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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/202,195	03/10/2014	Tahany Ibrahim El-Wardany	71024US03; 67097-2465PUS1	7035
54549	7590	01/27/2020	EXAMINER	
CARLSON, GASKEY & OLDS/PRATT & WHITNEY 400 West Maple Road Suite 350 Birmingham, MI 48009			SANCHEZ-MEDINA, REINALDO	
			ART UNIT	PAPER NUMBER
			3753	
			NOTIFICATION DATE	DELIVERY MODE
			01/27/2020	ELECTRONIC

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte TAHANY IBRAHIM EL-WARDANY, MATTHEW E. LYNCH,
DANIEL V. VIENS, and ROBERT A. GRELOTTI

Appeal 2019-003485
Application 14/202,195
Technology Center 3700

Before JENNIFER D. BAHR, MICHELLE R. OSINSKI, and
SEAN P. O'HANLON, *Administrative Patent Judges*.

O'HANLON, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellant¹ appeals under 35 U.S.C. § 134(a) from the Examiner's decision to reject claims 1–5, 7–13, and 15–17. We have jurisdiction over this appeal under 35 U.S.C. § 6(b). We REVERSE.

In explaining our Decision, we refer to the Specification filed March 10, 2014 (“Spec.”), the Final Office Action mailed April 19, 2018 (“Final Act.”), the Appeal Brief filed October 11, 2018 (“Appeal Br.”), the

¹ We use the term “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as United Technologies Corporation. Appeal Br. 1.

Examiner's Answer mailed February 8, 2019 ("Ans."), and the Reply Brief filed March 29, 2019 ("Reply Br.").

SUMMARY OF THE INVENTION

Appellant's claimed invention relates to gas turbine engines. Spec. ¶ 2. Claims 1 and 12 are independent. Claim 1, reproduced below from page 9 (Claims Appendix) of the Appeal Brief, is illustrative of the claimed subject matter:

1. A method of fabricating a functionally graded turbine engine component comprising:
 - depositing layers of powder onto a base;
 - solidifying and fusing each layer with a first directed energy beam to define a component; and
 - varying a process parameter between deposited layers to define different material properties within the component, further comprising varying the energy level from the first directed energy beam to vary a density of a solidified layer of powder.

REFERENCES

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

El-Wardany	US 2013/0195671 A1	Aug. 1, 2013
Neuhaeusler	US 2013/0287590 A1	Oct. 31, 2013

REJECTIONS²

- I. Claims 1–3, 7–13, 16, and 17 stand rejected under 35 U.S.C. § 102(a) as being anticipated by Neuhaeusler.

² The Final Action included a rejection of claims 1–5, 7–11, 13, 15, and 16 under 35 U.S.C. § 112(b) as being indefinite. Final Act. 4. Although the Examiner did not expressly withdraw this rejection, the after-final

II. Claims 4, 5, and 15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Neuhaeusler and El-Wardany.

ANALYSIS

Rejection I – Anticipation by Neuhaeusler Claims 1–3 and 7–11

Independent claim 1 recites, in relevant part, “varying the energy level from the first directed energy beam to vary a density of a solidified layer of powder.” Appeal Br. 9 (Claims App.). The Examiner finds that Neuhaeusler discloses “varying the energy level (from an initial beam level to a final beam level) from the first directed energy beam (24) to vary a density (while being sintered by the beam the density is inherently varied) of a solidified layer of powder.” Final Act. 5 (citing Neuhaeusler ¶ 31). The Examiner explains that “the energy level of the laser beam is varied from an initial energy level capable of being zero when the laser is initially off, to a finishing energy level when the laser is sintering the powder.” Ans. 6 (citing Neuhaeusler ¶ 31). According to the Examiner, “the density of the powder is inherently varied by the sintering/heating of the laser beam to produce the desired component.” *Id.*

Appellant persuasively asserts, however, that “[o]ne skilled in the art would not understand the simply turning on of an energy beam as a variation that provides a variation in a solidified layer.” Reply Br. 4. In particular,

amendment filed June 14, 2018, which was entered by the Advisory Action dated July 9, 2018, removed the allegedly indefinite claim language, and the Examiner did not reproduce the rejection in the Answer. *See* Ans. 3–6. Thus, we consider the rejection under 35 U.S.C. § 112(b) to have been effectively withdrawn, and not before us for review.

Neuhaeusler discloses an electron or laser beam impinging on a layer of powder on a base, and melting the powder such that it is locally sintered together to form a component. Neuhaeusler ¶ 31. Then, the base is lowered, a new powder layer is applied, and the new powder layer is sintered by the electron or laser beam in a continued process until the component is finished. *Id.* To the extent that turning on and off the laser involves varying the energy level of the laser (i.e., from zero to a value greater than zero), as posited by the Examiner (*see* Ans. 6), the Examiner does not point to, nor do we find, any evidence on the record to support a finding that turning on and off the laser also would inherently “vary a density of a solidified layer of powder,” as recited in claim 1. Even assuming, *arguendo*, that “the density of the *powder* is inherently varied by the sintering/heating of the laser beam” of Neuhaeusler (*id.* (emphasis added)), the Examiner has not explained adequately how sintering also would inherently vary the density of a *solidified layer* of powder. To understand what claim 1 means by “to vary a density of a *solidified layer* of powder” (Appeal Br. 9 (Claims App.) (emphases added)), we need look no further than the preceding language recited in this method step of claim 1. Specifically, claim 1 recites “*varying a process parameter between deposited layers to define different material properties within the component,*” and this “varying” step further comprises “varying the energy level from the first directed energy beam to vary a density of a solidified layer of powder.” *Id.* (emphases added). Thus, claim 1 recites varying the energy level between deposited layers to vary a density of a solidified layer of powder relative to other solidified layers of the component.

“[T]here are strict requirements before a finding of inherent anticipation is made. Indeed, inevitability is at the heart of inherency” *Howmedica Osteonics Corp. v. Zimmer, Inc.*, 640 F. App’x 951, 957 (Fed. Cir. 2016). In other words, “that a certain thing may result from a given set of circumstances is not sufficient.” *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999) (citations and quotation marks omitted). Here, the Examiner has not provided sufficient evidence or technical reasoning that varying the density of a *solidified layer* of powder would necessarily or inevitably result from Neuhaeusler’s sintering. In short, the Examiner has not established a finding supported by a preponderance of the evidence that Neuhaeusler discloses, either expressly or inherently, varying the energy level of the laser to vary the density of a solidified layer of powder.³

For the foregoing reasons, we are persuaded that the Examiner erred in finding that Neuhaeusler discloses all of the limitations of claim 1. Accordingly, we do not sustain the rejection of claim 1, or its dependent claims 2, 3, and 7–11, as being anticipated by Neuhaeusler.

Claims 12, 13, 16, and 17

Independent claim 12 recites, in relevant part, “heat treating a solidified layer using a second directed energy beam to induce compressive residual stress into solidified layers of powder.” Appeal Br. 10 (Claims

³ The Examiner states, in the Answer, that “there are several examples of prior art that teach treating turbine engine components by varying the electron beam from a level above zero power to another level above zero power in order to vary the density.” Ans. 6–7 (citing US 2015/0064407 ¶ 15; US 5,837,960, 22:1–10). However, the Examiner does not rely on these references in any rejection before us for review. As such, these additional references have not been considered in this Decision.

App.). The Examiner finds that finds that Neuhaeusler discloses “heat treating a solidified layer (paragraph 31) using a second (Fig. 1) directed energy beam (24) to induce compressive residual stress into solidified layers of powder (laser beam sintering the layer will inherently induce residual stress in the same manner as the inventors[’] invention).” Final Act. 6. The Examiner explains that, “in Figure 1 of the drawings[,] the laser cited as 24 is clearly illustrated as two different laser beams and in paragraph 31 Neuhaeusler . . . disclose[s] the new powder layer being sintered again by ‘beams.’” Ans. 8.

Appellant argues that “Neuhaeusler discloses that multiple beams could be utilized to speed up the fabrication process . . . , [but] nothing in Neuhaeusler discloses any type of heat treating to a solidified layer.” Appeal Br. 7. In particular, Appellant asserts that “the Examiner’s reading of the melting process common to all additive manufacturing processes as the recited heat treating step is not a reasonable interpretation of Neuhaeusler.” *Id.*; *see also id.* (asserting that “the Examiner is reading the same step in Neuhaeusler as both the initial melting step and a heat treating step”). We agree with Appellant.

Although Neuhaeusler discloses that multiple electron or laser beams can be used to sinter layers of powder (*see* Neuhaeusler ¶¶ 31, 40), the Examiner does not point to, nor do we find, adequate disclosure in Neuhaeusler to support a finding that a second laser is used to heat treat a solidified layer of powder, as required by claim 12. To the extent that Neuhaeusler’s sintering involves heating layers of powder (*see* Ans. 7–8), the Examiner has not provided sufficient evidence or technical reasoning to establish that Neuhaeusler discloses using a second electron or laser beam to

heat treat a *solidified layer* of powder (i.e., a layer solidified and fused by a first electron or laser beam).

For the foregoing reasons, the Examiner fails to establish by a preponderance of the evidence that Neuhaeusler anticipates the subject matter of claim 12. Accordingly, we do not sustain the rejection of claim 12, or its dependent claims 13, 16, and 17, as being anticipated by Neuhaeusler.

*Rejection II – Obviousness based on Neuhaeusler and
El-Wardany*

The Examiner's rejection of claims 4, 5, and 15 relies on the same findings as to the disclosure of Neuhaeusler that we find deficient for the reasons discussed above in connection with Rejection I. *See* Final Act. 7–8. The Examiner relies on El-Wardany for teaching additional recited features, but does not articulate any findings or reasoning that would cure the aforementioned deficiencies in the disclosure of Neuhaeusler. *See id.* Accordingly, for the same reasons discussed above, we do not sustain the rejection of claims 4, 5, and 15 as being unpatentable over Neuhaeusler and El-Wardany.

Conclusion

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)	Affirmed	Reversed
1-3, 7-13, 16, 17	102(a)	Neuhaeusler		1-3, 7-13, 16, 17
4, 5, 15	103(a)	Neuhaeusler, El-Wardany		4, 5, 15
Overall Outcome				1-5, 7-13, 15-17

REVERSED