasive. We initially note that claim 1 requires only that the claimed process obtains the two specified products without limitation on or exclusion of other three-carbon products and that claim 8 does specify limitations on but not exclusion of other three-carbon products. These claims further specify only the presence of hydrogen, “an elevated temperature of about 300°C or less,” and a “catalytically effective amount” of the specified catalyst. Indeed, according to specification Runs No. 1 through 5, as set forth in Run No. 1, “[t]he hydrogen-containing products included” the two products specified in claim 1 “in addition to very small quantities of other products,” such that the “quantities of other products” of these runs, which involved combinations of three different temperatures and two different hydrogen flowrates, ranged from 1.7% to 7.5% (page 5).

Thus, in the absence of additional process parameter limitations and product limitations in claim 1 and claim 8, we must agree with the examiner that appellant has not established on this record that one of ordinary skill in the art following the combined teachings of Kellner I and Smith would *not* have

had a reasonable expectation that a supported palladium catalyst, including palladium supported on aluminum fluoride or fluorinated alumina as taught by Kellner I, would successfully hydrodechlorinate the known reactant 2,2-dichlorohexafluoropropane ($\text{CF}_3\text{CCl}_2\text{CF}_3$) to obtain the expected, known products 2,2-dihydro-hexafluoropropane ($\text{CF}_3\text{CH}_2\text{CF}_3$) and/or 2-chloro-2-hydrohexafluoropropane ($\text{CF}_3\text{CHClCF}_3$) using conditions taught in the references. Further, with respect to the product limitations of claim 8, we agree with the examiner that one of ordinary skill in this art would have optimized conditions for the palladium catalyst, regardless of the support, with respect to obtaining the optimum yield of the desired product(s). While appellant focuses on the teachings of Smith with respect to olefinic products obtained in using palladium on activated carbon, we find that this reference clearly would have taught one of ordinary skill in this art that the saturated product 1,1,1,3,3-pentafluoropropane ($\text{CF}_3\text{CH}_2\text{CHF}_2$) can be obtained with at least the substantial elimination of the unsaturated products, with the appropriate selection of result effective variables (e.g., cols. 2-3). Thus, we agree with the examiner that the results of specification Comparative Runs No. 6 and 7, based on the combinations of one temperature and two hydrogen flowrates, as explained in the specification, do not adequately reflect the teachings of Smith. Therefore, in the absence of an explanation of the significance of the results obtained in the specification Comparative Runs, appellant's unsupported allegation in the brief (page 11) that this evidence establishes that "very different results [are] obtained when using different palladium supports" does not establish that the results obtained with palladium supported on fluorinated alumina are unexpected vis-à-vis the combined teachings of Kellner I and Smith,³ and in any event, does not establish that such evidence based on limited variation in process parameters and catalyst is commensurate in scope

³ It is well settled that the burden of establishing the significance of data in the record, with respect to unexpected results rests with appellant, which burden is not carried by mere arguments of counsel. *See generally, In re Geisler*, 116 F.3d 1465, 1470, 43 USPQ2d 1362, 1365-66 (Fed. Cir. 1997); *In re Merck & Co.*, 800 F.2d 1091, 1099, 231 USPQ 375, 381 (Fed. Cir. 1986); *In re Longi*, 759 F.2d 887, 897, 225 USPQ 645, 651-52 (Fed. Cir. 1985); *In re Klosak*, 455 F.2d 1077, 1080, 173 USPQ 14, 16 (CCPA 1972); *In re D'Ancicco*, 439 F.2d 1244, 1248, 169 USPQ 303, 306 (CCPA 1971).

with the breadth of the processes encompassed by the appealed claims.⁴

We observe that appellant has also argued that the teachings of Kellner II when combined with Kellner I would not have suggested the claimed processes (brief, pages 10-11). However, Kellner II was not combined with Kellner I and Smith for that purpose. In this respect, we note that appellant has limited his argument to two groups of claims of which claims 1 and 8 are representative and we have so considered them above. Thus, appellant has not directly addressed the rejection of claims 11, 12 and 14 over the combined teachings of Kellner I, Smith and Kellner II, in which Kellner II is relied on by the examiner as evidence that it was known to regenerate aluminum fluoride supported palladium catalysts (answer, pages 6-7), as recognized by the examiner (*see supra* n. 1).

Accordingly, based on our consideration of the totality of the record before us, we have weighed the evidence of obviousness found in the combined teachings of Kellner I and Smith and in the combined teachings of Kellner I, Smith and Kellner II with appellant's countervailing evidence of and argument for nonobviousness and conclude that the claimed invention encompassed by appealed claims 1 through 10, 13 and 15 through 17 and of claims 11, 12 and 14 would have been obvious as a matter of law under 35 U.S.C. § 103.

The examiner's decision is affirmed.

⁴ *See In re Landgraf*, 436 F.2d 1046, 1050, 168 USPQ 595, 597 (CCPA 1971).

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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)	
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CHARLES F. WARREN)	BOARD OF PATENT
Administrative Patent Judge)	APPEALS AND
)	INTERFERENCES
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