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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte S. KRISHNA SRIVASTAVA and LEE PIKE

Appeal 2018-000703
Application 14/768,845
Technology Center 1700

Before JAMES C. HOUSEL, JEFFREY R. SNAY, and
DEBRA L. DENNETT, *Administrative Patent Judges*.

DENNETT, *Administrative Patent Judge*.

DECISION ON APPEAL¹

STATEMENT OF THE CASE

Appellant² appeals under 35 U.S.C. § 134(a) from a rejection of claims 1–25. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

¹ In our Decision, we refer to the Specification filed August 19, 2015 (“Spec.”); the Final Action mailed February 16, 2017 (“Final Act.”); the Appeal Brief filed July 17, 2017 (“Appeal Br.”); the January 26, 2017 Declaration of Lee M. Pike, Jr. under 37 C.F.R. § 1.132 (“Pike Decl.”); the Examiner’s Answer mailed August 29, 2017 (“Ans.”); and the Reply Brief filed October 30, 2017 (“Reply Br.”).

² Appellant is the applicant, Haynes International Inc., identified as the real party in interest. Appeal Br. 1.

The claims are directed to fabricable, high strength, oxidation resistant nickel-chromium-cobalt-molybdenum-aluminum based alloys. Claim 1, reproduced below, is illustrative of the claimed subject matter:

1. A nickel-chromium-cobalt-molybdenum-aluminum based alloy having a composition comprised in weight percent of:

15 to 20	chromium
9.5 to 20	cobalt
7.25 to 10	molybdenum
2.72 to 3.9	aluminum
up to 10.5	iron
present up to 0.15	carbon
up to 0.015	boron
up to 0.75	titanium
up to 1.5	tantalum
up to 1	hafnium
up to 1	manganese
up to 0.6	silicon
up to 0.06	zirconium

with a balance of nickel and impurities, the alloy further satisfying the following compositional relationship defined with elemental quantities being in terms of weight percent:

$$Al + 0.56Ti + 0.29Nb + 0.15Ta \leq 3.9.$$

Appeal Br. 15 (Claims App'x).

REFERENCES

The Examiner relies on the following prior art in rejecting the claims on appeal:

Hirata et al. (“Hirata”)	US 2010/0166594 A1	July 1, 2010
Uno ³	JP 2009-167500	July 30, 2009

REJECTIONS

The Examiner maintains and Appellant seeks review of the following rejections under 35 U.S.C § 103: (1) claims 1, 3, 7, 8, 10, 12–15, 18, 19, 22, 23, and 25 over Uno; and (2) claims 1–25 over Hirata. Final Act. 2–25; Appeal Br. 5.

OPINION

The Examiner rejects claims 1, 3, 7, 8, 10, 12–15, 18, 19, 22, 23, and 25 as obvious over Uno. Final Act. 2. The Examiner finds that Uno discloses an alloy having a composition that overlaps the amounts of chromium, cobalt, molybdenum, aluminum, iron, carbon, boron, titanium, tantalum, hafnium, manganese, silicon, and zirconium in the rejected claims, which is prima facie evidence of obviousness. *Id.* at 2–3; *see, e.g., In re Mochel*, 470 F.2d 638, 640 (CCPA 1972) (holding the phrase “up to” includes zero as the lower limit). The Examiner finds that the formula in the claims ($Al + 0.56Ti + 0.29Nb + 0.15Ta \leq 3.9$) does not prevent a conclusion of obviousness because “there is no invention in the discovery of a general formula if it covers a composition described in the prior art.” *Id.* at 3–4 (citing, *inter alia*, *In re Cooper*, 134 F.2d 630, 632 (CCPA 1943)). The

³ The Examiner and the Appellants rely on the machine translation of record. We do the same in this Decision.

Cooper court held that “[p]atentability of the claims may not rest solely on the fact that the carbon contents specified therein are calculated from the formula.” “Appellants’ entire contention herein is that, unless there is specifically set out in the prior art an alloy produced by their formula, such prior art may not be used in denying patentability to their claims. We cannot agree with such contention.” *Cooper*, 134 F.2d at 632.

The Examiner rejects claims 1–25 as obvious over Hirata. Final Act. 12. As with Uno, the Examiner finds that Hirata discloses an alloy wherein the amounts of chromium, cobalt, molybdenum, aluminum, iron, carbon, boron, titanium, tantalum, hafnium, manganese, silicon, and zirconium in the reference overlap the amounts of those elements in the rejected claims, again, which is prima facie evidence of obviousness. *Id.*

Appellant combines arguments for patentability over Uno and over Hirata. Appeal Br. 6–9. With the exception of claims 12–14, for which Appellant makes separate arguments for patentability, Appellant argues the claims as a group. We select claim 1 as representative of the group for each reference. 37 C.F.R. § 37.41(c)(1)(iv). Claims 3, 7, 8, 10, 15, 18, 19, 22, 23, and 25 will stand or fall with claim 1 in the rejection over Uno. Claims 2–11 and 15–25 will stand or fall with claim 1 in the rejection over Hirata. “[T]he failure of appellant to separately argue claims which appellant has grouped together shall constitute a waiver of any argument that the Board must consider the patentability of any grouped claim separately.” *In re Huai-Hung Kao*, 639 F.3d 1057, 1065 (Fed. Cir. 2011). The rejection of claims 12–14 argued separately is addressed separately below.

Appellant’s arguments focus on the compositional relationship, or formula, in claim 1: $Al + 0.56Ti + 0.29Nb + 0.15Ta \leq 3.9$. Appeal Br. 6.

Appellant contends that the Examiner fails to identify any composition in the prior art that meets the formula, thus, there is no prima facie case of obviousness over either reference. *Id.* at 7. Appellant argues that *In re Tanczyn* applies to the facts here. *Id.*; see *In re Tanczyn*, 202 F.2d 785 (CCPA 1953).

In *Tanczyn*, applicants claimed

10. In manufactures of the class described, wrought and polished straight chromium stainless steel sheet, strip, wire, and like products containing large amounts of chromium and small amounts of manganese and silicon *which products are substantially free of surface-defacing complex silicate inclusions* and comprise 10% to 27% chromium, up to about 0.2% manganese and from incidental amounts up to about 1% silicon with said manganese content restricted to amounts beneath the curve in the accompanying diagram corresponding to the specific amount of said chromium, and the remainder substantially all iron.

Tanczyn, 202 F.2d at 785–86 (emphasis added). The Court found the Examiner (and Board) improperly rejected the claims over references that disclosed steel alloys and that steel alloys are commonly wrought and highly polished. *Id.* at 786. The Court held that *In re Cooper* did not apply because the claimed alloy in *Cooper* differed from the alloy of the prior art reference only in degree and not in kind. *Id.* at 787. The Court noted that in *Cooper*, the applicants disclosed and claimed a tool steel alloy having constituents in ranges which applicants admitted fell within the upper ranges disclosed in a prior patent. *Id.* In contrast, the *Tanczyn* court found

[N]either of the [prior art] references indicates that its author was in any way concerned with the problem of surface defects in wrought and polished straight chromium stainless steel products. Not only does neither reference in any way suggest any solution for eliminating such defects, but neither indicates

that the author even recognized that such a problem existed, or that he attempted to trace its source.

...

These two specific alloys [disclosed in the prior art] are in no way correlated to the production of wrought and polished straight chromium stainless steel products substantially free of complex silicate inclusions.

Id. Thus, the Court in *Tanczyn* focused its patentability determination on the claims' inclusion of the limitation that the products were "substantially free of complex silicate inclusions."

In the instant case, Appellant argues that neither Uno nor Hirata "describe an alloy expected to possess certain properties (as does the present application)." Appeal Br. 8–9. Appellants further argue that neither reference teaches anything "about an alloy composition or how to find an alloy composition that possesses key properties required by the present application (excellent oxidation resistance, strain-age cracking resistance, and thermal stability)." *Id.* at 9.

However, claim 1 does not recite the "key properties," nor is it limited to an alloy for use in gas turbines that operate at continually higher and higher temperatures. *See* Appeal Br. 15–22 (Claims App'x); Pike Decl. 26. It is axiomatic that the claims define the invention that an applicant believes is patentable. *In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993). Appellant's argument would improperly import limitations from the Specification into claim 1 by importing the properties of excellent oxidation resistance, strain-age cracking resistance, and thermal stability. *Id.* ("[L]imitations are not to be read into the claims from the specification.").

Appellant contends that the formula alone is sufficient to distinguish the claimed composition from the cited references because the Specification

teaches that the relationship must be satisfied to maintain fabricability. Appeal Br. 6, 9 (citing Spec. 24, ll. 1–4). The Specification states “[t]o maintain fabricability, *certain elements which may or may not be present* (specifically, aluminum, titanium, niobium, and tantalum) should be limited in quantity in a manner to satisfy the following additional relationship (where elemental quantities are in wt.%): $Al + 0.56Ti + 0.29Nb + 0.15Ta \leq 3.9$.” Spec. 24, ll. 1–4 (emphasis added). The formula in claim 1 permits the amounts of Ti, Nb, and Ta to each equal zero, as the claim allows Al to present in 3.9 wt.%. The fact that the elements in the formula *may not be present* in the claimed alloy means these elements are optional.

Because the ranges of elements required by claim 1 are overlapped by ranges of the same elements disclosed in the prior art, the Examiner reasonably makes a prima facie case of obviousness. *In re Boesch*, 617 F.2d 272, 275 (CCPA 1980) (where ranges overlap, a prima facie case of obviousness is made out); *see also In re Harris*, 409 F.3d 1339, 1341 (Fed. Cir. 2005) (a prima facie case of obviousness typically exists when the ranges of a claimed composition overlap the ranges disclosed in the prior art); *In re Peterson*, 315 F.3d 1325, 1329 (Fed. Cir. 2003) (same).

Appellant contends that it has rebutted the prima facie case of obviousness based on overlapping ranges. Appeal Br. 10. Appellant contends that test data in the Specification shows that the claimed range for aluminum is critical. *Id.*

Criticality of a claimed range may be shown by providing evidence that the claimed range achieves unexpected results relative to the prior art range. *In re Geisler*, 116 F.3d 1465, 1470–71 (Fed. Cir. 1997) (quoting *In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990)).

Appellant provides a single data point in support of 2.72 wt.% being a critical lower limit for the content of aluminum. Appeal Br. 11; Spec. 6, 8–9 (Tables 1 and 2). Specifically, the Specification indicates that alloy CC, with an aluminum content of 1.93 wt.%, did not have an acceptable oxidation resistance for the purposes of the invention. Spec. 8–9 (Table 2 and following paragraph). The Specification provides data on only one alloy with an aluminum content of 2.72 wt.% (alloy T), and alloy T includes 1.89 wt.% tungsten and 0.91 wt.% niobium, a combination of elements not present in any other alloy tested. *Id.* at 6 (Table 1). The data, therefore, is insufficient to establish the criticality of the lower range of aluminum content for the alloys tested, much less, for the alloys claimed.⁴ Appellant’s argument regarding criticality of 2.72 wt.% Al is unpersuasive on these facts.

Appellant also argues that 3.9 wt.% is a critical upper limit of aluminum in the claimed alloys. The Specification provides no test results for an alloy with an aluminum content of 3.9 wt.%. *Id.* at 6 (Table 1). Several alloys with an aluminum content in the claimed range (2.72 to 3.9 wt.%) had failing test results. Alloy O, with an aluminum content of 3.60 wt.%, had an unacceptable strain-age cracking test result. *Id.* at 10–12. Alloy P, with an aluminum content of 3.63 wt.%, had an unacceptable creep-

⁴ Appellant argues that the Examiner ignores the commercial alloys that were tested and identified in the Specification. Reply Br. 5. In the Background section, the Specification mentions numerous commercial alloys, but nowhere provides any information on the composition of any commercial alloys. *See generally* Spec. The Pike Declaration states that four commercial alloys are within the ranges disclosed by both Uno and Hirata, but provides no information on their composition. Therefore, the record on appeal contains no evidence of the composition of any commercial alloys.

rupture life. *Id.* at 13–14. The Specification provides data showing acceptable thermal stability for alloy S, with an aluminum content of 3.78 wt.%, but not for alloy DD, with an aluminum content of 4.30 wt.%. This data is insufficient to establish 3.9 wt.% as critical upper range for the alloys tested, much less for the alloys claimed (that do not require the iron, carbon, silicon, titanium, yttrium, and boron present in the tested alloys). An applicant must show that whatever property they are asserting is unexpected is unexpected throughout the claimed range, but not outside that critical range. *See Peterson*, 315 F.3d at 1330; *Harris*, 409 F.3d at 1344. Appellants have not established that the alloys within the ambit of the claim have the unexpected property while the alloys outside the critical range do not have the unexpected property.

In addition, for unexpected results to be probative of non-obviousness, Appellant must establish that the difference actually obtained would not have been expected by one skilled in the art at the time of the invention. *In re Freeman*, 474 F.2d 1318, 1324 (CCPA 1973). Appellant provides no evidence that acceptable oxidation resistance was unexpected below any aluminum content.

Appellant contends that Hirata teaches away from the claimed upper limit of 3.9 wt.% aluminum because Hirata states, “the content of Al is set to not more than 3% to ensure creep strength at high temperatures.” Appeal Br. 11–12. Teaching away requires that a reference “criticize, discredit, or otherwise discourage the solution claimed” by Appellant. *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). Hirata discloses the aluminum content should not exceed 3%. Hirata ¶ 92. This evidence is not persuasive of nonobviousness of claim 1, however, because both Hirata and Uno disclose

aluminum content within the claimed range. Appellant does not argue that Uno teaches away from the claimed upper limit.

In response to Appellant’s arguments, the Examiner finds that the claims are not commensurate in scope with the test data. Ans. 2–3. Specifically, the Examiner finds that each of the alloys presented in Table 1 of the Specification (which encompass all alloys tested for the test data to which Appellant refers) that have an aluminum content within the claimed ranges⁵ also require the presence of iron, carbon, silicon, titanium, yttrium, and/or boron. *Id.* at 2. Table 1 is reproduced below:

Table 1
 Compositions of Experimental Alloys (in wt.%)

Alloy	Ni	Cr	Co	Mo	Al	Fe	C	Si	Mn	Ti	Y	Zr	B	Other
A	Bal.	19.9	14.8	7.8	3.64	1.2	0.095	0.15	--	0.25	0.02	0.04	0.004	
B	Bal.	19.8	10.1	7.7	3.56	1.3	0.088	0.14	--	0.25	0.02	0.04	0.004	
C	Bal.	16.1	19.9	7.6	3.65	1.3	0.099	0.14	--	0.24	0.02	0.04	0.004	
D	Bal.	16.1	19.9	7.7	3.54	1.2	0.079	0.14	--	0.25	0.02	0.02	0.004	
E	Bal.	16.0	19.8	7.7	3.62	1.2	0.085	0.14	--	0.25	0.02	0.01	0.004	
F	Bal.	16.0	10.1	7.7	3.46	1.2	0.097	0.14	--	0.22	0.01	0.02	0.004	
G	Bal.	16.1	9.9	7.8	3.51	1.0	0.089	0.13	--	0.23	0.01	0.02	0.005	
H	Bal.	16.0	19.7	9.5	3.56	1.2	0.107	0.17	--	0.24	<0.005	0.02	0.005	
I	Bal.	15.8	19.3	7.5	3.60	1.0	0.110	0.18	--	0.23	0.02	0.02	0.004	1.94 W
J	Bal.	16.0	9.8	9.5	3.58	1.0	0.116	0.17	--	0.22	0.02	0.01	0.005	
K	Bal.	16.3	19.3	7.5	3.50	1.1	0.103	0.14	--	0.22	0.02	0.04	0.004	0.43HF
L	Bal.	16.2	20.0	7.8	3.48	1.0	0.106	0.22	--	0.23	0.02	0.02	0.005	0.74Ta
M	Bal.	16.6	10.1	7.7	3.75	10.4	0.108	0.15	--	0.23	0.02	0.03	0.004	0.38HF
N	Bal.	16.7	10.2	7.8	3.64	10.2	0.110	0.19	--	0.23	0.02	0.02	0.005	0.78Ta
O	Bal.	16.0	19.9	7.5	3.60	1.1	0.107	0.17	--	0.23	0.02	0.02	0.004	0.35Nb, 0.69Ta
P	Bal.	16.0	9.9	7.5	3.63	10.0	0.107	0.19	--	0.23	0.02	0.02	0.004	1.93 W
Q	Bal.	16.2	10.1	7.5	3.65	10.2	0.112	0.18	--	0.22	0.02	0.02	0.005	0.35Nb, 0.71Ta
R	Bal.	15.3	20	10.0	3.32	<0.1	0.114	0.19	0.20	0.22	0.01	0.04	0.004	
S	Bal.	15.9	9.9	9.5	3.78	1.0	0.107	0.47	0.19	0.02	0.011	0.04	0.004	
T	Bal.	16.0	9.9	7.6	2.72	4.5	0.120	0.17	0.20	0.22	0.015	0.04	0.004	1.89 W, 0.91 Nb
U	Bal.	19.4	19.9	7.6	3.36	1.1	0.103	0.17	0.20	0.49	0.013	0.04	0.005	
V	Bal.	19.0	9.9	8.0	3.40	1.0	0.080	0.18	0.15	0.21	0.013	0.04	0.005	0.48 HF
W	Bal.	18.9	19.9	7.5	3.51	1.0	0.086	0.18	0.14	0.21	0.009	0.02	0.004	1.0 Ta
X	Bal.	19.2	19.9	7.7	3.40	1.0	0.088	0.17	0.13	0.21	0.011	0.04	0.004	0.45 HF
Y	Bal.	16.4	10.2	7.8	2.81	1.1	0.108	0.49	0.50	0.22	0.010	0.04	0.004	
Z	Bal.	19.0	10	7.4	3.19	1.0	0.091	0.18	0.16	0.21	0.008	0.03	0.004	1.0 Ta
AA	Bal.	19.2	20	5.2	3.37	1.0	0.107	0.15	0.20	0.24	0.012	0.04	0.004	
BB	Bal.	19.3	20	12.3	3.67	1.0	0.098	0.51	0.53	0.42	0.011	0.04	0.004	
CC	Bal.	19.4	10	9.6	1.93	1.0	0.107	0.19	0.21	0.24	<0.002	<0.01	0.004	
DD	Bal.	18.9	10	9.5	4.50	1.0	0.117	0.49	0.21	0.43	0.005	0.05	0.004	

Table 1 provides the compositions of experimental alloys in wt.%.
 Spec. 5.

⁵⁵ Independent claims 1 and 15 specify an aluminum content of 2.72 to 3.9 wt.%. Appeal Br. 15, 18–19 (Claims App’x). Independent claim 22 specifies an aluminum content of 2.72 to 3.78 wt.%. *Id.* at 20–21.

Appellant contends that the Examiner improperly infers from Table 1 that titanium and iron must be present in the alloy. Appeal Br. 11. We do not agree that this is the Examiner's conclusion. Rather, the Examiner properly determines that all of the alloys *for which Appellant provides test data with an aluminum content in the claimed range* contain iron, boron, titanium, silicon, and zirconium, yet none of these elements is required by claim 1. See Spec. 6 (Table 1). It is well settled "that objective evidence of non-obviousness must be commensurate in scope with the claims which the evidence is offered to support." *In re Graselli*, 713 F.2d 731, 743 (Fed. Cir. 1983). Claim 1, consequently, has a broader scope than the alloys for which Appellant provides test data. Appellant's test data is insufficient to rebut the prima facie case of obviousness.

Appellant argues that the Examiner is incorrect in stating that "Appellant's claims are not commensurate in scope with the testing data . . . because each of the alloys presented in Table 1 . . . having an aluminum content within the claimed range require the presence of [specified elements]." Appeal Br. 2. Appellant states that example alloys O and Q do not have the desired ductility, despite containing aluminum within the claimed amount in addition to iron, carbon, silicon, titanium, yttrium, and boron in amounts similar to alloys with the desired ductility, and this shows that the presence of those elements in the alloys does not affect ductility. Reply Br. 2–3.

First, Appellant's statement is incorrect, in that the ductility test result for alloy Q is 10.2%, a value well above the Specification's stated lower limit. Spec. 11–12 (Table 3). Second, whether alloy O does not have the desired ductility is of no consequence to the determination that the test data

is not commensurate with the scope of claim 1. Appellant cannot simply remove the presence of elements in the tested alloys and assign the test results to alloys without those elements. Alloy O, which fails the ductility test, is one of only two tested alloys that contains niobium and tantalum. Spec. 6 (Table 1). One of ordinary skill in the art could reasonably conclude that the presence of niobium and tantalum in the alloy accounts for the undesirable ductility.

Appellant argues that dependent claims 12–14 are each separately patentable. Appeal Br. 12. Claims 12–14 require that the claimed alloy has a specified oxidation resistance (claim 12), modified CHRT test ductility value greater than 7% (claim 13), or a specified creep-rupture life (claim 14). *Id.* at 18 (Claims App’x). However, the alloys of claim 1 and their properties are inseparable. *In re Papesch*, 315 F.2d 381, 391 (CCPA 1963) (“From the standpoint of patent law, a compound and all of its properties are inseparable; they are one and the same thing.”). Appellant does not argue nor establish that the alloys meeting the properties of claims 12–14 represent a narrower set of alloys of claim 1 not covered by the overlapping alloys of Uno and Hirata. Because the Examiner establishes *prima facie* obviousness of the alloys falling within the limits of claim 1, Appellant must come forward with evidence of surprising or unexpected results in rebuttal. Having failed to do so, the properties recited in claims 12–14 do not confer patentability on these claims.

Appellant has not shown that the Examiner reversibly erred in rejecting claims 1, 3, 7, 8, 10, 12–15, 18, 19, 22, 23, and 25 over Uno and claims 1–25 over Hirata as obvious.

Appeal 2018-000703
Application 14/768,845

DECISION

The rejection of claims 1–25 is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv) (2015).

AFFIRMED