UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte YOSHIMI YAMADERA and EIKI NAGASHIMA

Appeal 2007-2242
Application 10/352,997
Technology Center 1700

Decided: August 1, 2007

Before TEDDY S. GRON, CAROL A. SPIEGEL, and MARK NAGUMO, *Administrative Patent Judges*.

GRON, *Administrative Patent Judge*.

DECISION ON APPEAL

Introduction

This is an appeal under 35 U.S.C. § 134 from the Examiner's final rejection of Claims 1-15 of Application 10/352,997, filed January 29, 2003, under 35 U.S.C. § 103(a) as unpatentable in view of Lee, European Patent 777,756, published December 12, 1996. Claims 1-15 are the only claims pending in the Application.

In deciding this appeal, we have considered the following: (1) the Final Rejection, mailed January 20, 2006; (2) the Appeal Brief, filed September 1, 2006; (3) the Examiner's Answer, mailed November 6, 2006; and (4) the Reply Brief, filed January 8, 2007. We have also studied Applicants' Specification and the whole of Lee, European Patent 777,756.

Statement of the Case

The claims on appeal relate to "a duplex stainless steel for use in a urea manufacturing plant" (Specification, p. 1). "This duplex stainless steel has a high corrosion resistance in environments where construction materials of urea plants are exposed" (Specification, p.1). The claimed steel is also said to possess strength, prevent formation of a sigma phase if the steel is exposed to specific temperatures, and display good surface properties in hot working (Specification, p. 3).

The main issue on appeal is whether the Examiner has made out a case for obviousness under 35 U.S.C. § 103(a). "[T]he examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a prima facie case of unpatentability." *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). The concept of *prima facie* obviousness is a procedural mechanism, which requires the examiner to produce evidence sufficient to support a ruling of obviousness in the first instance. *See In re Piasecki*, 745 F.2d 1468, 1472, 223 USPQ 785, 787-788 (Fed. Cir. 1984). "If examination at the initial stage does not produce a *prima facie* case of unpatentability, then without more the applicant is entitled to grant of the patent." *In re Oetiker*, 977 F.2d at 1445, 24 USPQ2d at 1444.

Applicants argue the claims in four separate groups: (i) Claims 1, 2, 3, and 9; (ii) Claims 4, 10, and 11; (iii) Claims 5, 7, 12, and 14; and (iv) Claims 6, 8, 13, and 15. Claims 1 and 2 are the only independent claims on appeal and have been grouped together by Appellant. If there is no support for the rejection against Claim 1, the broadest claim, then all other claims stand with Claim 1. Claim 1 is transcribed below (Br. app. A):

> 1. A duplex stainless steel for use in urea manufacturing plants, in mass %, consisting of C: 0.03% or less, Si: 0.5% or less, Mn: 2% or less, P: 0.04% or less, S: 0.003% or less, Cr: 26 % or more, but less than 28%, Ni: 7.3-10%, Mo: 0.2-1.7%, W: more than 2%, but no more than 3%, N: more than 0.3%, but no more than 0.4%, with the balance being Fe and impurities, in which the content of Cu as an impurity is no more than 0.1%.

Findings of Fact Relating to Obviousness

1. According to Lee, there are (circa 1996) two general classes of duplex stainless steel, UNS 31803, which is 21-23 w% Cr, and SAE 2507, which is 24–26 w% Cr (both have several other required ranges of various components). (Lee, p. 2, ll. 18–22.)

2. Lee's aim is to provide a duplex stainless steel that is superior in hot ductility and high temperature oxidation resistance, while maintaining the corrosion resistance and phase stability of heat-affected zones. (Lee, p. 3, ll. 6–8.)

3. Lee, the only applied prior art, describes a duplex stainless steel comprising in weight %: less than 0.03% of Carbon (C), less than 1.0% of Silicon (Si), less than 2.0% of Manganese (Mn), less than 0.04% of Phosphorus (P), less than 0.004% of Sulfur (S), less than 2.0% of Copper (Cu), 5.0-8.0% of Nickel (Ni), 22-27 % of Chromium (Cr), 1.0-2.0% of

Molybdenum (Mo), 2.0-5.0 % of Tungsten (W), and 0.13-0.30% of Nitrogen (N) (Lee, p. 16, ll. 3-5).[1]

4. Lee teaches that, with regard to Cu, "[p]articularly, in the duplex stainless steel which contains 22.5-23.5% of Cr, the impact toughness is improved by adding Cu" (Lee, p. 4, ll. 31-32).

5. Lee teaches that, with regard to Cu, "it is preferable to limit the content of Cu to less than 2.0%, and more preferably to less than 1.0%" (Lee, p. 4, l. 33)

6. Lee teaches that, with regard to Ni, "the content of Ni should preferably be limited to 5-8%" (Lee, p. 4, ll. 38-39).

7. Lee teaches that, with regard to Ni, "if the content of Ni departs from the proper range, the ratio of the austenite phase to the ferrite phase is disturbed, with the result that the duplex stainless steel loses its intrinsic properties" (Lee, p. 4, ll. 34-36).

8. Lee teaches that, with regard to Cr, "if [the content of Cr] exceeds 27%, the precipitation rate of intermetallic compounds becomes faster, with the result that the corrosion resistance and the impact toughness are decreased" (Lee, p. 4, ll. 41-43).

9. Lee teaches that, with regard to N, "the content of N should be preferably limited to 0.13-0.27%. However, if the content of S is less than 0.002%, the content of N can be increased up to 0.3%" (Lee, p. 4, ll. 57-58).

[1] We take "mass %" and "weight %" to be proportionately equivalent terms. In so doing, we follow the Applicants and the Examiner, who have not distinguished the two measures.

10.Lee teaches that, with regard to N, "if the content of N exceeds 0.27%, then the austenite phase is too much reinforced, with the result that the hot ductility is decreased" (Lee, p. 4, 56-57).

Discussion

"[T]he Board must weigh each reference for its power to suggest solutions to an artisan of ordinary skill." *In re Young*, 927 F.2d 588, 591, 18 USPQ2d 1089, 1091 (Fed. Cir. 1991). "The quantum of evidence required to establish unobviousness will depend upon the strength of the showing of obviousness made by the prior art." *In re Skoll*, 523 F.2d 1392, 1398, 187 USPQ 481, 485 (CCPA 1975). "[T]he question under 35 U.S.C. 103 is not merely what the references expressly teach, but what they would have suggested to one of ordinary skill in the art at the time the invention was made." *In re Lamberti*, 545 F.2d 747, 750, 192 USPQ 278, 280 (CCPA 1976).

In this case, there is evidence weighing for and against patentability. The evidence favoring unpatentability must be properly weighed against all the countervailing evidence. *See Piasecki*, 745 F.2d at 1472, 223 USPQ at 788; *See also Skoll*, 523 F.2d at 1397-98, 187 USPQ at 484-485. Lee most broadly teaches duplex stainless steels having element mass percentages within the limits of the claimed percentage ranges required for each of C, Mn, P, and S. Furthermore, for Si, P, Mo, and W, Lee's teaching as a whole reasonably suggests element mass percentages within Applicants' claimed ranges. However, the element mass percentages Applicants' claims require for Cu, Ni, Cr, and N differ from those preferred and/or exemplified by Lee. On the other hand, as we explain below, Lee's broadest teaching is suspect

for element mass percentages of Cu, Ni, Cr, and N. Therefore, we pay particular attention to the evidence relating to these elements.

Applicants' steel contains Cu in mass percentages of "not more than 0.1%" (Br. app. A). Lee broadly describes steel containing less than 2% Cu (Lee, p. 16, l. 5). However, the percentages of Cu in all of Lee's examples greatly exceed Applicants' upper limit (Lee, pp. 9-11, Table 1).

Applicants' steel contains Ni in mass percentages of 7.3-10% (Br. app. A). Lee broadly describes steel containing 5.0-8.0% Ni (Lee, p. 16, l. 5). However, the percentages of Ni in all of Lee's examples never exceed 6.64% (Lee, pp. 9-11, Table 1).

Applicants' steel contains Cr in mass percentages of "26% or more, but less than 28%" (Br. app. A). Lee broadly describes steel containing 22-27% Cr (Lee, p. 16, l. 5). However, the percentages of Cr in all of Lee's examples never exceed 25.55% (Lee, pp. 9-11, Table 1). Moreover, Lee indicates that steels containing percentages of Cr greater than 26% are not standard steels (Lee at p. 2, ll. 18–22).

Finally, Applicants' steel contains N in mass percentages of "more than 0.3%, but no more than 0.4%" (Br. app. A). Lee broadly describes steel containing 0.13-0.30% N (Lee, p. 16, l. 5). However, Lee prefers to limit the content of N to 0.13-0.27% (Lee, p.4, ll. 54-58).

We find that one of ordinary skill in the art reasonably would not have been moved by Lee to the limits of the broad element mass percentage ranges for Cu, Ni, Cr, and N in the steels Lee describes for any purpose Lee suggests. And, Lee's examples direct persons having ordinary skill in the art away from Applicants' claimed steel.

"[S]imply because an invention falls within a range disclosed by prior art does not necessarily make it per se obvious." *Iron Grip Barbell Co. v. USA Sports Inc.*, 392 F.3d 1317, 1321, 73 USPQ2d 1225, 1228 (Fed. Cir. 2004). "Nonetheless, where there is a range disclosed in the prior art, and the claimed invention falls within that range, there is a presumption of obviousness." *Id* at 1322, 73 USPQ2d at 1228. "But the presumption will be rebutted if it can be shown … [t]hat the prior art taught away from the claimed invention." *Id*.

Applicants claim steel containing "not more than 0.1%" Cu (Br. app. A). Lee teaches that impact toughness may be improved by adding Cu (Lee, p. 4, ll. 32-33). Applicants seek to decrease the percentage of Cu. Of the 48 examples contained in Lee, not one steel composition contains less than 0.1% Cu (Lee, pp. 9-11, Table 1). Lee's examples include from 0.19-1.04% Cu (Lee, pp. 9-11, Table 1).

With respect to Ni, Lee discloses (Lee, p. 4, ll. 35-40; emphasis added):

> The Ni is an important element which stabilizes the austenite phase. However, <u>if the content of Ni departs from the proper range, the ratio of the austenite phase to the ferrite phase is disturbed, with the result that the duplex stainless steel loses its intrinsic properties.</u> Particularly, in the case where the content of Ni is less than 5%, the ferrite phase which has a low solubility of N is increased, and the chromium nitride is formed in the ferrite phase, with the result that the corrosion resistance and the impact toughness are lowered. Therefore, <u>the content of Ni should be preferably limited to 5-8%.</u>

Applicants claim steel containing 7.3-10% Ni (Br. app. A). Of the 48 examples of steel compositions contained in Lee, not one contains as much as 7% Ni (Lee, pp. 9-11). The maximum percentage of Ni in any of Lee's

examples is 6.64% (Lee, p. 9, Table 1, steel #13). Lee provides little, if any, motivation to try at least 7.3% Ni.

With respect to Cr, Lee discloses (Lee, p. 4, ll. 41-44; emphasis added):

> The Cr is an important element for improving the corrosion resistance. If the content of Cr is less than 22%, the duplex stainless steel cannot have the required corrosion resistance. On the other hand, if it exceeds 27%, the precipitation rate of intermetallic compounds becomes faster, with the result that the corrosion resistance and the impact toughness are decreased. Therefore, the content of Cr should be preferably limited to 22-27%.

Applicants claim steel containing "26% or more, but less than 28%" of Cr (Br. app. A). None of Lee's 48 examples contains Cr in an amount of at least 26% (Lee, pp. 9-11). In fact, the highest Cr percentage in any example is 25.55% (Lee, pp. 9-10, Table 1, steel #19, 32, and 42). Again, Lee points to a mass percentage different than Applicants' 26-28%.

Finally, with respect to N, Lee discloses (Lee, p. 4, ll. 55-59; emphasis added):

> The N is a strong austenite stabilizing element, and improves the corrosion resistance. If the content of N is less than 0.13%, the duplex stainless steel cannot have the required corrosion resistance, and promotes the precipitation of the intermetallic compounds. On the other hand, if the content of N exceeds 0.27%, then the austenite phase is too much reinforced, with the result that the hot ductility is decreased. Therefore, the content of N should be preferably limited to 0.13-0.27%. However, if the content of S is less than 0.002%, the content of N can be increased up to 0.3%.

Applicants claim steel containing "more than 0.3%, but no more than 0.4%" of N (Br. app. A). Lee teaches that the content of N should be preferably below 0.27% (Lee, p. 4, ll. 58-59). If the content of N exceeds

0.27%, the hot ductility is decreased (Lee, p. 4, ll. 57-58). As hot ductility is a property particularly sought by Lee (Lee, p. 3, ll. 6–7), evidence that some particular benefit known to the prior art arises from similar steel alloys with high N content would be highly desirable to avoid falling into the trap of hindsight reconstruction of Applicant's claimed invention, In the present case, the Examiner has not directed our attention to any such teachings, but merely relies on the general teachings of Lee.

The record indicates that the teaching in Lee as a whole would not have directed one of ordinary skill in the art to Applicants' claimed ranges for each of Cu, Ni, Cr, and N. While the Supreme Court recently rejected a rigid application of the teaching, suggestion, or motivation test in an obviousness inquiry in *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 82 USPQ2d 1385 (2007), the Court acknowledged the importance of identifying "a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does." *Id* at 1731, 82 USPQ2d at 1396. Furthermore, it is not unreasonable to require the prior art to provide some reason to alter a known chemical composition in a particular manner to establish the obviousness of a claimed chemical composition. *See Takeda Chem. Indus., Ltd. v. Alphapharm Pty., Ltd.*, ____ F.3d ____, _____, 83 USPQ2d 1169, 1174 (Fed. Cir. 2007).

While Lee provides some evidence against the patentability of the chemical composition Applicants claim, this evidence is far outweighed by the evidence favoring patentability. Accordingly, the Examiner has not made a case for the obviousness of the composition of Applicants' Claim 1. All claims stand with Claim 1.

Conclusion

Having considered all the evidence of record for and against the patentability of Claims 1-15 of Application 10/352,997 under 35 U.S.C. § 103(a), we reverse the appealed final rejection.

Order

Upon consideration of the appeal, and for the reasons given, it is

ORDERED that the decision of the Examiner rejecting Claims 1-15 of Application 10/352,997 under 35 U.S.C. § 103(a) is reversed; and

FURTHER ORDERED that the case be returned to the Examiner for action consistent herewith.

REVERSED

NAGUMO, *Administrative Patent Judge*, concurring.

Although I agree with the conclusions of my colleagues, I write separately to emphasize my view that this case falls into the classic problem of deciding when a species—more accurately, a subgenus—within the scope of a broadly disclosed genus, is prima facie obvious.

Technologically, as indicated by Lee, steel alloys are members of an extraordinarily complex class. Relatively small amounts of various elements can have large and largely unpredictable physical consequences. In a similarly complex situation (herbicidal activity of organic compounds), the

Federal Circuit ruled, "We decline to extract from *Merck*[2] the rule that the Solicitor appears to suggest that regardless of how broad, a disclosure of a chemical genus renders obvious any species that happens to fall within it." *In re Jones*, 958 F.2d 347, 350, 21 USPQ2d 1941, 1943 (Fed. Cir. 1992).

In the present case, no fewer than 12 elements are named in Applicants' claim 1, each with a prescribed range of relative amount. Of those 12 elements, Lee discloses only five (Fe, C, Mn, P, and S) that are entirely within the recited (in the case of iron, implied) ranges, and three more (Si, Mo, and W), that have a substantial and preferred overlap with the claimed ranges. Lee's preferred amounts of the remaining four elements, as shown in the majority opinion, are not within the scope of Applicants' claimed subject matter. Conversely, Lee indicates that amounts in Applicants' ranges tend to lead to properties, such as a loss in high temperature ductility, that Lee is trying to avoid.

The evidence favoring a conclusion of obviousness are Lee's general teachings of ranges of elements in steel alloys. The contrary evidence are Lee's specific cautions that certain ranges of four elements, Cu, Ni, Cr, and N, lead to undesired results in the general class of claimed steel alloys. Particularly because it appears that all the elements interact with one another, this does not seem to be a case of linear optimization of independent parameters. Moreover, the Examiner has not directed our attention to any teachings suggesting that the specific *combination* of ranges of the required elements would have been expected to be beneficial. In light of the complexity and unpredictability of the art of steel alloys indicated by

---

[2] *Merck & Co. v. Biocraft Labs., Inc.*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir. 1989).

the record, I would find that the evidence favoring nonobviousness outweighs the evidence favoring obviousness. It is not necessary, in my view, to find that Lee teaches away from the broader ranges that encompass ranges recited in Applicants' claims.

For the foregoing reasons, I join the majority's disposition of this appeal.

js

Christopher W. Brody
CLARK & BRODY
1090 Vermont Ave., NW, Suite 250
Washington, D.C. 20005