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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte THOMAS J. SMITH, THOMAS STONG,
ANDREA C. PAUL, and ALEXANDER S. COOPER

Appeal 2025-000819
Application 17/857,673
Technology Center 3700

Before LINDA E. HORNER, WILLIAM V. SAINDON, and MICHAEL L. WOODS, *Administrative Patent Judges.*

SAINDON, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant[1] appeals from the Examiner's decision to reject claims 1–7. *See* Final Rej. 1. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

[1] "Appellant" refers to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as Assignee Mahle International GmbH. App. Br. 1.

CLAIMED SUBJECT MATTER

The claims on appeal are directed to a method for manufacturing a piston ring. Claim 1, reproduced below, illustrates the claimed subject matter:

> 1. A method for manufacturing a piston ring, comprising:
>
> providing a piston ring base having an unchamfered face surface, and a gap between two gap surfaces of the ring;
>
> grit blasting the unchamfered face surface to create a roughened texture having an average surface roughness R_a of 1.02-1.99 μm and Rz 6.28 to 9.05 μm, with the roughened texture exhibiting peaks and valleys on the unchamfered face surface;
>
> depositing a coating on and over the roughened texture of the face surface via physical vapor deposition, wherein the coating is applied at a thickness of at least 10[ ]μm, and wherein the peaks and valleys of the roughened texture on the face surface telegraph through the coating and are visible on the deposited coating on the face surface; and
>
> lapping the coating to remove the peaks in the deposited coating on the face surface without penetrating the coating, so that the coated face surface contains plateaus from the removed peaks, and valleys telegraphing through the coating by the roughened texture from the grit blasting of the face surface.

App. Br. 14 (Claims Appendix).

REFERENCES

The Examiner relies on the following references to reject the claims:

Name	Reference	Date
Hite	US 5,605,741	Feb. 25, 1997
Herbst-Dederichs	US 8,857,820 B2	Oct. 14, 2014
He	US 2002/0081251 A1	June 27, 2002
Opel	US 2003/0064665 A1	Apr. 3, 2003
Saylor	US 2003/0134956 A1	July 17, 2003
Adam	US 2011/0268944 A1	Nov. 3, 2011
Thompson	US 2015/0111058 A1	Apr. 23, 2015

Banfield	US 2017/0102071 A1	Apr. 13, 2017
Ooya	EP 0 707 092 A1	Apr. 17, 1996
Schuetz	*Surface Texture from Ra to Rz*, Modern Machine Shop	Nov. 1, 2002

REJECTIONS

The Examiner maintains the following rejections:

Claim(s) Rejected	**35 U.S.C. §**	**Reference(s)/ Basis**
1, 5, 6	103	Herbst-Dederichs, Adam, Schuetz, Banfield
2	103	Herbst-Dederichs, Adam, Schuetz, Banfield, He, Ooya
3	103	Herbst-Dederichs, Adam, Schuetz, Banfield, He, Ooya, Opel
4	103	Herbst-Dederichs, Adam, Schuetz, Banfield, Thompson, Saylor
7	103	Herbst-Dederichs, Adam, Schuetz, Banfield, Hite

OPINION

Claim 1 is directed to a piston ring that is grit blasted to a particular average surface roughness, treated with a physical vapor deposition (PVD) coating, and then lapped to remove the peaks of the coating on the face surface. The Examiner rejects claim 1 in view of Herbst-Dederichs, which teaches a piston ring that is treated with a PVD coating, and then lapped. Final Rej. 2–4 (citing Herbst-Dederichs, 2:44–46, 2:50–52, 2:57–58). The Examiner asserts that Herbst-Dederichs is silent as to any grit-blast pre-treatment, but notes that it was known in the art to treat piston rings with grit blasting prior to applying a coating in order to improve adhesion, citing to Adam. *Id.* at 3 (citing Adam ¶¶ 45–47, 50). Further, the Examiner asserts that Herbst-Dederichs is not clear as to the degree of lapping, but notes that it was known in the art to lap piston ring coatings in the manner claimed in

order to reduce contact pressure, citing to Banfield. *Id.* at 3–4 (citing Banfield ¶ 49). Lastly, as to the particular average surface roughness achieved by the grit blast in Adam, when applied to the piston ring of Herbst-Dederichs, the Examiner notes that although Adam suggests a range of average surface roughness values using the Rz measurement similar to the claimed range, Adam does not give the roughness value using the R_a measurement. *Id.* at 3. However, the Examiner notes the two roughness values are known in the art to be related, citing Schuetz, such that knowing one value gives a person of ordinary skill in the art a good idea of what the other value would come out to be (as they are simply two different ways to describe the roughness of a given surface), and finds that Adam's R_a range would be generally expected to similarly overlap with the claimed range. *Id.*[2]

Appellant argues that a person of ordinary skill in the art would not look to the grit-blasting process of Adam when considering the piston ring of Herbst-Dederichs, because the coating in Adam is not a PVD coating. App. Br. 8–10. However, Adam discloses grit blasting to improve coating adhesion on a piston ring (Adam ¶¶ 45–46), and as the Examiner states, "one of ordinary skill would have reasonably expected success for roughening *regardless of the coating material*" later applied to the piston ring. Ans. 5 (emphasis added). We agree with the Examiner on this record, who further states that "[r]oughening a surface to enhance coating adhesion is hardly

[2] Surface roughness can be measured in various ways. The most common method in North America is R_a, which (generally speaking) averages the heights of the peaks and valleys, whereas the most common method in Europe is Rz, which focuses on the differences between the highest peaks and lowest valleys. Schuetz, 1.

new." *Id.* Appellant merely asserts that the coating applied in Adam is different from the one in Herbst-Dederichs (Reply Br. 2–3), but fails to explain why the generally understood principle of roughening a surface prior to coating in order to improve adhesion is inapplicable here. *See KSR Int'l Co. v. Teleflex, Inc*., 550 U.S. 398, 419 (2007) ("if 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").[3]

Appellant also argues that Herbst-Dederichs "teaches away" from a piston ring having the claimed surface roughness, citing its smoothed finish. App. Br. 6–7. However, as the Examiner explains, the surface smoothness values in Herbst-Dederichs are the *post*-treatment values (Ans. 3–4); the claimed smoothness values are instead *pre*-treatment values, for which the Examiner relies on Adam (Ans. 5). Appellant points to no disclosure of Herbst-Dederichs that teaches away from any particular pre-treatment surface roughness value. *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004) (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).

[3] For example, if the surface roughness considerations for coating adhesion were significantly different based on whether the coating to be applied was a resin/polymer (Adam) versus a PVD coating (Herbst-Dederichs), then Appellant should introduce evidence in support of such an assertion for the Examiner to consider, in the event of further prosecution. Applicant's present attorney argument "is not evidence and cannot rebut other admitted evidence." *Elbit Sys. of Am., LLC v. Thales Visionix, Inc.*, 881 F.3d 1354, 1359 (Fed. Cir. 2018) (internal quotation marks and citation omitted).

Reviewing the record before us, we credit the Examiner's position that it would have been obvious to use grit blasting, as taught in Adam, as a pre-treatment to the piston ring of Herbst-Dederichs, in order to improve coating adhesion.

Appellant also argues that the pre-treatment grit blasting in Adam does not teach the claimed R_a and Rz values. App. Br. 8–9. The Examiner had found that Adam teaches an Rz value in the range of 3–8 μm, significantly overlapping with the claimed Rz range of 6.28–9.05 μm. Final Rej. 3. This aspect of the rejection is unchallenged. The Examiner cites evidence explaining that a person of ordinary skill in the art would have understood that the corresponding R_a range of Adam would significantly overlap with the claimed R_a range of 1.02–1.99 μm.[4] *Id.*; *see also* Ans. 5. In particular, Schuetz teaches that, although there is not a precise mathematical conversion between the R_a and Rz forms of measuring surface roughness, a person of ordinary skill in the art would have *expected* the Rz measurement to be about 4 to 7 times larger than the R_a measurement. Schuetz, 2. Appellant tries to dismiss this relationship as a "rule[] of thumb" (App. Br. 8), but it is evidence regarding the knowledge of a person of ordinary skill in the art that supports the Examiner's finding, and is not contravened by any other evidence proffered by Appellant. Accordingly, we credit the Examiner's position that a person of ordinary skill in the art would have understood Adam's grit-blasting treatment to provide an average surface

[4] The Rz lower bound of 3 μm would convert to an Ra of 0.43–0.75 μm and the upper bound of 8 μm would convert to an Ra of 1.14–2 μm. The range of Ra values recited in claim 1 is 1.02–1.99 μm.

roughness of 3–8 μm when measuring using Rz, or 1.14–2 μm when measuring using R_a.

Appellant argues that "none of the prior art even mentions the base material roughness telegraphing through the applied coating." App. Br. 4 (emphasis removed). However, as the Examiner explains, "where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been established." Final Act. 4 (citing MPEP 2112.01); *see In re Best*, 562 F.2d 1252, 1255 (CCPA 1977). Here, in both the Examiner's proposed combination and independent claim 1, a PVD process is applied to a roughened surface. It is reasonable for the Examiner to conclude, therefore, that these structures would then be substantially identical, and Appellant offers no technical reason or evidence suggesting otherwise. *In re Spada*, 911 F.2d 705, 709 (Fed. Cir. 1990) ("When the PTO shows a sound basis for believing that the products of the applicant and the prior art are the same, the applicant has the burden of showing that they are not."). Accordingly, we credit the Examiner's position that a person of ordinary skill in the art would have understood that the piston ring of Herbst-Dederichs roughened as taught in Adam would have, after the PVD process, a surface of peaks and valleys that generally matches the shape of the pre-treatment surface of peaks and valleys.

The remainder of Appellant's arguments either argue the references in isolation, are not directed to the claimed subject matter or the rejection presented by the Examiner, or are not persuasive for reasons similar to those identified above. *See generally* App. Br.; Reply Br.

Regarding the rejection of claims 5 and 6, because Appellant only argues claim 1, the remaining claims fall with it. 37 C.F.R. § 41.37(c)(1)(iv). Further, Appellant relies on the same arguments presented for claim 1 as the basis for seeking reversal of the remaining obviousness rejections of claims 2–4, and 7. App. Br. 11–12. For the reasons provided above, we do not find these arguments persuasive.

CONCLUSION

The Examiner's decision to reject the claims is AFFIRMED.

DECISION SUMMARY

The following table summarizes our decision:

Claim(s) Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1, 5, 6	103	Herbst-Dederichs, Adam, Schuetz, Banfield	1, 5, 6	
2	103	Herbst-Dederichs, Adam, Schuetz, Banfield, He, Ooya	2	
3	103	Herbst-Dederichs, Adam, Schuetz, Banfield, He, Ooya, Opel	3	
4	103	Herbst-Dederichs, Adam, Schuetz, Banfield, Thompson, Saylor	4	
7	103	Herbst-Dederichs, Adam, Schuetz, Banfield, Hite	7	
Overall Outcome			1–7	

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