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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte JOE OTT, JOHN J. RUP JR., SHAWN STEMPINSKI, STANLEY J. FUNK, DENNIS M. MOURA, LYUTSIA DAUTOVA, and ROGER O. COFFEY

Appeal 2020-001638
Application 14/790,907
Technology Center 3700

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

BAHR, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellant[1] appeals under 35 U.S.C. § 134(a) from the Examiner's decision rejecting claims 1–3, 6, 8–10, and 14–16. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

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[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 Corp. Appeal Br. 3.

THE CLAIMED SUBJECT MATTER

Claim 1, reproduced below, is illustrative of the claimed subject matter.

1. A tube assembly comprising:
an additive manufactured first tube;
an additive manufactured second tube connected to the additive manufactured first tube and manufactured as one unitary piece, and a generally annular void defined by and radially between the additive manufactured first tube and the additive manufactured second tube; and
a plurality of pylons projecting through the generally annular void, the plurality of pylons connecting the additive manufactured first tube to the additive manufactured second tube, and
the plurality of pylons spaced axially along a centerline of the tube assembly;
wherein the tube assembly is part of a fuel nozzle for a gas turbine engine.

EVIDENCE

The prior art relied upon by the Examiner is:

Name	Reference	Date
Schilling	US 6,357,222 B1	Mar. 19, 2002
Caples	US 8,096,135 B2	Jan. 17, 2012
Epstein	US 2013/0186059 A1	July 25, 2013
Pidcock	US 2015/0211418 A1	July 30, 2015
Ryon	US 9,556,795 B2	Jan. 31, 2017

REJECTIONS

I. Claims 1–3, 6, 8, 14, and 16 stand rejected under 35 U.S.C. § 103 as unpatentable over Schilling, Ryon, and Pidcock.

II. Claims 9 and 15 stand rejected under 35 U.S.C. § 103 as unpatentable over Schilling, Ryon, Pidcock, and Caples.

III. Claim 10 stands rejected under 35 U.S.C. § 103 as unpatentable over Schilling, Ryon, Pidcock, Caples, and Epstein.

OPINION

Rejection I – Obviousness based on Schilling, Ryon, and Pidcock

In contesting this rejection, Appellant presents arguments for independent claim 1 (Appeal Br. 7–12), and relies on the same arguments for independent claim 14 (*id.* at 12) and dependent claims 2, 3, 6, 8, and 16 (*id.*). We select claim 1 as representative, and claims 2, 3, 6, 8, 14, and 16 stand or fall with claim 1. *See* 37 C.F.R. § 41.37(c)(1)(iv).

The Examiner finds that Schilling discloses a

> tube assembly comprising: a first tube (60); a second tube (62) connected to the first tube (60), and a generally annular void (between 60 and 62) defined by and radially between the first tube (60) and the second tube (62); wherein the tube assembly is part of a fuel nozzle for a gas turbine engine (see col. 2, lines 8–10).

Final Act. 3. The Examiner finds that

> Schilling is silent on the first tube and the second tube being additive manufactured as one unitary piece, and a plurality of pylons projecting through the generally annular void, the plurality of pylons connecting the additive manufactured first tube to the additive manufactured second tube, and the plurality of pylons spaced axially along a centerline of the tube assembly.

Id. However, the Examiner finds that

> Ryon teaches a similar fuel injector, including (in Fig. 2) a first tube (inward of 230) and a second tube (outward of 230) which are formed as one unitary piece ('monolithically formed

> nozzle body' col. 4, lines 20–24). Ryon further teaches an additive manufactured fuel nozzle (col. 2, line 60 – col. 3, line [2]).

Id. The Examiner determines that it would have been obvious "to modify Schilling to include additive manufacturing the first tube and the second tube to form one unitary piece, [in order] to promote rapid manufacturing and eliminate joints and brazing, as taught by Ryon in col. 3, lines 3–9." *Id.* at 3–4.

The Examiner also finds that

> Pidcock teaches a similar tube assembly, including (in Fig. 11) a plurality of pylons (75, see Para. [0057], lines 18–25) projecting through the generally annular void (84), the plurality of pylons (75) connecting the additive manufactured first tube (82) to the additive manufactured second tube (74), and the plurality of pylons (75) spaced axially along a centerline of the tube assembly (see Para. [0057], lines 18–25). See also description of additive manufacturing in Para. [0058]).

Final Act. 4. The Examiner determines that it would have been obvious to modify the combination of Schilling and Ryon to include Pidcock's pylons "in order provide support structures to make the tube assembly more rigid, as taught by Pidcock in Para. [0046], lines 16–20." *Id.*

Appellant argues that "a person of skill in the art would not have modified the teachings of Schilling based on the teachings of Ryon and Pidcock to provide such a tube assembly." Appeal Br. 7. Appellant asserts that Schilling's delivery system 60 and support system 62 are discrete components formed of different materials, each material having a distinct coefficient of expansion. *Id.* at 8 (citing Schilling, col. 2, ll. 52–55). Appellant asserts that "there is no teaching or suggestion in Schilling nor Ryon that such tailoring of the coefficient of expansion is possible if the

delivery system 60 and the support system 62 were to be formed together as one unitary piece." *Id.* at 8–9. According to Appellant, one of ordinary skill in the art

> would have no reasonable expectation of success in modifying the teachings of Schilling based on the teachings of Ryon to form the delivery system 60 and the support system 62 together as a unitary body since neither Schilling nor Ryon individually or combined teach or suggest it is possible to form a unitary body from two different materials as required in Schilling to achieve its tailored coefficient of expansion.

Id. at 9. We are not persuaded by this argument.

The Examiner responds that "one of ordinary skill in the art would have recognized that a single component can be additively manufactured using two different materials." Ans. 4–5. To support this position, the Examiner points to Vaezi[2] and Sevenson[3] as evidencing "that, before the effective filing date of the claimed invention, it was known to additively manufacture a single component using different materials." *Id.* at 5.[4] The Examiner explains that

> Sevenson discloses "[w]hat they have managed to do, is figure out a way in which a part can be 3D printed out of several different metal alloys. For instance, a jet engine component could be printed in one piece with several different properties throughout." (Sevenson, third paragraph, emphasis added).

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[2] Mohammad Vaezi et al., *Multiple Material Additive Manufacturing – Part 1: A Review*, Virtual and Physical Prototyping, Vol. 8, No. 1, 19–50 (Apr. 2013) (hereafter "Vaezi").

[3] Brittney Sevenson, *Manufacturing Breakthrough Allows for 3D Printing of Several Different Metals Within One Print*, available at https://3dprint.com/10602/3d-print-multiple-metals (July 2014) (hereafter "Sevenson").

[4] The Examiner first relied on Vaezi and Sevenson as evidence in the Response to Arguments on page 17 of the Non-Final Action mailed Aug. 6, 2018. *See* Notice of References Cited mailed Aug. 6, 2018.

> Furthermore, Vaezi teaches several different methods in which a component is additive manufactured using different materials (Vaezi, pages 19–46).

Id. (emphasis omitted). The Examiner takes the position that "one o[f] ordinary skill in the art would have recognized that Schilling's injector, made of two different materials, could have been additively manufactured a[s] one unitary piece." *Id.* However, Appellant does not specifically address the Examiner's position or the evidence cited in support thereof. *See generally* Appeal Br.; Reply Br. Appellant does not offer any factual evidence or persuasive technical rationale to refute the Examiner's rationale or explain why it would be deficient.

Appellant argues that "Schilling discloses the need for the slip joint 80 between the delivery system 60 and the support system 62 to accommodate the still present, although reduced, thermal growth differential between the elements 60 and 62." Appeal Br. 9 (citing Schilling, col. 2, l. 64–col. 3, l. 8). Appellant asserts that there would be "no motivation to manufacture the delivery system 60 and the support system 62 as one unitary piece as alleged in the Office Action since such a modification would result in a fixed connection between the elements 60 and 62 at the joint 80." *Id.*; *see also id.* at 11 (asserting that "additively manufacturing the delivery system 60 and the support system 62 together as a single unit would likely result in a fixed connection at both 68 and 80"). This argument is unpersuasive.

The Examiner responds "that only one fixed connection point is needed for the inner and outer tubes to meet the limitation 'unitary.'" Ans. 6. The Examiner explains that "[m]odifying Schilling to make the inner and outer tubes unitary would not necessarily result in a fixed connection at 80, since the assembly already includes a fixed connection

point at 68." *Id.* In this regard, Appellant does not persuasively rebut the Examiner's position that a fixed connection at only end 68 would make Schilling's assembly unitary. Moreover, Appellant does not proffer any evidence to support the contention that using an additive manufacturing process to produce Schilling's assembly necessarily would result in a fixed connection at slip joint 80. *See* Appeal Br. 9; Reply Br. 2–3. Appellant's assertion amounts to nothing more than attorney argument unsupported by evidence and, thus, is entitled to little, if any, weight. *In re Geisler*, 116 F.3d 1465, 1470 (Fed. Cir. 1997); *see also In re Pearson*, 494 F.2d 1399, 1405 (CCPA 1974) (An attorney's arguments in a brief cannot take the place of evidence.).

Appellant argues that "Schilling teaches away from a feature of 'an additive manufactured second tube connected to the additive manufactured first tube and manufactured as one unitary piece' as recited in claim 1." Appeal Br. 10 (emphasis omitted). We are not persuaded by this argument.

A reference teaches away from a claimed invention or a proposed modification if "a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re Kubin*, 561 F.3d 1351, 1357 (Fed. Cir. 2009) (quoting *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994)). Prior art does not teach away from claimed subject matter merely by disclosing a different solution to a similar problem unless the prior art also criticizes, discredits, or otherwise discourages the solution claimed. *See In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). Here, Appellant does not point to, nor do we find, any disclosure in Schilling criticizing, discrediting, or otherwise discouraging the

use of additive manufacturing to form the fuel nozzle assembly as a unitary piece, as proposed by the Examiner in the rejection.

Appellant argues that, if Schilling's delivery system 60 and support system 62 were additively manufactured as a unitary piece, "there would be no way to locate the O-ring 86 in the groove 84." Appeal Br. 9–10. Appellant asserts that, "although Schroeder [(US 2013/0245801 A1, pub. Sept. 19, 2013)] allegedly teaches adding an element during additive manufacturing production, there is no teaching or suggestion in Schroeder that such an element can be an O-ring." *Id.* at 10.[5] Appellant contends that "there is no teaching or suggestion in Schroeder that an O-ring can be added mid-additive manufacturing while still providing the required interference fit, particularly since one of the surfaces against which the O-ring may press may not yet be formed." *Id.* According to Appellant, "if an O-ring is simply laid on a partially manufactured part and then material is laid over the O-ring, the O-ring will not be subject to an interference fit since that O-ring would not be compressed before the laying of additional material." *Id.* at 10–11. This line of argument is unpersuasive.

Schroeder discloses that, "[d]uring additive manufacturing production, the process may be programmed to pause such that an element may be added." Schroeder ¶ 52. Although Appellant correctly observes that Schroeder does not specifically disclose that the added element is an O-ring (*see* Appeal Br. 10), Appellant's argument does not persuasively refute the Examiner's position "that Schroeder's teaching of pausing the additive

[5] The Examiner first relied on Schroeder as evidence in the Response to Arguments on page 10 of the Final Action. *See* Notice of References Cited mailed March 5, 2019.

manufacturing process to add an element obviously could have applied to the addition of an O-ring" (Ans. 7). The Examiner explains that Appellant's argument

> consider[s] a case in which only one surface has been formed before adding the O-ring, while failing to consider a case in which two opposing surfaces were formed before adding the O-ring. Specifically, both the inner and outer tubes could have been additively manufactured together before the insertion of the O-ring, thus providing two surfaces between which the O-ring could be fit.

Id. In this regard, Appellant asserts that, "if the inner and the outer tubes are additively manufactured before inserting the O-ring, then the cavity in which the O-ring is disposed would be enclosed without access thereto." Reply Br. 3. However, we understand the Examiner's position to be that it would have been obvious, based on the combined teachings of the references, to pause an additive manufacturing process used to produce Schilling's fuel nozzle at a point in which two opposing surfaces of delivery system 60 (inner tube) and support system 62 (outer tube) are formed, such that O-ring 86 could be interference fit between these surfaces and the process would then be resumed to complete forming groove 84 that would enclose the O-ring. In this regard, Appellant does not proffer factual evidence or persuasive technical reasoning to explain how, in an additive manufacturing process to produce Schilling's assembly, pausing the process to add O-ring 86 in groove 84 in an operable manner would be beyond the level of ordinary skill in the art. *See KSR Int'l Co. v. Teleflex Inc.,* 550 U.S. 398, 421 (2007) ("A person of ordinary skill is also a person of ordinary creativity, not an automaton."). Thus, we are unpersuaded by Appellant's contention that one of ordinary skill in the art would have had no reasonable

expectation of success in combing the reference teachings, as proposed by the Examiner. *See* Appeal Br. 9.

For the above reasons, Appellant does not apprise us of error in the Examiner's determination that the subject matter of claim 1 would have been obvious. Accordingly, we sustain the rejection of claim 1, and claims 2, 3, 6, 8, 14, and 16 falling therewith, under 35 U.S.C. § 103 as unpatentable over Schilling, Ryon, and Pidcock.

Rejections II and III – Obviousness based on Schilling, Ryon, Pidcock, and one or more of Caples and Epstein

In contesting the rejections of claims 9, 10, and 15, Appellant relies on the same arguments and reasoning we found unpersuasive in connection with the rejection of claim 1. *See* Appeal Br. 12–13. Accordingly, for the same reasons discussed above with respect to Rejection I, we also sustain the rejections of claims 9, 10, and 15 under 35 U.S.C. § 103.

CONCLUSION

In summary:

Claims Rejected	35 U.S.C. §	References	Affirmed	Reversed
1–3, 6, 8, 14, 16	103	Schilling, Ryon, Pidcock	1–3, 6, 8, 14, 16	
9, 15	103	Schilling, Ryon, Pidcock, Caples	9, 15	
10	10	Schilling, Ryon, Pidcock, Caples, and Epstein	10	
Overall Outcome			1–3, 6, 8–10, 14–16	

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

AFFIRMED