

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. 18

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JOHN R. MIHALISIN, JOHN CORRIGAN,
GILBERT M. GRATTI and RUSSEL G. VOGT

Appeal No. 2002-2142
Application No. 09/276,858

ON BRIEF

Before GARRIS, TIMM, and JEFFREY T. SMITH, *Administrative Patent Judges*.
TIMM, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal the decision of the Primary Examiner finally rejecting claims 1-20, which are all of the claims pending in this application. We have jurisdiction under 35 U.S.C. § 134.

THE CLAIMED SUBJECT MATTER

The claims are directed to a method of making nickel-based superalloy single crystal castings with a particular amount of carbon content. According to Appellants, increasing the carbon content beyond a specified alloy carbon level reduces the formation of surface scale on the cast superalloy and also reduces the formation of recrystallized grains after heat treatment (specification at 3, ll. 10-19). Claims 1, 5, and 9 are illustrative of the subject matter on appeal:

1. A method of reducing as-cast metallic surface scale formed on a single crystal casting made by solidifying a molten nickel base superalloy that includes Cr, Co, Mo, W, Ta, and Al, comprising

providing said nickel base superalloy with a C concentration high enough to substantially reduce formation of said as-cast metallic surface scale during solidification, and

solidifying said molten nickel base superalloy in a mold to form said single crystal casting.

5. A method of reducing as-cast metallic surface scale formed on a single crystal casting made by solidifying a molten nickel base superalloy consisting essentially of, in weight %, about 6% to 6.8% Cr, about 8% to 10% Co, about 0.5% to 0.7% Mo, about 5.0% to 6.6% W, about 6.3% to 7% Ta, about 5.4% to 5.8% Al, about 0.6% to 1.2% Ti, about 0.05% to 0.3% Hf, up to about 100 ppm by weight B, up to 50 ppm by weight Mg, and balance essentially Ni, comprising

providing said nickel base superalloy with a C concentration greater than 0.04 weight % effective to substantially reduce formation of said as-cast metallic surface scale when the superalloy is solidified as a single crystal casting, and

solidifying said molten nickel base superalloy in a mold to form said single crystal casting.

9. A method of reducing as-cast metallic surface scale formed on a single crystal casting made by solidifying a molten nickel base superalloy that includes Cr, Co, Mo, W, Ta, and Al, comprising

providing said nickel base superalloy with a C concentration controlled in accordance with the equation,

$\% \text{ area fraction scale} = -0.193 \times \text{carbon content in ppm} + 86$ effective to substantially reduce formation of said as-cast metallic scale when the superalloy is solidified as a single crystal, casting, and

solidifying said molten superalloy in a mold to form said single crystal casting.

THE EVIDENCE

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

Wukusick et al. (Wukusick)	5,100,484	Mar. 31, 1992
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THE REJECTIONS

Claims 1-20 stand rejected as follows: under 35 U.S.C. § 102(b) as being anticipated by Wukusick (Answer at 4-5) and under 35 U.S.C. § 103(a) as being unpatentable over Wukusick (Answer at 5-6).

THE GROUPING OF THE CLAIMS

In the section of the Brief entitled “GROUPING OF THE CLAIMS”, Appellants state that claims 1-20 do not stand or fall together (Brief at 6). We consider the claims separately only to the extent Appellants present separate substantive arguments in the argument section of the Brief. *See* 37 CFR § 1.192(c)(7) and (8)(2001).

OPINION

We affirm the decision of the Examiner to reject claims 1-4, 9-11, 17, and 18 under 35 U.S.C. § 102(b) and claims 1-20 under 35 U.S.C. § 103(a). However, we reverse the decision of the Examiner with respect to the rejection of claims 5-8, 12-16, 19, and 20 under 35 U.S.C. § 102(b).

Anticipation

Anticipation of a claim under § 102 can be found only if the prior art reference discloses something embodying every element of the claim. *In re King*, 801 F.2d 1324, 1326, 231 USPQ 136, 138 (Fed. Cir. 1986). However, that does not mean that the reference must expressly disclose every limitation. A prior art reference may anticipate when a claim limitation not expressly found in the thing described in the reference is nonetheless inherent in it. *In re Best*, 562 F.2d 1252, 1254-55, 195 USPQ 430, 432-34 (CCPA 1977). Moreover, merely choosing to describe the process using different terminology does not render the method patentable. *In re Skoner*, 517 F.2d 947, 950, 186 USPQ 80, 82 (CCPA 1975).

Appellants have chosen to describe their invention in terms of a process of obtaining certain physical characteristics when making a nickel base superalloy single crystal casting. For instance, claim 1 is directed to a method of reducing as-cast metallic surface scale. But that does not change the essence of the process which is really a method of forming a single crystal casting by molding a nickel base superalloy of a particular composition. Wukusick describes a process of forming single crystal castings of nickel base superalloys. In the instances that Wukusick describes a process of making single crystal castings of compositions with the inherent properties recited in the claim, that claim is anticipated.

Particularly, we find that claims 1-4, 9-11, 17, and 18 are anticipated by Wukusick. Focusing on claim 1 to illustrate, we note that this claim is directed to forming single crystal castings of nickel base superalloy containing Cr, Co, Mo, W, Ta, Al. In addition, the alloy contains C in a concentration “high enough to substantially reduce formation of said as-cast metallic surface scale during solidification.” According to Appellants’ specification, carbon concentrations greater than 0.04 wt. % are effective to substantially reduce as-cast metallic scale (specification at 7, ll. 9-13). Not only does Wukusick describe nickel base superalloy compositions with carbon concentrations greater than 0.04 wt. % (Table I, preferred and most preferred), those alloy compositions contain Cr, Co, Mo, W, Ta, and Al in concentrations encompassed by the range of alloy compositions described in the specification at page 6, lines 20-25 for which an increase in carbon content of greater than 0.04 wt.% results in scale reduction

(specification at 7, ll. 9-13). Therefore, there is a strong evidentiary basis to believe that the preferred and most preferred compositions of Wukusick will result in cast single crystal articles having the required reduced scale.

Wukusick describes processes of making single crystal castings of alloys containing preferably 0.04-0.06, and most preferably, 0.05 weight % carbon (Table I). Appellants themselves indicate that this level of carbon results in reducing scale and grain recrystallization in various different alloy compositions containing the elements specified by Wukusick (specification at 4-7). This is sufficient for a finding of anticipation for those claims which cover compositions described by Wukusick, such as claims 1-4, 9-11, 17, and 18. *See Best*, 562 F.2d at 1254, 195 USPQ at 433; *see also King*, 801 F.2d at 1326, 231 USPQ at 138.

Claims 5-8, 12-16, 19, and 20, on the other hand, are limited to compositions containing alloying elements in ranges outside what is taught as preferred and most preferred by Wukusick (*see* Brief at 9). Moreover, while Wukusick more broadly describes a base composition encompassing the alloy composition of, for instance, claim 5, this portion of Wukusick fails to clearly and unequivocally disclose the claimed invention or direct those skilled in the art to the invention without any need for picking, choosing, and combining various disclosures not directly related to each other by the teachings of the cited reference. *In re Arkley*, 455 F.2d 586, 587, 172 USPQ 524, 526 (CCPA 1972).

As we find that anticipation is limited to the subject matter of claims 1-4, 9-11, 17, and 18, we address the arguments for those claims only.

Appellants argue that they have overcome problems not recognized and not solved by the Wukusick patent (Brief at 7-8). “A reference may be from an entirely different field of endeavor than that of the claimed invention or may be directed to an entirely different problem from the one addressed by the inventor, yet the reference will still anticipate if it explicitly or inherently discloses every limitation recited in the claims.” *In re Schreiber*, 128 F.3d 1473, 1477, 44 USPQ2d 1429, 1432 (Fed. Cir. 1997). “[M]erely discovering and claiming a new benefit of an *old* process cannot render the process again patentable.” *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990). Here, there is reason to believe that casting the preferred and most preferred compositions of Wukusick as taught by Wukusick will result in a reduction in scale and grain recrystallization as required by independent claims 1, 9, and 17.

Moreover, the fact that Wukusick does not discuss the same problems allegedly discovered by Appellants does not mean the claimed process is new as required by the patent statute. *See* 35 § U.S.C. 101(2001)(“Whoever invents any *new* ... process or any *new* ... improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.”)(emphasis added). A material and its properties are inseparable. *In re Papesch*, 315 F.2d 381, 391, 137 USPQ 43, 51 (CCPA 1963). In obedience with the laws of nature, adding the amount of carbon specified by Wukusick will result in the properties desired by Appellants. “A

person of ordinary skill in the art does not need to recognize that a method or structure behaves according to a law of nature in order to fully and effectively practice the method or structure.”

EMI Group North America Inc. v. Cypress Semiconductor Corp., 268 F.3d 1342, 1351, 60 USPQ2d 1423, 1429-30 (Fed. Cir. 2001).

Appellants also argue that the failure of Wukusick to recognize Appellants’ problems and provide a solution thereto is apparent in the fact that Wukusick discloses a range of 0-0.07 weight % carbon. This range is listed for the base alloy of Table I. The presence of this broader disclosure does not overcome the fact that Wukusick describes preferred and most preferred compositions containing the required amount of carbon which would inherently result in the reduction of scale and grain recrystallization upon casting. *Cf. In re Sivaramakrishnan*, 673 F.2d 1383, 1384-85, 213 USPQ 441, 442 (CCPA 1982).

Appellants additionally argue that claims 3, 6, 12, and 14 recite that the casting is substantially free of as-cast metallic scale and that Appellants have overcome problems not recognized and not solved by the Wukusick patent (Brief at 9). Here we focus on claim 3 as that is the only claim of the group that we find to be anticipated. Appellants’ own specification provides evidence that carbon levels of 0.045 (450 ppm) and above result in castings which are essentially free of scale (Fig. 2 and specification at 11). Therefore, there is reason to believe that the most preferred alloy composition of Wukusick, which contains 0.05 wt% carbon, would inherently result in castings which are essentially free of scale as required by claim 3.

With respect to claims 9-11, Appellants argue that Wukusick is silent with respect to controlling carbon content in the manner required by claim 9. Claim 9 recites “providing said nickel base superalloy with a C concentration controlled in accordance with the equation, % area fraction scale = $-0.193 \times \text{carbon content in ppm} + 86$ effective to substantially reduce formation of said as-cast metallic scale when the superalloy is solidified as a single crystal casting.” Again, “[a] person of ordinary skill in the art does not need to recognize that a method or structure behaves according to a law of nature in order to fully and effectively practice the method or structure.” *EMI Group North America*, 268 F.3d at 1351, 60 USPQ2d at 1429-30. The equation recited in the claim represents what happens to the % area fraction scale in accordance with the laws of nature as the carbon concentration varies. This law of nature is followed whether or not one practicing the process of providing carbon in a nickel base superalloy knows it or not. Wukusick provides carbon in an amount effective to substantially reduce formation of as-cast metallic scale as required by the claim. The carbon concentration is necessarily controlled in accordance with the equation.¹

We find that claims 1-4, 9-11, 17, and 18 are anticipated by Wukusick because there is reason to believe that the reduced scale and grain recrystallization properties required by the claims would be obtained when practicing the preferred and most preferred embodiments of

¹Should prosecution continue, the Examiner should consider whether claim 9 is sufficiently definite in accordance with 35 U.S.C. 112, ¶ 2. The scope of carbon concentrations encompassed is somewhat unclear as the equation is only valid for carbon concentrations between 0 and 450 ppm (see Fig. 2), but the language “effective to substantially reduce formation of said as-cast metallic scale” relates to concentrations of about 0.04 wt. % (400 ppm) and above, including concentrations above 450 ppm (specification at 10, ll. 19-23). It is thus not entirely clear what concentrations are encompassed by the claim.

Wukusick. Under the circumstances of this case, it is fair to shift the burden to Appellants to prove that the claimed reduction in scale or grain recrystallization is not obtained when following the preferred embodiments of Wukusick. *See Best*, 562 F.2d at 1255, 195 USPQ at 432-33.

Appellants have not provided any objective evidence sufficient to meet their burden.

Obviousness

Wukusick discloses the formation of single crystal cast articles of nickel base superalloys containing the elements required by the claims. With regard to the claims reciting concentration ranges for elements other than carbon, those ranges are encompassed by the ranges of the base alloy of Wukusick (Table I). The concentration range of carbon in the base alloy overlaps the claimed range. A *prima facie* case of obviousness typically exists when the ranges of a claimed composition encompass and/or overlap the ranges disclosed in the prior art. *E.g., In re Peterson*, 315 F.3d 1325, 1329, 65 USPQ2d 1379, 1382 (Fed. Cir. 2003); *In re Geisler*, 116 F.3d 1465, 1469, 43 USPQ2d 1362, 1365 (Fed. Cir. 1997); *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936-37 (CCPA 1976); *In re Malagari*, 499 F.2d 1297, 1303, 182 USPQ 549, 553 (CCPA 1974). In addition, even though the base of alloy of Wukusick is described as including anywhere from 0 to 0.07 wt. % carbon, Wukusick provides reasons for including small controlled amounts of carbon to increase grain boundary strength (Wukusick at col. 9, ll. 1-20). This provides a motivation for including concentrations of carbon above zero.

Appellants make many of the same arguments with regard to obviousness as made in regard to anticipation. We incorporate our responses above and add the following which additionally applies to the issue of obviousness.

With regard to the argument that Wukusick fails to recognize the problems of metallic scale and of deleterious extraneous grain recrystallization (Brief at 11), the prior art need not express the same reason or motivation for making the composition as Appellants to establish unpatentability. *In re Kemps*, 97 F.3d 1427, 1430, 40 USPQ2d 1309, 1311 (Fed. Cir. 1996); *see also Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Int. 1985) (“The fact that appellant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious.”) “It is a general rule that merely discovering and claiming a new benefit of an old process cannot render the process again patentable. While the processes encompassed by the claims are not entirely old, the rule is applicable here to the extent that the claims and the prior art overlap.” *In re Woodruff*, 919 F.2d at 1578, 16 USPQ2d at 1936 (citations omitted).

Appellants quote *In re Spormann*, 363 F.2d 444, 448, 150 USPQ 449, 452 (CCPA 1966) for the proposition that: “That which may be inherent is not necessarily known. Obviousness cannot be predicated on what is unknown.” (Brief at 12). We quite agree. However, in the present case, obviousness is not predicated on what is unknown. The fact that Wukusick discloses base alloys with element concentrations encompassing and overlapping the ranges of

the claims and further indicates that an increased concentration of carbon is desirable provides the required basis to conclude that it would have been obvious to one of ordinary skill in the art to formulate alloys of composition within the claimed ranges for production of single crystal castings therefrom.

This is not to say that Appellants' claims are unpatentable, rather, the existence of overlapping or encompassing ranges shifts the burden to the applicants to show that their invention would not have been obvious. *Peterson*, 315 F.3d at 1329, 65 USPQ2d at 1383. Appellants do not state that they are relying upon any objective evidence for a showing of unexpected results or other secondary considerations which would be sufficient to meet this burden.

We conclude that the Examiner has established a *prima facie* case of obviousness with respect to the subject matter of claims 1-20 which has not been sufficiently rebutted by Appellants.

OTHER ISSUES

Should prosecution continue, the Examiner may wish to review U.S. Patent 5,549,765 issued to Mihalisin et al. See, in particular, column 3, lines 9-20 which describes a range of alloy compositions fully encompassing those of claims such as claim 5. See also Tables 3, 4 and Table 11, CMSX-4 for species of alloys fully within the ranges of various claims or closely adjacent thereto. This patent is of record (PTO-892 of Paper no. 5).

CONCLUSION

To summarize, the decision of the Examiner to reject claims 1-4, 9-11, 17, and 18 under 35 U.S.C. § 102(b) and claims 1-20 under 35 U.S.C. § 103(a) is affirmed. The decision of the Examiner to reject claims 5-8, 12-16, 19, and 20 under 35 U.S.C. § 102(b) is reversed.

Accordingly, the decision 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

BRADLEY R. GARRIS)	
Administrative Patent Judge)	
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)	BOARD OF PATENT
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