Paper No. 16

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte HIDEAKI IKEDA,
MASANORI KOSUGI,
SHIZUO KIMURA,
MAMORU MATSUO,
TSUTOMU TAGATA
AND NOBUYUKI MATSUMOTO

Appeal No. 1997-2958
Application No. 08/401,719

ON BRIEF

Before JOHN D. SMITH, WALTZ, and TIMM, Administrative Patent Judges.

TIMM, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the examiner's final rejection of claims 1 through 22, the only claims in the application.

BACKGROUND

The appellants' invention relates to a non-recrystallized aluminum alloy plate suitable for superplastic molding and methods for producing the non-recrystallized plate. Claims 1 and 20 are representative of the subject matter on appeal with regard to the plate. Claim 1 defines the plate in terms of its composition, its crystalline structure and certain properties. Claim 20 contains the same composition limitations as claim 1. Claim 20 differs, *inter alia*, from claim 1 in that it recites process limitations instead of property limitations.

1. An aluminum alloy plate for super plastic molding capable of cold pre-molding, comprising:

Mg ranging from 2.0 to 8.0 weight %;
Be ranging from 0.0001 to 0.01 weight %;

at least one of
Mn ranging from 0.3 to 2.5 weight %,
Cr ranging from 0.1 to 0.5 weight %,
Zr ranging from 0.1 to 0.5 weight % and
V ranging from 0.1 to 0.5 weight %;

Fe and Si each ranging from 0.0 to 0.2 weight %;
Na ranging from 0 to 3 ppm;
Ca ranging from 0 to 5 ppm;
a remainder of Al and inevitable impurities;

a crystalline structure of the plate being a non-recrystallized crystal structure;
a 90° critical bending radius of the plate ranging from 0 to 7.5 times a plate thickness;
and
a yield strength ratio before and after final annealing is at least 70%.

20. An aluminum alloy plate for super plastic molding capable of cold pre-molding, consisting essentially of:

Mg ranging from 2.0 to 8.0 weight %;
Be ranging from 0.0001 to 0.01 weight %;

at least one of
Mn ranging from 0.3 to 2.5 weight %,
Cr ranging from 0.1 to 0.5 weight %,
Zr ranging from 0.1 to 0.5 weight % and
V ranging from 0.1 to 0.5 weight %;

Fe and Si each ranging from 0.0 to 0.2 weight %;
Na ranging from 0 to 3 ppm;
Ca ranging from 0 to 5 ppm;
and a remainder of Al and inevitable impurities;

the aluminum alloy plate being formed by casting an aluminum alloy of the above composition, rolling the cast alloy to a final plate thickness in which a cold rolling rate at a final stage of the rolling is at least 50%, and final annealing the rolled plate of the final plate thickness at an elevated temperature in a range of 70-250°C so that the plate has a non-recrystallized crystal structure.

Independent process claims 2 and 4 are each directed to forming the plate by casting, rolling and final annealing. The annealing step is conducted either batchwise or continuously. Claim 2 sets forth the temperature and time parameters of the batch annealing operation. Claim 4 sets forth the temperature and time parameters of the continuous annealing operation.

2. A method for producing an aluminum alloy plate for superplastic molding capable of cold pre-molding from an aluminum alloy containing

Mg ranging from 2.0 to 8.0 weight %;
Be ranging from 0.0001 to 0.01 weight %;
at least one of
Mn ranging from 0.3 to 2.5 weight %;
Cr ranging from 0.1 to 0.5 weight %,

Zr ranging from 0.1 to 0.5 weight % and
V ranging from 0.1 to 0.5 weight %;
Fe and Si each ranging from 0.0 to 0.2 weight %;
Na ranging from 0 to 3 ppm;
Ca ranging from 0 to 5 ppm; and
a remainder of Al and inevitable impurities;

wherein the method comprises the steps of:

casting the aluminum alloy;

rolling the cast alloy to a final plate thickness, said rolling step including setting a cold rolling rate at final stage to at least 50%; and

subjecting the rolled plate of the final plate thickness to final annealing, wherein the rolled plate having the final plate thickness is heated to an elevated temperature within a range of *70 to 150°C* at a temperature-elevating speed of 10°C/min or less, maintaining the rolled plate at the elevated temperature *for 0.5 to 12 hours*, and thereafter cooling the rolled plate at a cooling speed of 10°C/min or less. [Emphasis ours.]

4. A method for producing an aluminum alloy plate for superplastic molding capable of cold pre-molding from an aluminum alloy containing

Mg ranging from 2.0 to 8.0 weight %;
Be ranging from 0.0001 to 0.01 weight %;
at least one of
Mn ranging from 0.3 to 2.5 weight %;, [typo]
Cr ranging from 0.1 to 0.5 weight %;
Zr ranging from 0.1 to 0.5 weight % and
V ranging from 0.1 to 0.5 weight %;
Fe and Si each ranging from 0.0 to 0.2 weight %;
Na ranging from 0 to 3 ppm;
Ca ranging from 0 to 5 ppm; and
a remainder of Al and inevitable impurities;

wherein the method comprises the steps of:

casting the aluminum alloy;

rolling the cast alloy to a final plate thickness, said rolling step including setting a cold rolling rate at a final stage to at least 50%; and

subjecting the rolled plate of a final plate thickness to final annealing, wherein the rolled plate of the final plate thickness is heated to an elevated temperature within a range of *150 to 250°C* at a temperature-elevating speed of at least 1°C/sec, maintaining the rolled plate at the elevated temperature for *0 to 5 minutes*, and thereafter cooling the rolled plate at a cooling speed of at least 1°C/sec. [Emphasis ours.]

The prior art reference of record relied upon by the examiner in rejecting the appealed claims is:

Komatsubara et al. (Komatsubara)	5,181,969	Jan. 26, 1993

Claims 1-22 stand rejected under 35 U.S.C. § 103 as being unpatentable over Komatsubara. We affirm the rejection of claims 1, 4, 5, and 15-22 and reverse the rejection of claims 2, 3, and 6-14. In addition, we raise issues for the examiner to consider upon return of the application.

OPINION

Grouping of the Claims

Initially, we note that appellants have not separately argued all the claims. Appellants do present arguments for claims 1-5, 14, and 20-22, although, in many instances, the arguments are not clearly distinguished as being directed to any particular claim[1]. We were unable to identify any

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[1] It is prudent for appellants and examiners to organize the arguments on a claim by claim basis and to tailor the arguments to the particular claim being addressed so that important issues are not overlooked and each claim is treated appropriately.

arguments specifically directed to claims 6-13 and 15-19. Therefore, we find the statement in the brief at page 8 that each of the claims on appeal stands or falls on its own merits is not supported by specific, substantive arguments for separate patentability in accordance with 37 CFR § 1.192(c)(7) and (8)(1995). Thus, it will be necessary for us to discuss in detail only claims 1-5, 14, and 20-22. We break the claims into the following general groups for discussion:

- claim 1 to the plate;
- claims 20-22 to the plate as defined by the process;
- claims 2, 3 and 14 to the process including batchwise annealing parameters; and
- claims 4 and 5 to the process including continuous annealing parameters.

We begin our analysis with independent process claim 4.

Process Claim 4

Claim 4 sets forth a process of forming an aluminum alloy plate of a specific composition, casting the alloy, rolling to a final plate thickness and subjecting the rolled plate to final annealing at the specific temperature and time parameters of the continuous annealing operation.

The Alloy Composition Recited in Claim 4

In regard to the specific alloy composition, the examiner, in the rejection, states that the Komatsubara alloys contain alloying elements (Mg, Mn, Be, Cr, Zr, V, Fe, Si) in amounts overlapping those claimed. As seen from the table below the overlap is quite substantial. As pointed out by the examiner in the First Office Action, Komatsubara also discloses specific examples of alloys having compositions within the claimed ranges. See, for instance, Komatsubara, table 1, alloy 2, also included in the following table.

Comparison of claimed composition and Komatsubara

Claimed element	claimed range wt %	Komatsubara ranges	Komatsubara alloy no. 2
Mg	2.0-8.0	2.0-8.0	4.2
Be	0.0001 to 0.01	0.0001-0.01	0.0011
at least one of:			
Mn	0.3 to 2.5	0.3-1.5	0.62
Cr	0.1 to 0.5	0.05-0.3 (optional)	--
Zr	0.1 to 0.5	0.05-0.3 (optional)	--
V	0.1 to 0.5	0.05-0.3 (optional)	--
Fe	0-0.2	0-0.2	0.07
Si	0-0.2	0-0.1	0.07
Na	0-3 ppm	silent except to say other incidental impurities are present	
Ca	0-5 ppm	silent except to say other incidental impurities are present	
a remainder of Al and inevitable impurities		a remainder of Al and inevitable impurities	

Appellants point out that the claims set specific low content ranges for sodium and calcium whereas Komatsubara never discloses any content of the impurities sodium and calcium. However, as pointed out by the examiner, the claimed sodium and calcium ranges include 0%. The critical question that must be asked here is: do the claims read on or encompass an alloy which was already known by reason of disclosure in Komatsubara? *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 780-81, 227 USPQ 773, 777-778 (Fed. Cir. 1985). When the claims explicitly include 0% levels of a component, that component need not be present to meet the claims. *In re Mochel*, 470 F.2d 638, 640, 176 USPQ 194, 195 (CCPA 1972). If Komatsubara teaches a composition in which there is no sodium or calcium, then Komatsubara teaches the composition as claimed.

We note that Komatsubara is completely silent as to the presence of sodium and calcium even though specific amounts of other impurities are disclosed. Komatsubara does state that the alloy composition includes incidental impurities. However, there is no evidence in the record showing that the alloys of Komatsubara routinely contain sodium or calcium as impurities.

Komatsubara, on its face, seems to indicate that there is no sodium or calcium in the alloy. When the prior art discloses a composition which reasonably appears to be identical or only slightly different than a composition claimed in one of applicants' own prior patents, a rejection under 35 U.S.C. § 102 or § 103 is fair and acceptable. As a practical matter, the Patent Office is not equipped to manufacture compositions and make physical comparisons. *Cf. In re Brown*, 459 F.2d 531, 535, 173 USPQ 685, 688 (CCPA 1972).

It is noted that several of the inventors of the Komatsubara alloy are listed as inventors in this appealed application. In addition, Sky Aluminum is an assignee in both this application and the Komatsubara reference. The appellants, having developed both the alloy of the prior art and the claimed alloy, are presumed to have access to data, or the facilities to obtain data, that would show that the Komatsubara alloy normally would contain sodium and calcium as impurities. No evidence or even a scientific rationale for believing that sodium or calcium is normally present was ever introduced into the record by appellants. We find that the examiner’s conclusion that Komatsubara teaches the claimed composition is reasonable under the circumstances.

The Process Steps of Claim 4

Claim 4 sets forth steps of casting, rolling and final annealing the alloy composition. As the examiner points out in the final rejection, Komatsubara forms the plate by casting, rolling and optionally annealing. Appellants challenge two points of the rejection. Appellants argue that Komatsubara does not teach the claimed cold rolling rate of at least 50% and also that Komatsubara does not teach the claimed final annealing processing parameters.

In regard to the cold rolling rate, claim 4 recites “rolling the cast alloy to a final plate thickness, said rolling step including setting a cold rolling rate at a final stage to at least 50%”. The examiner notes, in the final rejection, that the percent rolling reduction overlaps appellants range and optimization would have been obvious. Komatsubara discloses at column 7, lines 48-

53 that a cold rolling rate of at least 30% is desired. Komatsubara also states that if the rolling rate is too low, recrystallized grains sometimes become too coarse to provide superplasticity.

We agree with the examiner that adjusting the rolling rate to optimize the size of the grains and the level of superplasticity would have been a matter of routine experimentation. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955)("[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.").

As stated above, appellants also argue that Komatsubara does not teach the claimed final annealing processing parameters. After casting and rolling, appellants' alloy plate is annealed. In rejecting the claims, the examiner discusses the following passage of Komatsubara from the paragraph bridging columns 7 and 8:

> The final step is annealing, but optional. In practice, superplastic forming uses a temperature of 350° to 560°C. Since recrystallization can take place during heating to the superplastic forming temperature so that superplasticity is developed, the strip manufacturing process need not necessarily include final annealing. In general, however, final annealing is often effected to insure a recrystallized structure. Either continuous or batchwise annealing may be employed, with the continuous annealing being somewhat advantageous for superplasticity. The batchwise annealing is at 250° to 400°C. for ½ hour or longer, and the continuous annealing is at 35° to 550°C. without holding or for at most 180 seconds.

The examiner concludes from this passage that Komatsubara "clearly teaches a temperature range (i.e., 350-560°C) at which Al-Mg alloys undergo recrystallization"[2]. The examiner further concludes that "a person skilled in the art of heat treating superplastic Al-Mg alloys would understand that unrecrystallized alloy microstructures prevail whenever the final anneal step is performed at temperatures lower than 350°C."[3]

The appellants argue in the brief at pages 14 and 15 that the inference that non-recrystallized structure prevails below 350°C is flawed. The Board agrees. While one can infer from Komatsubara's disclosure that recrystallization occurs between the temperatures of 350 to 560°C, one cannot infer from the Komatsubara disclosure that recrystallization does not occur at lower temperatures.

We are not persuaded, however, that the examiner's flawed inference results in a fatal flaw in the *prima facie* case of obviousness. Claim 4 is directed to casting, rolling and annealing at specific temperatures and times, i.e. 150-250°C for 0 to 5 minutes. Even without the examiner's flawed inference, the fact remains that Komatsubara teaches continuous annealing at 35 to 550°C for 0 to 3 minutes[4]. As the examiner pointed out in the final rejection, Komatsubara suggests using final anneal

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[2] Final rejection, page 3, lines 15-16.

[3] Final rejection, page 3, lines 16-19.

[4] Komatsubara recites 180 seconds at col. 8, line 8. 180 seconds equals 3 minutes.

temperatures within appellants' claimed range. Adjusting the final annealing temperature to insure a recrystallized structure during superplastic forming would have been a matter of routine experimentation. *In re Aller*, 220 F.2d at 456, 105 USPQ at 235.

Note that insuring a recrystallized structure during superplastic forming does not necessarily require recrystallization during final annealing. Komatsubara's statement that final annealing is often effected to insure a recrystallized structure must be read in context. This statement is made immediately after discussion of recrystallization during superplastic forming. Komatsubara is only referring to insuring recrystallization during superplastic forming, not insuring recrystallization during annealing. As pointed out by the examiner, Komatsubara suggests annealing at temperatures at the lower end of the 35-550°C range and at the lower temperatures a non-recrystallized alloy plate would be obtained[5]. Given that annealing temperatures and times that necessarily result in non-recrystallized structure are specifically taught by Komatsubara, it is not logical to say that Komatsubara is teaching annealing to insure recrystallization during annealing.

Claim 4 also requires that the rolled plate be heated at a temperature elevating speed of at least 1°C/sec and, after being maintained at 150 to 250°C for 0 to 5 minutes, be cooled at a cooling speed

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[5] Appellants' own lots 6 and 12 perform annealing within the parameters of Komatsubara, 210°C x 0 sec. and 220°C x 0 sec. respectively, and result in non-recrystallized crystal structure. The totality of the evidence suggests that the recrystallization temperature is somewhere between 220° and 350°C.

of at least 1°C/sec. Continuous heating ovens operate continuously hot. Placing a 2 mm aluminum alloy plate, such as that taught by Komatsubara, in an oven preheated to 35 to 550°C as taught by Komatsubara would necessarily result in heating the 2 mm plate at a speed of at least 1 °C/sec. Likewise, removing the 2 mm plate to ambient air would necessarily result in cooling at a speed of at least 1 °C/sec. The speeds naturally result from the teaching of Komatsubara. Under the principles of inherency, a patent cannot be obtained if the prior art necessarily functions in accordance with, or includes, the claimed limitations. *Mehl/Biophile International Corp. v. Milgraum*, 192 F.3d 1362, 1365, 52 USPQ2d 1303, 1305 (Fed. Cir. 1999); *In re Best*, 562 F.2d 1252, 1254-55, 195 USPQ 430, 433 (CCPA 1977). Appellants have presented no evidence that the heating and cooling speeds are not inherent in Komatsubara.

Claim 4 as a Whole

Directing our focus to claim 4 as a whole, we find that Komatsubara teaches the claimed alloy composition. Komatsubara also teaches casting, rolling and annealing. The rolling rate and annealing parameters overlap the claimed ranges and are optimizable as a matter of routine experimentation. The claimed temperature elevating and cooling speeds inherently result. We find that the examiner has established a *prima facie* case of obviousness with respect to the subject matter of claim 4. The burden is on applicants to show that any differences are not merely normal expected variations but would be unexpected by those of ordinary skill in the art. *See In re Freeman*, 474 F.2d 1318, 1324

(CCPA 1973), 177 USPQ 139, 143; *In re D'Ancicco*, 439 F.2d 1244, 1248, 169 USPQ 303, 306 (CCPA 1971); *Ex parte Karol*, 8 USPQ2d 1771, 1774 (Bd. Pat. App. & Int. 1988).

Rebuttal Evidence

Once the examiner has made a reasonable rejection under obviousness, applicants can rebut the *prima facie* case with a showing of criticality. "The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims . . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Appellants argue that sodium and calcium levels above 3 ppm and 5 ppm, respectively, result in adverse effects in the alloys as discussed on pages 13 and 14 of the specification and points to the comparative example of lot 13 present in Tables A, B, and C on pages 26, 28 and 30 of the specification, presumably as objective evidence of criticality. In regard to the statement made on pages 13 and 14 that levels of sodium higher than 3 ppm and levels of calcium higher than 5 ppm generate cavitation, this is merely a conclusory statement in the specification.

We must look to what is shown in Tables A, B, and C to determine if there is objective evidence showing criticality. Unexpected results must be established by factual evidence. Mere argument or conclusory statements in the specification do not suffice. *In re Soni*, 54 F.3d 746, 750, 34 USPQ2d 1684, 1687 (Fed. Cir. 1995) (*quoting In re De Blauwe*, 736 F.2d 699, 705, 222 USPQ 191, 196 (Fed. Cir. 1984)).

In appellants' Table C, there are no data points for direct comparison. None of the examples in Tables A, B, and C hold the other variables constant while varying only the sodium and calcium levels. In addition, Table C seems to indicate that many other variables effect cavitation. Many of the lots which use alloy compositions having sodium and calcium levels within the claimed range, such as lots 3, 4, and 10, have cavitation percentages as high or higher than lot 13, the lot having levels of sodium and calcium outside the claimed range. Holding these other variables constant while varying the sodium and calcium content is required in order to see how the sodium and calcium levels affect cavitation. *See In re Dunn*, 349 F.2d 433, 439, 146 USPQ 479, 483 (CCPA 1965) ("While we do not intend to slight the alleged improvements, we do not feel it an unreasonable burden on appellants to require comparative examples relied on for non-obviousness to be truly comparative. The cause and effect sought to be proven is lost here in the welter of unfixed variables.").

Appellants have not provided any explanation of how the illustrated examples can be compared to show the unexpected result. The Board is unable to find any appropriate comparison. Appellants must explain how the illustrated examples are considered to be commensurate in scope with the invention claimed and how the examples represent the appropriate comparison between the invention claimed and the prior art when it is not apparent on the face of the working examples. *Ex parte Gelles*, 22 USPQ2d 1318, 1320 (Bd. Pat. App. & Int. 1992).

Since appellants' working examples do not provide an appropriate comparison between compositions within and outside the claimed sodium and calcium ranges with all other variables held constant, a determination of the effect of varying the sodium and calcium levels on properties such as cavitation is impossible. Appellants have not shown criticality with a sufficient level of objective evidence.

Appellants' brief states at page 17, lines 7-8, that the claimed processing limitations are critical "as discussed above and throughout the specification". Appellants nowhere point out what specific data shows the alleged criticality of the rolling rate, annealing temperature range, time periods, or speeds or how the illustrated examples compare the invention with the closest prior art. Unexpected results must be established by factual evidence. Mere argument or conclusory statements are not enough. *In re Geisler*, 116 F.2d 1465, 1469, 43 USPQ2d 1362, 1365 (Fed. Cir. 1997). An explanation of where to find the data is, as a minimum, necessary. Furthermore, when it is not apparent on the face of the data, appellants also have the burden of explaining how the data is commensurate in scope with the claimed invention and to represent the appropriate comparison between the claimed invention and the prior art. *Ex parte Gelles*, 22 USPQ2d at 1320.

As to the subject matter of claim 4, we find an unrebutted *prima facie* case of obviousness has been established.

Dependent Claim 5

Claim 5 is dependent on claim 4 and further requires performing the rolling and final annealing steps such that a crystalline structure of the rolled plate is a non-recrystallized crystal structure, the 90° critical bending radius is 7.5 times or less a plate thickness, and a yield strength ratio before and after the final annealing is at least 70%.

Appellants state that these limitations are not disclosed or made obvious by Komatsubara. The examiner notes in the answer that the process steps of the claims are performed within the parameters of Komatsubara and that appellants have not established that any values for the bending radius and yield strength ratio are, in fact, any different than the corresponding values would be in Komatsubara or that the values would not be apparent from Komatsubara.

In the reply brief at pages 2 and 3, appellants argue that final annealing according to appellants' process is necessary in order to achieve the desired cold bending property, i.e. the 90° critical bending radius. Appellants, in the brief at pages 13 and 18, also argue that the yield strength ratio before and after annealing and the 90° critical bending radius are interdependent with final annealing. In the brief at page 19, appellants refer us to Tables A-C as objective evidence to support this argument.

In the brief, at page 19, appellants point to lots 2-4, 8, 10 and 13 of Table C. Appellants state that these lots subject the claimed alloy composition to processing parameters outside appellants' final annealing parameters and the resulting plates do not have the claimed non-recrystallized crystal structure, the claimed yield strength ratio before and after annealing or the 90° critical bending radius. There is no explanation as to how the final annealing temperatures and times inter-relate with the crystal structure, yield strength ratio before and after annealing or the 90° critical bending radius. There is also no explanation of how the data is commensurate in scope with the claims. *Ex parte Gelles*, 22 USPQ2d at 1320. Instead appellants seem to argue that the Komatsubara plate does not inherently possess the claimed properties and thus there is no *prima facie* case.

We have found a *prima facie* case, not based on inherency, but based on the premise that one of ordinary skill in the art would optimize the times and temperatures of the final annealing step of Komatsubara. We note appellants' lot 6 is both within Komatsubara's processing parameters and appellants' processing parameters. This lot, in fact, does possess appellants' claimed yield strength ratio and bending property. It also has a non-recrystallized crystal structure even though it has been annealed under conditions meeting Komatsubara's continuous annealing time and temperatures.

Assuming that there is a correlation between the annealing parameters and the bending radius as appellants argue, then if one follows the teaching of Komatsubara and optimizes the annealing temperature and time for superplastic forming so that recrystallization during superplastic forming is insured, the properties that are desirable for superplastic forming would also be optimized.

Claim 5 is a process claim. Appellants have not shown that the added property limitations of critical bending radius and yield strength ratio manipulatively modify the process in a way that overcomes the *prima facie* case of obviousness over Komatsubara. In fact, appellants seem to be arguing that the process of claim 4 results in the properties recited in claim 5.

Claim 1 to the Plate

Claim 1 is a claim to the aluminum alloy plate of specific alloy composition. This claim recites that the plate has a 90° critical bending radius is 7.5 times or less a plate thickness and a yield strength ratio before and after the final annealing is at least 70%. Claim 1 also requires the plate to have a non-recrystallized crystal structure.

As discussed above, in reference to claims 4 and 5, the examiner has come to a reasonable conclusion that optimizing the annealing step within the continuous annealing parameters of Komatsubara would result in a plate with the composition, the critical bending radius and yield strength ratio of claim 1. *In re Aller*, 220 F.2d at 456, 105 USPQ at 235.

In regard to the crystal structure set forth in claim 1, appellants would have us believe that Komatsubara teaches omitting the final annealing step whenever unrecrystallized crystal structure is desired. This is not what the reference teaches. As pointed out by the examiner, Komatsubara suggests annealing at lower temperatures, i.e. temperatures at the lower end of the 35-550°C range.

Appellants' own lots 6 and 12 perform annealing within the parameters of Komatsubara, 210°C x 0 sec. and 220°C x 0 sec. respectively, and result in non-recrystallized crystal structure.

The totality of the evidence suggests that the recrystallization temperature is somewhere between 220° and 350°C. Annealing below the recrystallization temperature would result in a non-recrystallized crystal structure. A large portion of Komatsubara's final annealing temperature range encompasses temperatures below the recrystallization temperature. Optimization of the temperature would result in non-recrystallized structure. Looking at the claim as a whole, we find that the examiner has established a *prima facie* case of obviousness with respect to the subject matter of claim 1.

Appellants have not rebutted the *prima facie* case. Appellants state that proof that Komatsubara's alloys do not possess the bending radius and yield strength ratio is contained in Tables A, B, and C. Indeed, lots 2, 3, 10, and 12 of Table C all subject alloys of Komatsubara's composition to annealing conditions meeting Komatsubara's ranges and result in properties outside the claimed parameters. Therefore, appellants have come forward with proof that Komatsubara's alloys do not necessarily possess the properties claimed. *Cf. In re Best*, 562 F.2d at 1255, 195 USPQ at 433. However, this does not end the analysis.

We have found that routinely experimenting with the final annealing temperatures and times to obtain optimal superplastic forming properties would lead one of ordinary skill in the art to an alloy with the claimed properties. While the properties may not be inherent, Komatsubara does indicate that the overall intent of Komatsubara's process is to obtain a plate optimized for superplastic forming.

Furthermore, Komatsubara discloses performing final annealing to insure recrystallized structure during superplastic forming. In other words, Komatsubara teaches a relationship between the final annealing processing conditions and the superplastic forming properties of the product plate. Therefore, a means to achieve the optimal condition, i.e. optimizing the annealing parameters, is taught by Komatsubara. *Cf. In re Rijckaert*, 9 F.3d 1531, 1533, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993). As discussed above, appellants have not presented the level of evidence necessary to show criticality of the temperature and time ranges. These are the parameters alleged to result in the bending and yield strength properties claimed. The level of evidence is insufficient to rebut the *prima facie* case for the reasons given with respect to claim 4.

Product-by-Process Claim 20

Claim 20, a product claim to the alloy plate, is in product-by-process format. The claim is limited to a plate consisting essentially of the alloying elements, which have already been established as taught by Komatsubara, formed by casting, rolling in which a cold rolling rate at a final stage of the rolling is at least 50%, and final annealing at 70-250°C so that the plate has non-recrystallized crystal structure.

"Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F.2d 695, 697, 227 USPQ 964, 966 (Fed. Cir. 1985) (citations omitted). Komatsubara, as acknowledged by appellants, teaches omitting the final annealing step altogether. Appellants acknowledge that a non-recrystallized crystal structure is obtained when the final annealing step is omitted[6]. No evidence presented by appellants lead us to believe that the product obtained when the annealing step is omitted is different than the product obtained when final annealing is undertaken in the temperature range of claim 20. Claim 20 does not require the product to have any particular yield strength ratio or 90° critical bending radius. Appellant does not present us with comparative data commensurate in scope with this particularly broad claim. We find that the examiner has established an unrebutted case of *prima facie* obviousness with respect to the subject matter of claim 20.

Dependent Claims 21 and 22

Claims 21 and 22, which are of near identical scope, further narrow product-by-process claim 20 by incorporating the final annealing parameters of claim 2 and by specifying that the plate have a 90° critical bending radius # 7.5 times a thickness of the plate and that the plate have a yield strength ratio before and after annealing of $ 70%.

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[6] The brief at page 15 lines 8-12 states: “the fact that Komatsubara discloses the final annealing step as being ‘optional’ ... is expressly a suggestion that the final annealing step should be omitted when unrecrystallized crystal structure is desired.”

We have concluded above that an unrebutted *prima facie* case of obviousness was made out with respect to the subject matter of claims 1 and 4. The evidence presented shows that optimizing the temperature and time parameters of Komatsubara's continuous final annealing operation would have resulted in the same properties as the temperature and time parameters of claims 21 and 22. We find that the examiner has established a *prima facie* case of obviousness. Looking at the arguments and evidence as a whole, the evidence presented by appellants is not sufficient to rebut the *prima facie* case.

The Process of Claim 2

Claim 2 requires final annealing at temperatures of 70 to 150°C for 0.5 to 12 hours. For batch final annealing processes of 0.5 hours or longer, Komatsubara specifies using temperatures of 250° to 400°C. The batch temperature range is specified as the only option taught by Komatsubara for batch annealing and is not just a preferred range or example. There is a hundred degree difference between the claimed temperature range and Komatsubara's range. For annealing processes of 0.5 hours and more, Komatsubara teaches away from the claimed temperature range. *In re Malagari*, 499 F.2d 1297, 1302, 182 USPQ 549, 553 (CCPA 1974) (appellant can rebut a *prima facie* case of obviousness of a range by showing that the art in any material respect taught away from the claimed range). Therefore, the rejection of claim 2 must fail.

Dependent Claims 3 and 14

As we have reversed the examiner with respect to claim 2, it is not necessarily to discuss the rejection of claims 3 and 14. The rejection as to these claims is also reversed.

OTHER ISSUES

The examiner is directed to U.S. Patent 5,540,791 to Matsuo et al. also assigned to Sky Aluminum for review for other issues of patentability. This application issued to the same assignee but a different inventive entity. This patent appears to describe the alloy composition. See, for instance, Alloy Nos. 1-7 in Table 1. It also describes batch annealing alloy no. 6 at 100°C for 2 hours after cold rolling at a draft of 67%. See Table 2, Prod. No. 13. At least some of the claims seem to be anticipated under 35 U.S.C. § 102(e). The subject matter of other claims, such as claim 4 and those dependent thereon, appear to be obvious over Matsuo based on final annealing at the 250°C endpoint in the annealing temperature range. Upon further prosecution, the examiner should consider making rejections over §§ 102(e) and 103 at least until such time as a certified translation of the priority document in this application is filed and found to support the claims. The examiner should also consider obvious double patenting issues as well. See the claims of Matsuo et al.

CONCLUSION

To summarize, the decision of the examiner to reject claims 1-22 under 35 U.S.C. § 103 is affirmed-in-part. We affirm the rejection of claims 1, 4, 5, and 15-22 and reverse the rejection of claims 2, 3, and 6-14. In addition, we bring U.S. Patent 5,540,791 to the attention of the examiner for review upon return of this application to the jurisdiction of the examiner.

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

AFFIRMED-IN-PART

JOHN D. SMITH Administrative Patent Judge	)
THOMAS WALTZ Administrative Patent Judge	) BOARD OF PATENT APPEALS AND INTERFERENCES
CATHERINE TIMM Administrative Patent Judge	)

WEINER CARRIER & BURT, P.C.
24101 NOVI RD.
SUITE 100
NOVI, MI 48375-3248