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Morgan, Lewis & Bockius LLP (WA) 1111 Pennsylvania Avenue, N.W. Washington, DC 20004			WU, JENNY R	
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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* JOHAN LINDEN and TOMAS ANTONSSON

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Appeal 2019-005989  
Application 15/839,588  
Technology Center 1700

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Before BEVERLY A. FRANKLIN, JAMES C. HOUSEL, and  
MONTÉ T. SQUIRE, *Administrative Patent Judges*.

HOUSEL, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant<sup>1</sup> appeals from the Examiner's decision to reject claims 1–10 under 35 U.S.C. § 103 as unpatentable over Linden (US 7,182,159 B2, iss. Feb. 27, 2007) in view of

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<sup>1</sup> We use the word Appellant to refer to “applicant” as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as Sandvik Intellectual Property AB. Appeal Brief (“Appeal Br.”) filed April 17, 2019, 3.

Kurebayashi (JP 2011-74427A, pub. Apr. 14, 2011).<sup>2</sup> We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.<sup>3</sup>

#### CLAIMED SUBJECT MATTER

The invention relates to a drill rod for top hammer drilling in which a drilling rig provides both high rotational movement and percussion to the drill rod. Spec. 1:9, 14–19. Drill rods typically comprise a central rod portion, a threaded male end, and a threaded female end, wherein a drilling head or bit is screwed onto the male end of the rod and the drilling head or bit is driven into the rock or ground by the drilling rig. *Id.* As the length of the drill hole increases, the drill rod may be extended by screwing additional drill rods onto the female end of the preceding one. *Id.* Appellant discloses that the life of drill rods seems to be limited by failure in the threaded ends of the drill rods. *Id.* at 2:12–14. Appellant’s drill rod is composed of a bainitic steel, but wherein the threaded ends are case hardened such that they have a martensitic surface zone and a bainitic-martensitic core. *Id.* at 2:24–3:13.

Claim 1, reproduced below from the Claims Appendix to the Appeal Brief, is illustrative of the claimed subject matter:

1. A top hammer drill rod, comprising

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<sup>2</sup> The Examiner relies, without dispute, on an English-language machine translation of Kurebayashi. We likewise rely on this translation in our Decision.

<sup>3</sup> This Decision also cites to the Specification (“Spec.”) filed December 12, 2017, the Final Office Action (“Final Act.”) dated September 13, 2018, and the Examiner’s Answer (“Ans.”) dated June 11, 2019.

a central rod portion extending longitudinally from a first end to a second end;

a case hardened, threaded male connector at the first end;  
and

a case hardened, threaded female connector at the second end,

wherein the drill rod is formed from a steel comprising, in weight % (wt%):

C: 0.16 - 0.23

Si: 0.85 - 0.95

Mo: 0.67 - 0.9

Cr: 1.10-1.30

V: 0.18 - 0.4

Ni: 1.60 - 2.0

Mn: 0.65 - 0.9

P:  $\leq 0.020$

S:  $\leq 0.02$

Cu:  $< 0.20$

N: 0.005 - 0.012

balance Fe and unavoidable impurities,

wherein at least one of the male connector and the female connector includes a core region and a surface zone,

wherein a microstructure of the surface zone includes martensite, and

wherein a microstructure of the core region includes bainite.

Independent claim 10 recites a top hammer drill rod having the same composition and structure as set forth in claim 1, wherein the surface zone and the core region are defined in perpendicular or transverse cross-section to the longitudinal axis of the drill rod.

#### OPINION

We review the appealed rejection for error based upon the issues Appellant identifies, and in light of the arguments and evidence produced thereon. *Ex parte Frye*, 94 USPQ2d 1072, 1075 (BPAI 2010) (precedential) (cited with approval in *In re Jung*, 637 F.3d 1356, 1365 (Fed. Cir. 2011) (“[I]t has long been the Board’s practice to require an applicant to identify the alleged error in the examiner’s rejections.”). After considering the argued claims and each of Appellant’s arguments, we are not persuaded of reversible error in the appealed rejection. Accordingly, we affirm the rejection for the reasons set forth in the Examiner’s Answer. We add the following primarily for emphasis.

Appellant does not argue the claims separately, but instead focuses on limitations common to independent claims 1 and 10. In accordance with 37 C.F.R. § 41.37(c)(1)(iv) (2018), we select claim 1 as representative, and claims 2–10 stand or fall with claim 1.

The Examiner finds that Linden discloses a top hammer drill rod comprising a central rod portion and case hardened, threaded male and female connectors at respective first and second ends of the central rod portion. Final Act. 2–3. The Examiner further finds that Linden’s drill rod is formed from a steel composition comprising overlapping amounts of all the same elements as recited in claim 1, except for vanadium (“V”) and nitrogen (“N”). *Id.* at 3–4. In addition, the Examiner acknowledges that Linden fails

to disclose that the microstructure of a surface zone of the connectors includes martensite and the microstructure of a core region of the connectors includes bainite. *Id.* at 4.

For these missing features, the Examiner finds that Kurebayashi discloses a steel drill rod having stem and threaded portions, wherein the stem portion defines a core region that includes bainite and the surface zone of the thread portion includes martensite. Final Act. 4. The Examiner also finds that Kurebayashi discloses including an amount of V of 0.1–0.3 wt% in the steel drill rod composition for the benefit of raising softening resistance and identifies an amount of N  $\leq$  0.015 wt% as an unavoidable impurity. *Id.* The Examiner concludes that it would have been obvious to have modified Linden’s steel composition by including an amount of V within the range recited in claim 1 to improve softening resistance, whereas an amount of N is restricted to  $\leq$  0.015 wt% as an unavoidable impurity. *Id.* The Examiner further concludes that it would have been obvious to provide the surface zones of Linden’s connectors include martensite, whereas the core regions of these connectors include bainite to provide the drill rod with a higher surface hardness and a strengthened core. *Id.*

Appellant argues that the combination of Linden and Kurebayashi is in error because Kurebayashi does not teach (but instead teaches away from) a drill rod having threaded connector end portions that are case hardened with a bainite core region and a martensite surface zone. Appeal Br. 10. In particular, Appellant contends the Examiner erred in relying on Kurebayashi to motivate modification of Linden’s case hardened threaded connectors to have surface zones with a microstructure including martensite and core regions with a microstructure including bainite because Kurebayashi teaches

the formation of martensite and bainite without carburizing as a replacement for case hardening. *Id.* at 8, 11–12. Instead, Appellant asserts that Kurebayashi motivates replacement of Linden’s case hardened threaded connectors with Kurebayashi’s threaded connectors that are not case hardened. *Id.* at 12–13.

Appellant’s arguments are not persuasive because, as the Examiner finds (Ans. 3–5), Kurebayashi teaches that the threaded connectors are induction hardened to provide a surface that includes martensite. Kurebayashi ¶¶ 23, 42. The Examiner further finds, without dispute, that induction hardening is an alternative to carburizing for case or surface hardening steel. Final Act. 7 (citing <https://web.archive.org/web/20100110234452/https://en.wikipedia.org/wiki/Case-hardening>, accessed September 6, 2018). Kurebayashi does not teach away from case hardening per se, but instead teaches away from carburizing or case hardening the entire drill rod including the central rod portion or stem part. Kurebayashi ¶¶ 10–11, 16. Indeed, Kurebayashi teaches that the central rod or stem portion requires both strength and toughness to prevent bending or breaking, whereas the threaded connectors require wear resistance and hardness to prevent wear. *Id.* ¶¶ 8–10. Kurebayashi, therefore, teaches providing a drill rod having a bainitic core and threaded connectors having an induction (case) hardened martensitic surface. *Id.* ¶¶ 20, 23. Thus, contrary to Appellant’s argument, the combination of Linden and Kurebayashi would have resulted in a drill rod having case hardened threaded connectors with martensitic surface zones and bainite core regions.

Appellant further argues that the Examiner erred in failing to account for the differences between Kurebayashi’s disclosed locations for the

bainitic and martensitic microstructural regions and Appellant's claimed positions for these regions. Appeal Br. 8. In particular, Appellant contends that Kurebayashi discloses these regions longitudinally along the drill rod, whereas the claims recite these regions in transverse cross-section at the threaded connectors. *Id.* at 8, 16–17.

This argument is not persuasive of reversible error because it relies on a mischaracterization of Kurebayashi's teaching. Kurebayashi teaches that stem part 16 and threaded parts 12, 14 of drill rod 10 are produced so as to have a core including bainite and martensite for both strength and toughness, but that the threaded parts are then subjected to induction or case hardening to produce a martensitic surface resulting in screw threads having the desired hardness and wear resistance. Kurebayashi ¶¶ 22–23, 42. Therefore, in transverse cross-section, Kurebayashi's case hardened, threaded connectors necessarily have a martensitic surface zone and a bainitic core region as required by claims 1 and 10. As such, we perceive no difference between the claimed and Kurebayashi's locations of the martensitic surface zones and bainitic core regions.

Accordingly, we sustain the Examiner's obviousness rejection of claims 1–10 over Linden in view of Kurebayashi.

#### CONCLUSION

Upon consideration of the record and for the reasons set forth above and in the Final Office Action and the Examiner's Answer, the Examiner's decision to reject claims 1–10 under 35 U.S.C. § 103 as unapertentable over Linden in view of Kurebayashi is *affirmed*.

DECISION SUMMARY

In summary:

<b>Claims Rejected</b>	<b>35 U.S.C. §</b>	<b>Reference(s)/Basis</b>	<b>Affirmed</b>	<b>Reversed</b>
1-10	103	Linden, Kurebayashi	1-10	

TIME PERIOD FOR RESPONSE

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