UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JYOTI MAZUMDER,
DWIGHT MORGAN and TIMOTHY W. SKSZEK

Appeal 2008-4004
Application 10/999,730[1]
Technology Center 1700

Decided: November 5, 2008

Before THOMAS A. WALTZ, JEFFREY T. SMITH, and
MICHAEL P. COLAIANNI, *Administrative Patent Judges*.

COLAIANNI, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134 the final rejection of claims 1-20. We have jurisdiction over the appeal pursuant to 35 U.S.C. § 6(b).

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[1] Though the Appeal Brief indicates there are no related appeals or related proceedings (App. Br. 1 and 12), we note that application 10/999,730 is a continuation of application 09/917,096. The decision of the Examiner in the parent application 09/917,096 was appealed (Appeal Number 2004-2034) and was decided on September 30, 2004.

We AFFIRM.

INTRODUCTION

Appellants' invention relates to a method of fabricating a component comprising, in relevant part, heating a region of a component with a laser sufficient to form a localized melt pool, feeding material into the melt pool to deposit a layer having a physical dimension, and monitoring the physical dimension using only radiation generated by the melt pool (claim 1). Appellants describe the method as an additive manufacturing using closed-loop, laser-based direct metal deposition (DMD) (Spec. 1:6-8).

Claim 1 is illustrative:

1. A method of fabricating a component having improved properties, comprising the steps of:

a) providing a substrate having a surface;

b) providing a description of the component to be fabricated;

c) heating a region of the component with a laser sufficient to form a localized meltpool;

d) feeding material into the meltpool to deposit a layer having a physical dimension;

e) monitoring the physical dimension using only radiation generated by the meltpool;

f) automatically controlling the physical dimension in accordance with the description of the article to be fabricated based upon feedback derived through the optical monitoring; and wherein, compared to the substrate, the layer of material exhibits:

improved resistance to wear, corrosion, or oxidation,
improved thermal conduction,
greater density, or
a different phase.

The Examiner relies on the following prior art references as evidence of unpatentability:

Lewis	5,837,960	Nov. 17, 1998

Singer	5,875,830	Mar. 2, 1999
Parks	5,952,057	Sep. 14, 1999
Jeantette	6,046,426	Apr. 4, 2000

Appellants request review of the following rejections:

1. Claims 1-20 are rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement;
2. Claims 1-20 are rejected under 35 U.S.C. § 112, second paragraph, as failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention;
3. Claims 1-11 and 14-18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Lewis in view of Jeantette;
4. Claims 12 and 13 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Lewis in view of Jeantette and Parks;
5. Claims 19 and 20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Lewis in view of Jeantette and Singer.

Appellants separately argue claims 1, 12, and 19 (App. Br. 3-6). Accordingly, with regard to rejections 1, 2, and 3 above, we address the rejections with regard to claim 1. With regard to rejection 4, we address Appellants' arguments regarding claim 12. With regard to rejection 5, we address Appellants' arguments with regard to claim 19.

OPINION

REJECTIONS UNDER 35 U.S.C. § 112, FIRST AND SECOND PARAGRAPHS

The Examiner finds that the claim feature "monitoring the dimension by 'only using radiation generated by the melt pool'" lacks written

description in the originally filed Specification (Ans. 4).[2] The Examiner also determines that the "monitoring" claim feature noted above is indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention (Ans. 4). The Examiner contends that it is not understood how to monitor the dimensions by "only" using the radiation generated by the melt pool (Ans. 4).

With regard to the rejection under 35 U.S.C. § 112, first paragraph, Appellants argue that the incorporated by reference U.S. Patent 6,122,564[3] to Koch on page 6 of the Specification provides support for the disputed claim feature (App. Br. 3-4). Appellants contend that Koch, at column 5, lines 54-65, indicates that the glowing melt pool is observed, and its dimensions are indicative of the growing structure (App. Br. 3-4).

With regard to the rejection under 35 U.S.C. § 112, second paragraph, Appellants argue that the claims are definite because, though other items will be necessary to measure the physical dimensions, such other items need not be set out in the claim because a person of ordinary skill in the art would understand the claim requires monitoring equipment that only observes the radiation from the melt pool to determine the physical dimension (App. Br. 4).

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[2] The Examiner finds that the disputed claim feature was added by preliminary amendment (Ans. 4), seemingly indicating that this fact further evinces that the disputed feature lacks written description. However, the preliminary amendment was filed on November 30, 2004, the same day the application was filed. After September 13, 2004, any preliminary amendment filed on the same day as the application is part of the original disclosure of the application. 37 C.F.R. § 1.115(a)(1) (2004). Accordingly, we do not see the significance of the disputed claim feature being added via preliminary amendment in this appeal.

[3] U.S. Patent 6,122,564 issued September 19, 2000.

Accordingly, the issue for the § 112 rejections on appeal is: Have Appellants established that the Examiner reversibly erred in finding that the claim feature "monitoring the physical dimension using only radiation generated by the meltpool" lacks written description and concluding that the claim feature is indefinite under 35 U.S.C. § 112? We affirmatively answer this question on both counts.

The fundamental factual inquiry in determining whether a claimed invention satisfies the written description requirement of 35 U.S.C. § 112, first paragraph, is whether the specification conveys with reasonable clarity to those skilled in the art that, as of the filing date sought, applicant was in possession of the invention as now claimed. *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d 1555, 1563-64 (Fed. Cir. 1991). The PTO has the initial burden of presenting evidence or reasons why persons skilled in the art would not recognize in the disclosure a description of the invention defined by the claims. *In re Wertheim*, 541 F.2d 257, 263 (CCPA 1976).

"Essential material," that is material necessary to provide a written description of the claimed invention, may be incorporated by reference in a Specification only by reference to a U.S. patent or U.S. patent application publication, which patent or patent application does not itself incorporate such essential material by reference. 37 CFR § 1.57(c) (2004).

The test for definiteness under 35 U.S.C. 112, second paragraph, is whether "those skilled in the art would understand what is claimed when the claim is read in light of the specification." *Orthokinetics, Inc. v. Safety Travel Chairs, Inc.*, 806 F.2d 1565, 1576 (Fed. Cir. 1986).

We find that there is no dispute that the Specification properly incorporates by reference the Koch U.S. patent in its entirety (Spec. 6). The

Specification further discloses that an optical feedback loop preferably maintains fabrication tolerances (Spec. 8). Koch discloses methods and apparatus for forming deposits of molten metal (i.e., melt pools) using a laser beam (Koch, col. 1, ll. 6-10). Koch further discloses that the apparatus and method use an optical detection means preferably having an apertured mask through which light from the deposit passes to reach the optoelectric sensor (Koch, col. 2, ll. 17-22). Koch further discloses that the optoelectric sensor measures a physical dimension of the melt pool (Koch, col. 2, ll. 45-46; col. 3, ll. 36-40). Koch describes that the molten surface of the molten pool emits radiation with intensity in the infrared region (Koch, col. 5, ll. 54-59). A narrow band pass filter[4] placed in front of the camera permits the infrared radiation to pass through the to the camera and be detected to provide a measure of a physical dimension (e.g., height of the melt pool) (Koch, col. 5, ll. 54-62).

From the foregoing, the Specification via the incorporated by reference Koch patent plainly discloses that the melt pool emits radiation in the infrared range, which is sent to an optical sensor for measurement of a physical dimension of the melt pool. Koch further discloses that an infrared region narrow band pass filter is used, which indicates that only the infrared radiation from the narrow band pass filter is observed and provides an indication of a physical dimension of the melt pool. In other words, the Specification via the incorporated by reference Koch patent supports that only radiation from the melt pool (i.e., the infrared radiation) is used to monitor the physical dimension of the melt pool. Accordingly, we

[4] A "band-pass filter" is a filter that transmits only frequencies within a selected band. *Merriam-Webster's Collegiate Dictionary*, 89 (10th Ed. 1996).

determine that the claim feature "monitoring the physical dimension using only radiation generated by the melt pool" is supported by the originally filed Specification.

For the same reasons, we further determine that the disputed claim feature particularly points out and distinctly claims the subject matter which Appellants regard as their invention in compliance with 35 U.S.C. § 112, second paragraph. Specifically, one of ordinary skill in the art would understand that the claimed "monitoring a physical dimension of the melt pool using only radiation generated by the melt pool" includes using an optical sensor to monitor only the radiation emitted by the melt pool as disclosed in the Specification via the incorporated by reference Koch patent. Accordingly, we cannot sustain the Examiner's rejections of claims 1-20 under 35 U.S.C. § 112, first and second paragraphs.

35 U.S.C. § 103 REJECTION OVER LEWIS IN VIEW OF JEANTETTE

Appellants argue that the teaching or suggestion to make the combination and the reasonable expectation of success clearly both come from Appellants' disclosure and not the prior art (App. Br. 5). Appellants further argue that even if the combination were made, Appellants' invention would not result, since Jeantette uses an entirely different feedback system (App. Br. 5). Specifically, Appellants contend that Jeantette uses a triangulation device that uses a diode laser such that more than radiation from the melt pool (i.e., the laser radiation) is required to determine a physical dimension (App. Br. 5).

The issue presented with regard to this rejection is as follows: Have Appellants showed that the Examiner reversibly erred in determining that

the claimed invention would have been obvious over the combination of Lewis in view of Jeantette? We answer that question in the negative.

We find that Lewis discloses fabricating articles using a particulate starting material, such as metal powder, which is formed using a directed light fabrication (DLF) using a laser (Lewis, col. 1, ll. 13-20; col. 3, ll. 25-36). Lewis discloses using a controller to direct movement of a deposition zone along a tool path and provides control signals to adjust apparatus functions, such as the speed at which a deposition head, which delivers the laser beam and powder to the deposition zone, moves along the tool path (Lewis, col. 3, ll. 31-36). Lewis discloses that the controller includes sensors to provide information on the deposition head and article configuration to controller (Lewis, col. 7, ll. 42-58).

We further find that Jeantette discloses a method and system for the deposition of a continuous stream of laser-melted powdered material to form complex, net-shaped objects (Jeantette, col. 1, ll. 10-14). Jeantette discloses using a controller that regulates the flow of powdered material from the powdered material feeder, the power level of the laser, the vertical position of the delivery system relative to the deposition stage, and the horizontal position of the deposition stage relative to the delivery system (Jeantette, col. 4, ll. 16-24). Jeantette discloses using an optical pyrometer to thermally monitor and maintain the deposition stage at a constant temperature by controlling the laser beam (i.e., the volumetric exposure which is the ratio of laser irradiance[5] to component velocity) to thereby provide uniform layer

[5] Irradiance is defined as the "the density of radiation incident on a given surface usually expressed in watts per square centimeter" (i.e., power per area). *Merriam-Webster's Collegiate Dictionary*, 619 (10th Ed. 1996).

control (i.e., deposition layer thickness, a physical dimension) (Jeantette, col. 10, ll. 1-49). Jeantette further discloses using the optical pyrometer thermal monitoring with the triangulation position sensor to control the deposition process (Jeantette, col. 8, ll. 55-60).

Based upon the above disclosures, we agree with the Examiner that it would have been obvious to combine Jeantette's optical monitoring with the method of Lewis in order to provide better control of the laser beam irradiance and, thus, provide a very controlled layer (Jeantette, col. 10, ll. 1-5 and 26-49). Jeantette clearly discloses that an optical pyrometer is used to measure the temperature, which measurement is then used to control the laser beam and the thickness of the layer. As such, Jeantette discloses using radiation only generated by the melt pool (i.e., the thermal radiation) to monitor the physical dimension (i.e., the layer thickness) via controlling the laser beam irradiance.

Contrary to Appellants' arguments, the teachings of the prior art taken as a whole would have suggested using Jeantette's optical sensing method to control laser irradiance with the laser production method of Lewis to provide more uniform control of the material deposition and to control the laser beam irradiance. Lewis discloses using a controller with sensors to affect changes in laser beam power level, and Jeantette discloses using an optical sensing method to control the laser irradiance (i.e., power per area). Moreover, the similarity between Lewis' and Jeantette's methods provides a reasonable expectation that combining Jeantette's optical sensors with the method of Lewis would have successfully monitored a physical dimension of the melt pool (i.e., height) and controlled laser irradiance (i.e., power per area) thereof.

Appellants' argument that Jeantette uses a different feed back control method is not persuasive. We note that the claims use the open-ended transitional claim language "comprising" such that the use of other sensors, control devices (such as Jeantette's diode laser) or steps are not excluded from the claim. *In re Crish*, 393 F.3d 1253, 1257 (Fed. Cir. 2004). Accordingly, Jeantette's disclosure to use an optical pyrometer to measure the temperature of the melt pool using radiation generated by the melt pool, which result is then used to control the laser beam and the thickness of the layer, uses radiation generated by the melt pool to monitor a physical dimension (i.e., thickness of the layer). The claim does not preclude other steps to ascertain the physical dimension from the radiation generated by the melt pool, such as Jeantette's use of the temperature ascertained from the radiation of the melt pool to control the laser beam and, thus, the thickness (i.e., physical dimension) of the melt pool, or other steps using other sources of radiation (such as Jeantette's diode laser in the triangulation position sensor).

For the above reasons, we sustain the Examiner's § 103 rejection of claims 1-11 and 14-18 over Lewis in view of Jeantette.

35 U.S.C. § 103 REJECTIONS OVER LEWIS IN VIEW JEANTETTE AND PARKS, OR LEWIS IN VIEW OF JEANTETTE AND SINGER

CLAIMS 12 AND 19

Appellants' arguments regarding claims 12 and 19 indicate that the Examiner's motivation statement is not evidence (App. Br. 6). Regarding claim 19, Appellants argue that there is no motivation for the combination and that the Examiner has no way of knowing whether the combination of

Lewis in view of Jeantette and Singer would "easily control the temperature" (i.e., reasonable expectation of success) (App. Br. 6).

Regarding Appellants' argument that the Examiner's motivation statement is not evidence, we find that the Examiner does not merely rely on the motivation statement for combining the references. Rather, the Examiner's rejections of claims 12 and 19, clearly point to portions of Parks and Singer to provide teachings to support the proposed combination and the motivation statement (Ans. 6 and 7). Appellants have not shown any error in the Examiner's finding regarding what the prior art teaches to one of ordinary skill in the art. Accordingly, Appellants' motivation and "evidence" arguments are without persuasive merit.

Regarding Appellants' claim 19 argument that there is no way of knowing whether the combination of Lewis in view of Jeantette and Singer would "easily control the temperature", we agree with the Examiner that Singer's teaching that cooling channels and thermal barriers easily control temperature provide a reasonable expectation to a person of ordinary skill in the art that combining Singer's cooling channels with the method of laser deposition disclosed by Lewis in view of Jeantette would have been successful in providing easy temperature control (Ans. 12). Moreover, Appellants provide no evidence that the Examiner's proposed combination would not have reasonably been expected to "easily control the temperature."

For the above reasons, we sustain the Examiner's § 103 rejections of claims 12 and 13 over Lewis in view of Jeantette and Parks, and claims 19 and 20 over Lewis in view of Jeantette and Singer.

DECISION

We reverse the Examiner's rejection of claims 1-20 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement.

We reverse the Examiner's rejection of claims 1-20 under 35 U.S.C. § 112, second paragraph, as failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention.

We affirm the Examiner's rejection of claims 1-11 and 14-18 under 35 U.S.C. § 103(a) as being unpatentable over Lewis in view of Jeantette.

We affirm the Examiner's rejection of claims 12 and 13 under 35 U.S.C. § 103(a) as being unpatentable over Lewis in view of Jeantette and Parks.

We affirm the Examiner's rejection of claims 19 and 20 under 35 U.S.C. § 103(a) as being unpatentable over Lewis in view of Jeantette and Singer.

ORDER

The Examiner's decision 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).

AFFIRMED

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