United States Court of Appeals for the Federal Circuit

04-1370
(Serial No. 09/797,326)

IN RE KENNETH HARRIS and JACQUELINE B. WAHL

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Appealed from: United States Patent and Trademark Office, Trademark Trial and Appeal Board

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(Serial No. 09/797,326)

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DECIDED: May 25, 2005

Before CLEVENGER, Circuit Judge, FRIEDMAN, Senior Circuit Judge, and RADER, Circuit Judge.

RADER, Circuit Judge.

The United States Patent and Trademark Office (PTO) Board of Patent Appeals and Inferences (Board) affirmed the PTO's rejection of claims 1-20 of Kenneth Harris and Jacqueline B. Wahl's (collectively Harris) U.S. Patent Application 09/797,326 ('326 Application) as obvious under 35 U.S.C. § 103. Ex Parte Harris, Appeal No. 2003-1930, Paper No. 16 (B.P.A.I. Sept. 26, 2003) (Paper No. 16). The Board found a prima facie case of obviousness because the claimed ranges overlapped the ranges disclosed in U.S. Patent No. 5,611,670 (issued Mar. 18, 1997) (Yoshinari) and found Harris's rebuttal evidence unpersuasive. Because substantial evidence supports the Board's factual findings and the Board's conclusion of obviousness was correct, this court affirms.

I.

On March 1, 2001, Harris filed the '326 Application claiming a nickel-based superalloy for turbine engine blades that experience high temperatures. The alloy disclosed in the '326 Application contains nickel, plus twelve additional elements defined by a range of weight percentages. Representative claim 1 reads:

> A nickel-base superalloy comprising, in percentages by weight, from about 4.3% to about 5.3% Chromium (Cr), from about 9.0% to about 10% Cobalt (Co), from about 0.6% to about 0.8% molybdenum (Mo), from about 8.4% to about 8.8% tungsten (W), from about 4.3% to about 4.8% tantalum (Ta), from about 0.6% to about 0.8% titanium (Ti), from about 5.6% to about 5.8% aluminum (Al), from about 2.8% to about 3.1% rhenium (Re), from about 0.9% to about 1.5% hafnium (Hf), from about 0.06% to about 0.08% carbon (C), from about 0.012% to about 0.020% boron (B), from about 0.004% to about 0.010% zirconium (Zr), the balance being nickel and incidental impurities.

The '326 Application discloses a single embodiment of the claimed alloy—CMSX®-486. The '326 Application's specification indicates that CMSX®-486 has improved stress-rupture properties over other alloys. The PTO made alternative rejections of representative claim 1 as being prima facie obvious in view of Yoshinari or U.S. Patent No. 5,069,873 (issued Dec. 3, 1991) (the '873 patent).[1]

The PTO rejected all pending claims in an Office Action dated August 7, 2002. The Board affirmed. Paper No. 16. The Board granted Harris's request for reconsideration but made no changes to the original decision. Ex Parte Harris, Appeal No. 2003-1930, Paper No. 18 (B.P.A.I. Feb. 4, 2004). Harris now appeals to this court. This court has jurisdiction under 28 U.S.C. § 1295(a)(4)(A).

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[1] The Patent and Trademark Office rejected claims 1-15 and 17-20 in light of Yoshinari, claim 16 in light of Yoshinari and U.S. Patent No. 6,074,602 (issued June 13, 2000) (Wukusick), and claims 1-10 in light of the '873 patent. Because this court affirms based on Yoshinari, it does not address the Board's alternative rejection based on the '873 patent. Harris did not appeal the rejection of claim 16.

II.

The ultimate determination of obviousness under 35 U.S.C. § 103 is a legal conclusion based on underlying findings of fact. In re Kotzab, 217 F.3d 1365, 1369 (Fed. Cir. 2000). This court reviews the Board's legal conclusion of obviousness de novo and its underlying factual determinations for substantial evidence. In re Gartside, 203 F.3d 1305, 1316 (Fed. Cir. 2000). Whether an invention has produced unexpected results and whether a reference teaches away from a claimed invention are questions of fact. In re Mayne, 104 F.3d 1339, 1343 (Fed. Cir. 1997) (unexpected results); Para-Ordnance Mfg. v. SGS Importers Int'l, 73 F.3d 1085, 1088 (Fed. Cir. 1995) (teaching away). Under the substantial evidence standard, this court affirms the Board's factual determinations if they are based upon "such relevant evidence as a reasonable mind might accept as adequate to support a conclusion." Gartside, 203 F.3d at 1312 (quoting Consol. Edison Co. v. NLRB, 305 U.S. 197, 217 (1938)).

The PTO has the burden of showing a prima facie case of obviousness. Mayne, 104 F.3d at 1341. In this type of claim, a prima facie case of obviousness arises when the ranges of a claimed composition overlap the ranges disclosed in the prior art. See In re Peterson, 315 F.3d 1325, 1329 (Fed. Cir. 2003); In re Geisler, 116 F.3d 1465, 1469 (Fed. Cir. 1997); In re Woodruff, 919 F.2d 1575, 1578 (Fed. Cir. 1990); In re Malagari, 499 F.2d 1297, 1303 (CCPA 1974). Where the "claimed ranges are completely encompassed by the prior art, the conclusion [that the claims are prima facie obvious] is even more compelling than in cases of mere overlap." Peterson, 315 F.3d at 1330. Even without complete overlap of the claimed range and the prior art range, a

minor difference shows a prima facie case of obviousness. Haynes Int'l v. Jessup Steel Co., 8 F.3d 1573, 1577 n.3 (Fed. Cir. 1993).

In this case, the Board found a prima facie case of obviousness because the ranges of the invention of Yoshinari overlap the ranges of representative claim 1. Paper No. 16, slip. op. at 7. As shown in the table below, not only do Yoshinari's disclosed ranges overlap all twelve of the '326 Application's claimed ranges, but eleven of Yoshinari's disclosed ranges completely encompass Harris's claimed ranges. Only Yoshinari's chromium range (5.0 – 14.0) does not completely encompass the '326 Application's chromium range (4.3 – 5.3) (in percentages by weight).

Element	**Claimed Range**	**Yoshinari**
Chromium (Cr)	about 4.3 - about 5.3	5.0 -14.0
Cobalt (Co)	about 9 – about 10	Up to 10.0
Molybdenum (Mo)	about 0.6 - about 0.8	Up to 6.0
Tungsten (W)	about 8.4 - about 8.8	2.0 -15.0
Tantalum (Ta)	about 4.3 - about 4.8	Up to 12.0
Titanium (Ti)	about 0.6 - about 0.8	0.5 - 5.0
Aluminum (Al)	about 5.6 - about 5.8	4.0 -7.0
Rhenium (Re)	about 2.8 - about 3.1	Up to 4.0
Hafnium (Hf)	about 0.9 - about 1.5	Up to 2.0
Carbon (C)	about 0.06 - about 0.08	0.05 - 0.20
Boron (B)	about 0.012 - about 0.020	Up to 0.035
Zirconium (Zr)	about 0.004 - about 0.010	Up to 0.035
Nickel (Ni)	Balance	Balance, 58% or more

Yoshinari, col. 8, l. 20 – col. 9, l. 16. In addition, even the narrower ranges taught by Yoshinari's preferred embodiments and examples overlap eleven of the twelve claimed ranges. Again, the chromium ranges disclosed in Yoshinari's preferred embodiment (5.5 – 9.0) and one of its examples (5.5 – 7.0) do not overlap the '326 Application's chromium range (4.3 – 5.3).

Element	Claimed Range	Yoshinari Preferred	Yoshinari Ex. 1	Yoshinari Ex. 2
Cr	about 4.3 - about 5.3	**5.5 - 9.0**	**5.5 - 7.0**	5.0 - 14.0
Co	about 9 - about 10	9 -10.5	9 - 9.5	0 - 12.0
Mo	about 0.6 - about 0.8	0.3 – 1	0.3 - 0.7	0.5 - 3.0
W	about 8.4 - about 8.8	8 – 11	8 - 9	5.0 -12.0
Ta	about 4.3 - about 4.8	3 – 4	3 - 4	3.0 -7.0
Ti	about 0.6 - about 0.8	0.5 – 1	0.5 - 0.9	0.5 - 3.0
Al	about 5.6 - about 5.8	5 – 6	5.5 - 6.0	4.0 - 6.0
Re	about 2.8 - about 3.1	2.5 - 3.5	2.8 - 3.1	0 - 3.5
Hf	about 0.9 - about 1.5	0.5 – 1	0.7 - 1.0	0 - 2.0
C	about 0.06 - about 0.08	0.03 - 0.1	0.05 - 0.1	Formula
B	about 0.012 - about 0.020	0.005 - 0.25	0.005 - 0.01	Formula
Zr	about 0.004 - about 0.010	0.005 - 0.25	0.005 - 0.01	Formula
Nb	None	0.2-3	None	None
Ni	Balance	>58%	>58%	>58%

Yoshinari, col. 8, l. 20 – col. 9, l. 16; col. 10, ll. 13-19. The Board explained that from the description of Yoshinari

> a person of ordinary skill in the art would have reasonably expected that the chromium content affects the hot corrosion resistance of the superalloy and cobalt content affects the hot corrosion resistance and the high temperature strength of the superalloy. Thus, a person of ordinary skill in the art would have recognized the suitability of adjusting the content of the disclosed elements within the disclosed ranges.

Paper No. 16, slip. op. at 7.

Harris points to Peterson to advance his position that Yoshinari's ranges are too broad to teach any specific alloy to the skilled artisan. Peterson discussed that a disclosed range might become too broad to teach a subset range. 315 F.3d at 1330 n.1. A review of Peterson informs the court that this case does not present such a problem. In Peterson, the applicant claimed a single-crystal, nickel-base superalloy comprising nickel and ten additional elements. Id. at 1327. Eight of the ten ranges disclosed in the Peterson prior art (Shah) are broader than the ranges disclosed in

Yoshinari. For example, Shah's range for cobalt (0-20) is twice the range allowed by Yoshinari (0-10). Id. at 1329. Shah also includes two elements (carbon and boron) that have no upper limits. Id. In contrast, Yoshinari bounds each element to a specific range, and limits the extent of those ranges by requiring at least 58% nickel. Yoshinari, col. 8, l. 20 – col. 9, l. 16; col. 10, ll. 13-19. Thus, the prior art in Peterson was broader than in this case.

In addition, Peterson's claimed ranges were narrower than those claimed in this case. Seven of the ten alloys claimed in Peterson were defined by a specific value. 315 F.3d at 1329 (e.g. claiming "about 14%" chromium and "about 9.5% cobalt"). In contrast, all twelve elements in this case vary over ranges that extend up to a full percentage point. '326 Application, col. 7, claim 1. Thus, this court determines the Board correctly concluded that representative claim 1 is prima facie obvious in view of Yoshinari because the ranges of the invention of Yoshinari sufficiently overlap the ranges of representative claim 1.

When the PTO shows prima facie obviousness, the burden then shifts to the applicant to rebut. In re Dillon, 919 F.2d 688, 692 (Fed. Cir. 1990) (en banc). Rebuttal may take the form of "a comparison of test data showing that the claimed compositions possess unexpectedly improved properties . . . that the prior art does not have, that the prior art is so deficient that there is no motivation to make what might otherwise appear to be obvious changes, or any other argument . . . that is pertinent." Id. at 692-93 (citations omitted).

Harris argues that Yoshinari teaches away from the claimed range of the invention. In support of this contention, Harris argues that nothing in the Yoshinari

patent suggests the use of less chromium and more tantalum, namely the claimed ranges of about 4.3% to 5.3% chromium and about 4.3% to 4.8% tantalum. To the contrary, Yoshinari's Example 2 teaches a superalloy having tantalum content from "3.0 to 7.0" percent, which completely encompasses the claimed range of tantalum. Yoshinari, col. 10, ll. 13-19. In addition, Yoshinari teaches that 5-14 weight percent is an "appropriate additive amount" of chromium. Id. at col. 8, ll. 33-37. Thus, Yoshinari teaches that a portion of the claimed range (e.g., 5.0-5.3) is "appropriate." Finally, the '326 Application's use of the term "about" shows that the applicants did not intend to limit the claimed ranges to their exact end-points. See Jeneric/Pentron, Inc. v. Dillon Co. 205 F.3d 1377, 1381 (Fed. Cir. 2000). Thus, contrary to Harris's contention, Yoshinari's preferred range of 5.5 to 7.0 is not necessarily outside the scope of "about 5.3." Therefore, this court finds substantial evidence supports the Board's finding that Yoshinari does not teach away.

With respect to unexpected results, the Board concluded that Harris had not shown that any results were unexpected. Paper No. 16, slip. op. at 11-12. As evidence of unexpected results, Harris compares CMSX®-486, an alloy centrally located within claim 1's range, to four commercial alloys, namely CM247LC, CMSX-3, CM186LC and CMSX-681. All are prior art except CMSX-681. When compared to CM186LC, CMSX®-486 shows 32% to 43% improvement in stress rupture life. Harris argues CM186LC is the closest prior art because it differs from the claimed invention only in that it has 6.0% chromium rather than about 4.3% to 5.3%, and 3.4% tantalum rather than about 4.3% to 4.8%. While the results were not as favorable when compared against CMSX-3, Harris argues CMSX®-486 can be produced at considerable cost

savings as compared with single crystal castings of CMSX-3 because of fewer rejectable grain defects.

The 32-43% increase in stress-rupture life, however, does not represent a "difference in kind" that is required to show unexpected results. See In re Huang, 100 F.3d 135, 139 (Fed. Cir. 1996) (holding that claimed ranges must "produce a new and unexpected result which is different in kind and not merely in degree from results of the prior art"). In addition, Yoshinari teaches that limiting the percentages of chromium and tantalum will improve the "hot corrosion resistance" and "high-temperature strength" of the alloy. Yoshinari, col. 8, ll. 33-37, 44-51. As these factors are related to the stress-rupture life of the alloy, substantial evidence supports the Board's conclusion that the increase in stress-rupture life is not unexpected.

The Board also correctly reasoned that the showing of unexpected results is not commensurate in scope with the degree of protection sought by the claimed subject matter because the elemental composition of CMSX®-486 is at or near the midpoint of the claimed range. While Harris's evidence may show a slight improvement over some alloys, the record does not show that the improved performance would result if the weight-percentages were varied within the claimed ranges. Even assuming that the results were unexpected, Harris needed to show results covering the scope of the claimed range. Alternatively Harris needed to narrow the claims.

Finally, substantial evidence supports the Board's finding that Harris did not compare an embodiment representative of the claimed range to an embodiment of the closest prior art. Paper No. 16, slip. op. at 11-12. As stated above, Harris contends CM186LC is the embodiment closest to the prior art. However, because both CM186LC

and CMSX®-486 have at least one element that is within Yoshinari's general range, but outside a preferred range, CM186LC is no closer to the prior art than is CMSX®-486. In other words, CMSX®-486, the embodiment allegedly exhibiting unexpected results, is as equally representative of the prior art as is CM186LC. Whereas each embodiment is equally representative of the prior art, a comparison of those two embodiments cannot be said to establish that one embodiment has results unexpectedly superior over the prior art.

III.

In sum, this court affirms the Board's finding of a prima facie case of obviousness because the ranges claimed in the '326 Application's overlapped the ranges disclosed in Yoshinari. This court also sustains the Board's finding that Harris's rebuttal evidence was unpersuasive.

COSTS

Each party shall bear its own costs.

AFFIRMED