Paper No. 19

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte THOMAS J. KELLY, MICHAEL J. WEIMER, CURTISS M. AUSTIN, BLAIR LONDON, DONALD E. LARSON JR. and DEAN A. WHEELER

Appeal No. 1997-0538
Application No. 08/262,168

ON BRIEF

Before PAK, WARREN, and SPIEGEL, Administrative Patent Judges.

PAK, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on an appeal from the examiner's final rejection of claims 1 through 19 which are all of the claims pending in the application.

Claims 1, 9 and 14 are representative of the subject matter on appeal and read as follows:

1. A method of producing a gamma titanium aluminide alloy article, comprising the steps of:

providing a piece of a gamma titanium aluminide alloy having a composition capable of forming alpha, alpha-2, and gamma phases;

determining the alpha transus temperature of the gama titanium aluminide alloy piece;

consolidating the gamma titanium aluminide alloy piece at elevated temperature to reduce porosity therein; and

heat treating the piece at a temperature of from about 5F to about 300F below the alpha transus temperature for a time sufficient to generate a refined microstructure comprising from about 10 to about 90 volume percent gamma phase.

9. A method of producing a gamma titanium aluminide alloy article, comprising the steps of:

providing a piece of a gamma titanium aluminide alloy having a composition capable of forming alpha, alpha-2, and gamma phases;

determining the alpha transus temperature of the gamma titanium aluminide alloy piece;

hot isostatic pressing the gamma titanium aluminide alloy piece at a temperature of from about 50F to about 250F below the alpha transus temperature and at a pressure of from about

20,000 to about 30,000 pounds per square inch, for a duration of from about 1 to about 20 hours; and

heat treating the piece at a temperature of from about 5F to about 300F below the alpha transus temperature for a time sufficient to refine the microstructure and generate a microstructure comprising from about 10 to about 90 volume percent gamma phase, the step of heat treating being conducted at a temperature of from about 45F to about 200F above the temperature of the step of hot isostatic pressing.

14. A method of producing a gamma titanium aluminide alloy article, comprising the steps of:

providing a piece of a gamma titanium aluminide alloy having a composition capable of forming alpha, alpha-2, and gamma phases;

determining the alpha transus temperature of the gamma titanium aluminide alloy piece;

hot isostatic pressing the gamma titanium aluminide alloy piece at a temperature of from about 125F to about 225F below the alpha transus temperature and at a pressure of from about 20,000 to about 25,000 pounds per square inch, for a duration of from about 2 to about 8 hours; and

heat treating the piece at a temperature of from about 50F to about 100F below the alpha transus temperature for a time sufficient to refine the microstructure and generate a microstructure comprising from about 20 to about 80 volume percent gamma phase, the step of heat treating being conducted at a temperature of from about 50F to about 100F above the temperature of the step of hot isostatic pressing.

In support of his rejections, the examiner relies on the following prior art:

Kim et al. (Kim) 5,226,985 Jul. 13, 1993

(Filed Jan. 22, 1992)

Larsen, Jr. et al (Larsen) 5,350,466 Sep. 27, 1994
(Filed Jul. 19, 1993)

The appealed claims stand rejected as follows:

(1) Claims 13 and 19 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as their invention;

(2) Claims 8, 13 and 19 stand rejected under 35 U.S.C. § 102(a) as anticipated by the disclosure of Kim;

(3) Claims 8, 13 and 19 stand rejected under 35 U.S.C. § 102(e) as anticipated by the disclosure of Larsen;

(4) Claims 1 through 4, 7, 8, 13 and 19 stand rejected under 35 U.S.C. § 103 as unpatentable over the disclosure of Kim; and

(5) Claims 1 through 19 stand rejected under 35 U.S.C. § 103 as unpatentable over the disclosure of Larsen.

Rather than reiterate the conflicting viewpoints advanced by the examiner and appellants concerning the above-noted rejections, we refer to the Answer, Brief and Reply Brief for

the full exposition thereof. For the reasons set forth below, we will sustain only the examiner's decision rejecting claims 8, 13 and 19 under 35 U.S.C. § 102 (a) and (e) based on Kim and Larsen, respectively and claims 1 through 4, 7, 8, 13 and 19 under 35 U.S.C. § 103 over Kim. We will not sustain the examiner's decision rejecting claims 13 and 19 under 35 U.S.C. § 112, second paragraph, and claims 1 through 7, 9 through 12 and 14 through 18 under 35 U.S.C. § 103 over Larsen.

Section 112, Second Paragraph, Rejection

The examiner has rejected claims 13 and 19 under 35 U.S.C. § 112, second paragraph. See Answer, page 3. According to the examiner (Answer, page 3):

> The above claims are indefinite because they all claim identical subject matter, since the only differences in the claims are methods of manufacture, and appellant has [sic, appellants have] provided no evidence, in proper declaration form, that the final products are different from one another.

However, even were we to agree with the examiner that claims 13 and 19 "all claim identical subject matter", that fact alone does not render the claims indefinite. The examiner

must demonstrate that the claims do not "set out and circumscribe a particular area with a **reasonable** degree of precision and particularity". ***In re Moore***, 439 F.2d 1232, 1235, 169 USPQ 236, 238 (CCPA 1971). The purpose of the second paragraph of Section 112 is to basically insure an **adequate** notification of the metes and bounds of what is being claimed. ***See In re Hammack***, 427 F.2d 1378, 1382, 166 USPQ 204, 208 (CCPA 1970). On this record, there simply is no explanation on the part of the examiner why the metes and bounds of the claims are not set forth with "a **reasonable** degree of precision and particularity". Accordingly, we reverse the examiner's decision rejecting claims 13 and 19 under 35 U.S.C. § 112, second paragraph.

102 Rejections

The examiner has rejected product-by-process claims 8, 13 and 19 under 35 U.S.C. § 102 (a) or (e) as anticipated by the disclosure of Kim or Larsen. The examiner's § 102 rejection is appropriate if Kim and Larsen individually disclose a product which appears to be identical to or slightly different from a product claimed in product-by-process claims. ***In re***

Brown, 459 F.2d 531, 535, 173 USPQ 685, 688 (CCPA 1972). The patentability of a product recited in product-by-process claims is based on the product itself. ***In re Thorp***, 777 F.2d 695, 697, 227 USPQ 964, 965-66 (Fed. Cir. 1985); ***Brown***, 459 F.2d at 535, 173 USPQ at 688. When a claimed product appears to be identical to or slightly different from a prior art product, the claimed product may be unpatentable even though the claimed product is made from a different process. ***See Thorp***, 777 F.2d at 797, 227 USPQ at 966; ***In re Marosi***, 710 F.2d 799, 803, 218 USPQ 289, 2920-93 (Fed. Cir. 1983).

Here, the examiner finds, and appellants do not dispute, that Kim and Larsen teach "a gamma titanium aluminide article with at least 10 % gamma phase..." Compare Answer, page 3, with Brief and Reply Brief in their entirety. We also find that both Kim and Larsen describe a gamma titanium aluminide in the form of a duplex microstructure comprising predominantly gamma phase grains and lamellar colonies. Compare Kim, column 2, lines 4-30, and Larsen, column 3, line 67 to column 4, line 2, with appellants' Reply Brief, page 4 and specification, page 5, line 27 to page 6, line 5.

According to Larsen (column 4, line 2), the presence of a minor amount of alpha-2 (Ti_3Al) phase is also present in the duplex microstructure. These gamma titanium aluminide products are also made from a process which is substantially identical to that claimed. Kim discloses (column 2, lines 46-57) that:

> Further, in accordance with the invention, there is provided a method for producing article of gamma titanium aluminide alloy having improved properties which comprises the steps of: (a) shaping the article at a temperature in the approximate range of about 130° C. below the titanium-aluminum eutectoid temperature of the alloy to about 20° C. below the alpha-transus temperature of the alloy; (b) heat treating the thus-shaped article at about the alpha-transus temperature of the alloy for about 15 to 120 minutes; and (c) aging the thus-heat treated article at a temperature between about 750° and 1050° C. for about 4 to 300 hours.

The term “about the alpha-trances temperature of the alloy” as used in Kim includes the claimed “about 5 °F” below the alpha transus temperature. Similarly, Larsen discloses (column 3, line 61 to column 4, lines 7) that:

> Typically, the case alloy is hot isostatically pressed to close internal casting defects (e.g. internal voids). In general, the as-cast alloy is hot isostatically pressed at 2100°-2400° F. at 10-25 ksi for 1-4 hours. A preferred hot isostatic press

> is conducted at a temperature of 2300° F. and argon pressure of 25 ksi for 4 hours.
>
> The alloy is heat treated to a lamellar or duplex microstructure comprising predominantly gamma phase as aquiaxed grains and lamellar colonies, a minor amount of alpha-two (Ti_3A1) phase and additional uniformly distributed phases that contain W or Mo or Si, or combinations thereof with one another and/or with Ti.
>
> The heat treatment is conducted at 1650° to 2400° F. for 1 to 50 hours. A preferred heat treatment comprises 1850° F. for 50 hours.

The temperature conditions used for the hot isostatic press and the heat treatment in Larsen appear to be within the claimed temperature conditions since they are below 1340 to 1400 °C which according to page 3, lines 38-40, of Kim, are generally considered as the alpha-transus temperature of these types of alloys. The resulting gamma titanium aluminide products, like appellants' gamma titanium aluminide product, have improved ductility, strength, toughness and creep resistance. Compare, e.g., Kim, column 2, lines 4-30, and Larsen, column 3, lines 6-15, with specification, pages 1 and 2.

Given the substantial identity between the claimed gamma titanium aluminide and the gamma titanium aluminide described

in Kim and Larsen, we determine that the examiner has established a ***prima facie*** case of unpatentability with respect to the claimed titanium aluminide within the meaning of 35 U.S.C. § 102. ***See also In re Spada***, 911 F.2d 705, 708, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990).

The burden is, therefore, on appellants to show that the gamma titanium aluminide product described in Kim or Larsen does not necessarily possess characteristics attributed to the claimed gamma titanium aluminide product. ***Thorp, supra; Brown, supra***. However, appellants do not refer to any evidence to show that the prior art titanium aluminide product does not necessarily possess characteristics and/or properties attributed to the claimed titanium aluminide product. See Brief and Reply Brief in their entirety. Rather, appellants state that their invention lies in a method of making a gamma titanium aluminide product having the above-mentioned desired properties in a more consistent and controlled manner. See specification, pages 1 and 2, particularly page 2, lines 15-21. In other words, appellants appear to acknowledge that appellants' invention is directed to a new process for making

a known gamma titanium aluminide product having the above-mentioned desired properties. Thus, we are persuaded that appellants have not supplied sufficient evidence to carry their burden of proof. Accordingly, we affirm the examiner's decision rejecting claims 8, 13 and 19 under 35 U.S.C. § 102 (a) and (e) over the disclosures of Kim and Larsen, respectively.

Section 103 Rejections

The examiner has rejected claims 1-4, 8, 13 and 19 under 35 U.S.C. § 103 as obvious over the disclosure of Kim. Under Section 103, the obviousness of an invention cannot be established by combining the teachings of the cited prior art references absent some teaching, suggestion or incentive supporting the combination. ***See ACS Hospital Systems, Inc. v. Montefiore Hospital***, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). This does not mean that the prior art references must specifically suggest making the combination. ***See B.F. Goodrich Co. V. Aircraft Braking Systems Corp.***, 72 F.3d 1577, 1582, 37 USPQ2d 1314, 1318 (Fed. Cir. 1996); ***In re***

Nilssen, 851 F.2d 1401, 1403, 7 USPQ2d 1500, 1502 (Fed. Cir. 1988)). Rather, the test for obviousness is what the combined teachings of the prior art references would have fairly suggested to those of ordinary skill in the art. ***In re Young***, 927 F.2d 588, 591, 18 USPQ2d 1089, 1091 (Fed. Cir. 1991); ***In re Keller***, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981). In evaluating the prior art references, it is proper to take into account not only the specific teachings of the references but also the inferences which one skilled in the art would reasonably be expected to draw therefrom. ***In re Preda***, 401 F.2d 825, 826, 159 USPQ 342, 344 (CCPA 1968).

Here, as indicated ***supra***, we find that Kim discloses

> a method for producing articles of gamma titanium aluminide alloy having improved properties which comprises the steps of:(a)shaping the article at a temperature in the approximate range of about 130° C. below the titanium-aluminum eutectoid temperature of the alloy to about 20° C. below the alpha-transus temperature of the alloy for about 15 to 120 minutes; (b) heat treating the thus-shaped article at about the alpha-transus temperature of the alloy for about 15 to 20 minutes; and (c) aging the thus-heat treated article at a temperature between about 750° and 1050° C. for about 4 to 300 hours.

See column 2, lines 47-57.

Appellants argue that Kim does not teach the claimed step of "determining the alpha-transus temperature of the gamma titanium aluminide alloy piece". See, e.g., Brief, page 14, and Reply Brief, pages 5 and 6. We disagree. We find that Kim clearly states (column 3, lines 38-42) that:

> The alpha-transus temperature (T_α) ranges from about 1340° to about 1400° C., depending on the alloy composition. T_α can be determined with sufficient accuracy by differential thermal analysis (DTA) and metallographic examinations.

We also find that to employ temperature conditions at or below the alpha-transus temperature of a titanium aluminide alloy as required by Kim, such alpha-transus temperature must necessarily be determined beforehand.

Appellants argue that Kim does not teach consolidation of the titanium aluminide alloy to reduce porosity. See, e.g., Brief, page 14. As indicated ***supra***, however, Kim discloses shaping the titanium aluminide alloy at the claimed consolidation temperature. We find that the shaping of the titanium aluminide alloy at the claimed temperature clearly causes the formation of a compact mass, reducing its original

size by at least 50%.[1] See column 4, lines 3-7. Reducing the size of the titanium aluminide alloy (making it more compact) through shaping necessarily requires reduction of its voids or porosity. In other words, we agree with the examiner that the shaping step described in Kim is encompassed by the consolidation step recited in claim 1.

Appellants argue that Kim does not disclose the claimed heat treating temperature, i.e., about 5 °F to about 300 °F below the alpha transus temperature of the alloy. See Brief, pages 15-16. However, we find that the heat treating temperature, namely about the alpha-transus temperature described at column 2 of Kim, embraces the claimed heat treating temperature. Indeed, we find that Kim teaches at column 4, lines 11-13, heat treating a shaped titanium aluminide alloy between about 5 °C (between 5 °F and 300 °F) below to 20 °C above the alpha-transus temperature of the alloy. Accordingly, we determine that the use of the workable or optimum heat treating temperature condition taught in Kim

[1] According to page 303 of Webster's II New Riverside University Dictionary, attached herewith, the term "consolidation" means "form into a compact mass" or "become united".

in Kim's heat treating step of the gamma titanium aluminide article producing process would have been obvious to one of ordinary skill in the art. ***See In re Boesch***, 617 F.2d 272, 276, 205 USPQ 215, 219 (CCPA 1980); ***In re Aller***, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Appellants argue (Brief, page 16) that:

> Kim does not teach the compositional limitations of claim 2.
>
> As to claims 3 and 4, where the composition is formulated in "consisting essentially of" language, Kim et al. does not teach the recited alloy, as it requires niobuim or tantalum (not present in the alloy of claim 3) and does not teach the use of about 0.5-2.0 percent boron (recited in claim 4). See Kim et al. compositions at col. 3, lines 17-21.

However, Kim discloses, ***inter alia***, titanium aluminide alloys consisting essentially of about 46 to 49 atomic percent of aluminum (Al), about 1 to 3 atomic percent of chromium (Cr), about 2 to 6 atomic percent of niobium (Nb) and about 0.05 to 2.0 atomic percent of boron (B). See column 3, lines 10-21. These particular alloys are included in the limited number of alloys which can be identified from the formula described in Kim. ***Id.*** Accordingly, we determine that the selection of these alloys from the limited number of alloys described in

Kim would have been obvious to one of ordinary skill in the art. ***See Merck & Co. v. Biocraft Labs.***, 874 F.2d 804, 807, 10 USPQ2d 1843, 1846 (Fed. Cir.), ***cert. denied***, 493 U.S. 975 (1989); ***In re Petering***, 301 F.2d 676, 681, 133 USPQ 275, 280 (CCPA 1962). Note that the transitional phrase "consisting essentially" recited in claim 3, when read in light of the specification, does not preclude the presence of boron. ***See In re Herz***, 537 F.2d 549, 551-52, 190 USPQ 461, 463-64 (CCPA 1976). Note also that appellants have not demonstrated that the presence of boron materially changes the basic and novel characteristics of the gamma titanium aluminide alloy. ***In re Lajarte***, 337 F.2d 870, 873-874, 143 USPQ 256, 258-59 (CCPA 1964)

Appellants argue that Kim does not teach "the step of heat treating ... at a temperature from about 45F to about 200F [sic, 45 ^{o}F to about 200 ^{o}F] above the temperature of the step of consolidating" recited in claim 7. We do not agree. We find that Kim's temperature conditions for the shaping and heat treatment indicated ***supra*** overlap the temperature recited in claim 7. Accordingly, we conclude that it would have been

obvious to employ the claimed temperature conditions in Kim's process, with a reasonable expectation of forming the desired titanium aluminide product described in Kim. ***See In re Aller***, ***supra***.

In view of the foregoing and the reasons set forth by the examiner in his Answer, we agree with the examiner that the subject matter of claims 1 through 4, 7, 8, 13 and 19 would have been obvious to one of ordinary skill in the art. Hence, we affirm the examiner's decision rejecting claims 1 through 4, 7, 8, 13 and 19 under 35 U.S.C. § 103 as unpatentable over the disclosure of Kim.

However, the examiner's rejection of method claims 1 through 7, 9 through 12 and 14 through 18 under 35 U.S.C. § 103 as unpatentable over the disclosure of Larsen is on a different footing. Although we agree with the examiner that Larsen discloses temperature conditions for both hot isostatical pressing (consolidation) and heat treating steps, which appear to be within the claimed temperature range, see column 3, line 60 to column 4, line 7, we agree with appellants that Larsen by itself does not provide a suggestion

sufficient to employ a step of determining the claimed alpha-transus temperature, see Larsen in its entirety. We find that Larsen does not recognize the importance of using a temperature below the alpha-transus temperature of a given alloy. Rather, it employs a temperature range generally applicable to the particular alloys it used, which happens to fall within the claimed temperature range. There is no reason or incentive in Larsen to determine the alpha transus temperature of a given alloy. Moreover, contrary to the examiner's argument at page 9 of the Answer, this step is more than a mere mental step as is apparent from pages 6 through 8 of the specification. Accordingly, we reverse the examiner's decision rejecting claims 1 through 7, 9 through 12 and 14 through 18 under 35 U.S.C. § 103 as unpatentable over the disclosure of Larsen.

With respect to the examiner's rejection of product claims 8, 13 and 19 under section 103, we affirm for the reasons indicated ***supra***. ***Thorp, supra; Brown, supra.***

In summary:

1) The rejection of claims 13 and 19 under 35 U.S.C. § 112, second paragraph, as being indefinite is reversed;

(2) The rejection of claims 8, 13 and 19 under 35 U.S.C. § 102(a) as anticipated by the disclosure of Kim is affirmed;

(3) The rejection of claims 8, 13 and 19 under 35 U.S.C. § 102(e) as anticipated by the disclosure of Larsen is affirmed;

(4) The rejection of claims 1 through 4, 7, 8, 13 and 19 under 35 U.S.C. § 103 as unpatentable over the disclosure of Kim is affirmed;

(5) The rejection of claims 1 through 7, 9 through 12 and 14 through 18 under 35 U.S.C. § 103 as unpatentable over the disclosure of Larsen is reversed; and

(6) The rejection of claims 8, 13 and 19 under 35 U.S.C. § 103 as unpatentable over the disclosure of Larsen is affirmed.

The decision of the examiner is affirmed-in-part.

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

AFFIRMED-IN PART

CHUNG K. PAK Administrative Patent Judge	)	
CHARLES F. WARREN Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
CAROL A. SPIEGEL Administrative Patent Judge	)	

lp

Appeal No. 1997-0538
Application No. 08/262,168

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Appeal No. 1997-0538
Application No. 08/262,168

APJ PAK

APJ SPIEGEL

APJ WARREN

DECISION: AFFIRMED-IN PART
Send Reference(s): Yes No
or Translation (s)
Panel Change: Yes No
Index Sheet-2901 Rejection(s):
Prepared: June 26, 2001

Draft Final

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OB/HD GAU

PALM / ACTS 2 / BOOK
DISK (FOIA) / REPORT