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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/047,424	02/18/2016	Dagobert GOEPFERT	6570-P50279	6515

13897 7590 12/20/2019

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EXAMINER	
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ART UNIT	PAPER NUMBER
3726	

NOTIFICATION DATE	DELIVERY MODE
12/20/2019	ELECTRONIC

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte DAGOBERT GEOPFERT,
ALEXANDER GINDORF, and MARCUS KLEMM

Appeal 2019-001098
Application 15/047,424
Technology Center 3700

Before DANIEL S. SONG, JAMES P. CALVE, and
WILLIAM A. CAPP, *Administrative Patent Judges*.

CALVE, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant appeals from the decision of the Examiner to reject claims 20–39.[1] We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

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[1] "Appellant" refers to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies MTU Aero Engines AG as the real party in interest. Appeal Br. 3.

CLAIMED SUBJECT MATTER

Claim 20, the sole independent claim, is reproduced below with disputed limitations italicized for emphasis.

> 20 A method for producing a component, wherein the component is a housing of a gas turbine and the method comprises:
>
> (a) providing a rotationally symmetrical forged blank,
>
> (b) *applying additional material of at least one substance to a surface of the blank by laser deposition welding and/or by kinetic cold gas compaction* at at least one location, and
>
> (c) removing material until a final contour of a finished component is attained.

REJECTIONS[2]

Claims 20, 21, 23–32, 34, 35, 38, and 39 are rejected under 35 U.S.C. § 103 as unpatentable over Xu (US 2012/0224960 A1, pub. Sept. 6, 2012) and Cleveland (US 2002/0020164 A1, pub. Feb. 21, 2002).

Claim 22 is rejected under 35 U.S.C. § 103 as unpatentable over Xu, Cleveland, and Jakimov (US 2012/0171041 A1, pub. July 5, 2012).

Claim 33 is rejected under 35 U.S.C. § 103 as unpatentable over Xu, Cleveland, and Stoltenhoff (US 2009/0148622 A1, pub. June 11, 2009).

Claim 36 is rejected under 35 U.S.C. § 103 as unpatentable over Xu, Cleveland, and Ravenhall (US 5,511,604, iss. Apr. 30, 1996).

Claim 37 is rejected under 35 U.S.C. § 103 as unpatentable over Xu, Cleveland, and Durocher (US 2013/0051989 A1, pub. Feb. 28, 2013).

[2] The Examiner withdrew the rejection of claims 21 and 22 under 35 U.S.C. § 112(d). *See* Ans. 7.

ANALYSIS

Claims 20, 21, 23–32, 34, 35, 38, and 39
Rejected over Xu and Cleveland

Appellant argues claims 20, 21, 23–32, 38, and 39 as a group. Appeal Br. 7–12. We select claim 20 as representative. 37 C.F.R. § 41.37(c)(1)(iv). We separately address Appellant's arguments for claims 34 and 35.

Claims 20, 21, 23–32, 38, and 39

Regarding claim 20, the Examiner finds that Xu teaches the claimed method by providing a rotationally symmetrical forged blank (annular case 64) and applying additional material for rings 80, 82, 84, 86, 88 to a surface of the blank and removing material until a final contour is attained, but Xu does not apply additional material by laser deposition welding and/or kinetic cold gas compaction as claimed. Final Act. 3. The Examiner finds that Cleveland applies additional material as deposited features of a substance to a surface of a blank by laser deposition welding as claimed. *Id.* at 4.

The Examiner determines that it would have been obvious to a skilled artisan to form the rings of Xu by a laser deposition welding which "allows for a simple and inexpensive means for changing and incorporating complex design of the rings" as Cleveland teaches. *Id.* (citing Cleveland ¶ 3).

Appellant argues that Xu expresses a preference to *forge* rings on the casings, but Cleveland uses laser deposition to make free formed features that are relatively small and bear no resemblance to *forged* net shape rings of Xu. Appeal Br. 9. As a result, Appellant argues that a skilled artisan would not produce Xu's rings by laser deposition absent hindsight, and the benefits cited by Cleveland for laser deposition welding would not be used on Xu when Xu's preferred method for making rings is forging. *Id.* at 10–11.

The Examiner has the better position. Xu attaches "near net shape rings" 72, 74, 76, 78, 80, 82, 84, 86 to a unitary annular case structure 68 by electron beam welding. Xu ¶ 17. The rings are formed by forging, casting, extrusion, or machining bar-stock/tube-stock depending on the application. *Id.* ¶ 20. Thus, Xu forms the rings in many different ways besides forging depending on a desired size and other needs of an application. *See id.*

The Examiner proposes to improve Xu with Cleveland's teachings to form surface features on engine casings by laser deposition welding, which produces detailed shapes and features without complex molds or expensive machining to finish a product as other methods require. *See* Cleveland ¶ 3; *see also* Ans. 8 (citing *id.*); Final Act. 4. These teachings provide a rational underpinning for the modification to Xu. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007) ("[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill."). Furthermore,

> we have repeatedly held that an implicit motivation to combine exists not only when a suggestion may be gleaned from the prior art as a whole, but when the "improvement" is technology-independent and the combination of references results in a product or process that is more desirable, for example because it is stronger, cheaper, cleaner, faster, lighter, smaller, more durable, or more efficient. Because the desire to enhance commercial opportunities by improving a product or process is universal—and even common-sensical—we have held that there exists in these situations a motivation to combine prior art references even absent any hint of suggestion in the references themselves. In such situations, the proper question is whether the ordinary artisan possesses knowledge and skills rendering him *capable* of combining the prior art references.

DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co., 464 F.3d 1356, 1368 (Fed. Cir. 2006).

Appellant's attempt to distinguish Xu's rings from surface features of Cleveland are not persuasive either. *See* Appeal Br. 9–10. Xu attaches rings to a unitary annular case structure 68. Xu ¶ 17. The "rings" vary with needs of a particular application and may be *flanges* for attaching engine case 60 to other structures, external stiffening rings that add stiffness to engine case 60, internal retaining *flanges* that support engine components positioned inside engine case 60, accessory attachment rings that attach accessories external to engine case 60, or scallops that reduce the ring's weight. *Id.* ¶ 18.

Cleveland forms features on metal engine casings by laser deposition welding. *See* Cleveland ¶¶ 4, 16. The free-formed features can be *brackets, mounting structures*, surface recesses, surface contours, *surface projections, flanges*, and the like. *Id.* ¶ 15. These features provide mounting or interface projections, contours, or surface features with similar structure and functions as Xu's rings. *Id*. Appellant admits that Cleveland free forms such features without explaining how the features differ from Xu's "rings." Appeal Br. 9–10; Reply Br. 3. Claim 20 recites "applying additional material of at least one substance" to a surface of a blank without specifying any other features.

Appellant's effort to cabin Xu's process to forging is not persuasive because Xu also forms the rings by extrusion, casting, and machining of bar-stock/tube-stock *depending on the application*. *See* Appeal Br. 11; Xu ¶ 20. Xu then attaches the rings to the casing by electron beam welding. Xu ¶ 20.

The Examiner proposes to improve Xu's process by free-forming the rings directly on the casing by laser deposition welding to produce structures of a desired height and shape as Cleveland teaches. *See* Cleveland ¶¶ 16, 17.

Rather than forming rings by forging, extrusion, casting, or machining processes and then attaching the rings to a case by electron welding as Xu does, Cleveland free forms such features directly onto a casing to improve efficiency. Cleveland ¶ 3. Cleveland free-forms the surface features to any desired size and shape without having to use or make new molds/forms that are required in Xu's forging, extrusion, or casting, and Cleveland's process can reduce the amount of machining required to finish features compared to Xu's pre-forged or pre-molded rings. *See id.* ¶¶ 3, 18, 25; Xu ¶ 20; Ans. 8.

Appellant is correct that Cleveland discusses the expense of molds for making engine casings with extra material for interfaces and projections that must be machined out of the molded casing. Appeal Br. 11. However, Xu makes similar "near net shape" rings by processes that use molds/forms, and the forged/cast/extruded rings must be machined to yield a final shape. *See* Xu ¶¶ 17–20, Figs. 2, 4, 5 (dashed lines show material to be removed).

Cleveland's use of laser deposition welding to obviate the need for expensive molds, moldings steps, and machining applies similarly to Xu's process of making rings using molds/forms that must be changed to make rings of different sizes and shapes, and also must be machined. *See* Ans. 8; *In re Berg*, 320 F.3d 1310, 1315 (Fed. Cir. 2003) ("As persons of scientific competence in the fields in which they work, [E]xaminers and administrative patent judges are responsible for making findings, informed by their scientific knowledge, as to the meaning of prior art references to persons of ordinary skill in the art and the motivation those references would provide to such persons. Absent legal error or contrary factual evidence, those findings can establish a prima facie case of obviousness."); *KSR*, 550 U.S. at 417 (use of known technique to improve similar devices similarly); Reply Br. 2–4.

These express teachings of Cleveland, particularly as they interrelate to those of Xu, provide sufficient facts to support the motivation to combine their teachings as the Examiner proposes to do. *See KSR*, 550 U.S. at 518 ("Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue."); *see also Nike Inc. v. Adidas AG*, 812 F.3d 1326, 1337 (Fed. Cir. 2016) ("We thus agree with the Board that the prior art references 'serve the same purpose' of efficiently creating knitted articles . . . . a skilled artisan interested in Nishida's preference to minimize waste in the production process would have logically consulted the well-known practice of flat-knitting, which eliminates the cutting process altogether.").

Supported by such factual underpinnings, the Examiner's motivation to combine teachings of Xu and Cleveland addresses Appellant's hindsight argument. *See In re Cree, Inc.*, 818 F.3d 694, 702 n.3 (Fed. Cir. 2016) (holding that the appellant's hindsight argument was addressed by showing that a proper motivation to combine the references in fact existed).

Accordingly, and for the foregoing reasons, we sustain the rejection of claim 20 and of claims 21, 23–32, 38, and 39, which fall therewith.

Claims 34 and 35

Claim 34 recites "a contact surface is worked into the forged blank." Appeal Br. 22 (Claims App.). Claim 35 recites that "a contact surface is turned into an interior of the region of the forged blank." *Id.* The Examiner relies on Xu to teach these features. Final Act. 5.

In particular, the Examiner finds that Xu teaches to machine a contact surface (a faying surface) into a near net shape ring and on the annular case of forged case 68 to provide contact surfaces where the rings are welded to the casing along the exterior and the interior of a flange region of the forged case. Final Act. 5; Ans. 9 (citing Xu ¶¶ 19–21); *see also* Xu, Figs. 2, 5.

Appellant acknowledges the Examiner's finding that Xu/Cleveland teaches contact surfaces at weld joints 98, 100, 102, 104, 106 in Figure 2 of Xu 's but argues that the Examiner provided no explanation in this regard. Appeal Br. 12. This argument is not persuasive because it does not explain why Xu's faying surfaces do not correspond to the claimed contact surfaces. *See* 37 C.F.R. § 41.37(c)(1)(iv); *see also In re Jung*, 637 F.3d 1356, 1365 (Fed. Cir. 2011) (noting the Board's long-standing practice under its rules to require an applicant to identify the alleged error in an examiner's rejections); *In re Lovin*, 652 F.3d 1349, 1357 (Fed. Cir. 2011) (holding "the Board reasonably interpreted Rule 41.37 to require more substantive arguments in an appeal brief than a mere recitation of the claim elements and a naked assertion that the corresponding elements were not found in the prior art."). The Specification describes the contact surfaces as being turned or machined into a forged blank to allow further machining of the blank. Spec. 7:15–20.

Thus we sustain the rejection of claims 34 and 35.

Claim 22
Rejected over Xu, Cleveland, and Jakimov

The Examiner relies on Jakimov to teach the application of additional material via kinetic cold gas compaction as recited in claim 22. Final Act. 6. The Examiner determines it would have been obvious to use this method to make Xu's rings as a known effective additive manufacturing process. *Id.*

Appellant argues that Jakimov does not provide additional material on a substrate or forged blank as claimed but instead manufactures thin-walled structural components on a substrate and then detaches the component from the substrate after it has been formed so the material does not become part of the substrate. Appeal Br. 13–14.

In response, the Examiner clarifies that Jakimov is relied on solely to modify Cleveland's laser deposition welding process, which already deposits material on a substrate as claimed, to a kinetic cold gas compaction process to overcome the long manufacturing time associated with a laser deposition welding process as Jakimov teaches. Ans. 9 (citing Jakimov ¶¶ 3–5). Appellant does not respond further. *See* Reply Br. 2–6.

Jakimov teaches that a kinetic cold gas compacting process provides a simple and effective method to implement in making structural components and has shorter manufacturing times than laser powder deposition welding. Jakimov ¶ 3. A "kinetic cold gas compacting method makes it possible to produce a homogeneous microstructure without great variations in chemical composition over the entire extent of the component, so that a very compact and dense structure without porosity can be obtained." *Id.* ¶ 5.

Jakimov's teachings provide a rational underpinning to replace the laser deposition welding process of Cleveland as applied to Xu as a more effective process for making Xu's rings. Final Act. 6. Such a predictable use of prior art techniques according to their established functions would have been obvious to a skilled artisan to provide similar improvements absent evidence that its application is beyond the level of ordinary skill in the art. *See KSR*, 550 U.S. at 417. Appellant's arguments do not address the level of difficulty in doing so. *See* Appeal Br. 13–14; *see also* Reply Br. 5.

Contrary to Appellant's arguments, Jakimov teaches that the thin-walled structural components can remain attached to the substrate after formation by kinetic cold gas compacting. *See* Appeal Br. 13–14; Reply Br. 5–6; Jakimov ¶ 9. These structural components are made for gas turbines and aircraft engines. *Id.* ¶¶ 4, 19. Jakimov's teachings provide a rational underpinning for the Examiner's determination that it would have been obvious to a skilled artisan to use a kinetic cold gas compacting process in lieu of the laser deposition welding method of Cleveland to make Xu's rings to achieve the advantages taught in Jakimov for kinetic cold gas compacting over laser deposition welding. Final Act. 6.

Jakimov uses a kinetic cold gas compacting process to form structural features of a gas turbine engine as Xu does for rings. Claim 20 only requires "additional material" to be applied to a forged blank. In this regard, Jakimov teaches that "the deposition can take place directly on the already existing semifinished product." Jakimov ¶ 6. Jakimov's kinetic cold gas compacting process thus would form features such as "rings" on Xu's engine case 60 by applying additional material to the case/blank as claimed.

Thus, we sustain the rejection of claim 22.

Claim 33
Rejected over Xu, Cleveland, and Stoltenhoff

Appellant argues that the Examiner's reliance on Stoltenhoff to teach the electrochemical removal of material as recited in claim 33 does not cure the deficiencies of Xu and Cleveland as to claim 20 from which claim 33 depends. Appeal Br. 14–15. Because we sustain the rejection of claim 20 as unpatentable over Xu and Cleveland, this argument is not persuasive and we also sustain the rejection of claim 33.

Claim 36
Rejected over Xu, Cleveland, and Ravenhall

The Examiner relies on Ravenhall to teach aircraft engine structural components made of a titanium alloy as recited in claim 36. Final Act. 7. The Examiner determines it would have been obvious to a skilled artisan to make the blank and applied material of the modified Xu method of titanium alloy such as Ti-63 and Ti-6242 taught by Ravenhall because these materials are known to have material characteristics that are ideal for aircraft engine structural components. *Id.* The Examiner reasons that because Ravenhall teaches that these materials are used in gas turbine engines similar to the gas turbine engine case of Xu, these materials satisfy the requirements for the working environment of gas turbine engines such as high temperature and stress and therefore a skilled artisan would have been motivated to use these materials for the claimed blank and applied material of Xu. Ans. 10.

Appellant argues that the aircraft engine structural components in Ravenhall are cast articles with a reinforced structural composite core and the cast articles "have virtually nothing in common with the turbine casing of XU." Appeal Br. 15–16. Appellant argues that the issue is whether it would have been obvious to use Ti-64 for the forged casing blank of Xu and to use Ti-6242 for making the rings of Xu. *Id.* at 16.

Ravenhall teaches titanium as a material of choice in making high strength aircraft engine structural components because of its low density, high strength, and high stiffness. *See* Ravenhall 1:15–20. More particularly, Ravenhall uses the claimed titanium alloys, namely, Ti-64 and Ti-6242, to make different aircraft parts such as engine struts, peripheral structures, and sheaths of turbine gas engine frames 10. *Id.* at 3:7–13, 6:19–31, Fig. 1.

The Examiner reasons that these teachings of Ravenhall would have motivated a skilled artisan to make the claimed blank and additional material of these titanium alloys as recited in claim 35 because Ravenhall teaches to use these different alloys to make different parts for gas turbine engines such as casings and structural components that are connected. Final Act. 7; Ans. 10. The Examiner also reasons that these teachings would have motivated a skilled artisan to modify the process of Xu to make the casing and rings of the claimed alloys for similar expected benefits. *See* Final Act. 7; Ans. 10.

Appellant's arguments do not apprise us of error in the Examiner's findings and determination in this regard, and we agree with the reasoning set forth by the Examiner. Appeal Br. 15–16. Ravenhall's use of these titanium alloys in a metal matrix composite structure is not dispositive and is not precluded by claim 36, which recites "the forged blank is produced from Ti-64 and the applied material *comprises* Ti 6242." Claim 36 is open-ended. It does not proscribe the use of other elements with the claimed alloys.

The Specification discloses that "it is for example possible for the forged blank to be produced from Ti-64 and for the functional regions to be produced from Ti 6242." Spec. 6. This allows the blank to have a first alloy composition such as Ti-64 and the functional element to have a second alloy composition such as Ti 6242. *Id.* at 10. No unexpected results or criticality are described for this feature, however, and Appellant does not argue or present evidence of such unexpected results or criticality.

Cleveland teaches titanium or alloy powder or other metal deposited on a workpiece and formed by laser deposition welding. Cleveland ¶ 16. Jakimov teaches that various superalloys can be used to form layers by kinetic cold gas spraying/compacting. *See* Jakimov ¶¶ 19, 42.

Claim 36 does not recite any properties of the claimed titanium alloys. Claim 36 requires the blank to be formed of one alloy and applied material to comprise another. The Examiner identifies prior art teachings that use the alloys in gas turbine engine components. Appellant has not persuaded us of error in the Examiner's findings that Ravenhall teaches the claimed titanium alloys or reasoning that a skilled artisan would have used the alloys in Xu's engine casing and components for similar results. *See KSR*, 550 U.S. at 418 (court can consider inferences and creative steps a skilled artisan would use).

For the foregoing reasons, we sustain the rejection of claim 36.

Claim 37
Rejected over Xu, Cleveland, and Durocher

Claim 37 depends from claim 20 and recites "the forged blank is produced from IN625 and the applied material comprises IN718 or DA718." The Examiner finds that Durocher teaches a gas turbine engine shroud made of IN625 or IN718 and determines it would have been obvious to a skilled artisan to make the blank and applied material of Xu and Cleveland of these alloys to display material characteristics ideal for aircraft engine structure components. Final Act. 8; Ans. 10.

Appellant argues that Durocher teaches to make feather seal 40 and metal inject a shroud body around that seal to provide a shroud segment with an integrated feather seal, and "[i]t is not seen that a feather seal and the turbine casing or the rings of Xu have anything in common with a feather seal." Appeal Br. 17–18. Appellant also argues that the issue is whether it would have been obvious to use IN625 for the forge casing blank of Xu and DA718 for making the rings of Xu, and the Examiner has not provided any explanation in this regard. *Id.* at 18.

The Specification does not ascribe criticality or unexpected results to the claimed alloys. Spec. 6, 10. Nor does Appellant present evidence of unexpected results or criticality to produce the forged blank from IN625 and the applied material to comprise IN718/DA718.

The Examiner correctly finds that Durocher uses/applies the alloys in a gas turbine engine shroud and reasons that it would have been obvious to use/apply the alloys for Xu's similar casing and rings for predictable results. Ans. 10. Appellant's arguments do not apprise us of Examiner error in this regard. *See KSR*, 550 U.S. at 417 (holding that the use of a technique that improves one device to improve similar devices in the same way is obvious unless its application is beyond the level of ordinary skill in the art).

Thus, we sustain the rejection of claim 37.

CONCLUSION

In summary:

Claims Rejected	**35 U.S.C. §**	**Reference/Basis**	**Affirmed**	**Reversed**
20, 21, 23–32, 34, 35, 38, 39	103	Xu, Cleveland	20, 21, 23–32, 34, 35, 38, 39	
22	103	Xu, Cleveland, Jakimov	22	
33	103	Xu, Cleveland, Stoltenhoff	33	
36	103	Xu, Cleveland, Ravenhall	36	
37	103	Xu, Cleveland, Durocher	37	
Overall Outcome			20–39	

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