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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex Parte MATTHEW MICHAEL LEE

Appeal 2019-003923
Application 14/836,202
Technology Center 1700

Before MICHELLE N. ANKENBRAND, MONTÉ T. SQUIRE, and
AVELYN M. ROSS, *Administrative Patent Judges*.

ROSS, *Administrative Patent Judge*.

DECISION ON APPEAL¹

Appellant² appeals under 35 U.S.C. § 134(a) from a final rejection of claims 1–20. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

¹ In our Decision we refer to the Specification filed August 26, 2015, as amended, (“Spec.”), the Final Office Action appealed from dated June 13, 2018 (“Final”), the Appeal Brief filed November 6, 2018 (“Appeal Br.”), the Examiner’s Answer dated March 8, 2019 (“Ans.”), and the Reply Brief filed April 24, 2019 (“Reply Br.”).

² 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 Lam Research Corporation. Appeal Br. 3.

STATEMENT OF THE CASE

The subject matter on appeal relates to “substrate processing systems, and more particularly to edge seals used in substrate processing systems.” Spec. ¶ 2. “In some [substrate processing] systems, the substrate support includes an electrostatic chuck (ESC)” and “[t]he ESC may include an edge seal that protects adhesive bonding layers that are used to bond a heater plate to a ceramic top plate of the ESC.” *Id.* ¶¶ 4–5. “When left unprotected, the adhesive bonding layers are damaged and particle contamination occurs” and the electrostatic chuck can be permanently damaged. *Id.* Claim 1, reproduced below, is illustrative of the claimed subject matter:

1. An electrostatic chuck comprising:
 - an upper layer;
 - an intermediate layer;
 - a lower layer;
 - a first adhesive bonding layer arranged between the upper layer and the intermediate layer;
 - a second adhesive bonding layer arranged between the intermediate layer and the lower layer, wherein radially outer edges of the intermediate layer and the first and second adhesive bonding layers form an annular slot relative to the upper layer and the lower layer; and
 - an edge seal arranged in the annular slot, wherein the edge seal includes an annular body including a radially inner surface, a radially outer surface, a top surface and a bottom surface, and wherein the radially inner surface has a continuous convex curvature.

Appeal Br. 19 (Claims App.).

REJECTIONS

The Examiner maintains the following rejections:

- A. Claims 1–10 stand rejected under 35 U.S.C. § 103 as unpatentable over Liu³ as evidenced by Tuckness,⁴ and in view of Foster⁵ and Schaefer.⁶ Final Act. 2.
- B. Claims 11 and 13 stand rejected under 35 U.S.C. § 103 as unpatentable over Liu as evidenced by Tuckness, and in view of Foster. *Id.* at 5.
- C. Claims 12 and 14–20 stand rejected under 35 U.S.C. § 103 as unpatentable over Liu as evidenced by Tuckness, and in view of Foster, and further in view of Schaefer. *Id.* at 7.

Appellant seeks our review of Rejections A–C. *See generally*

Appeal Br. Appellant presents argument for claims 1 and 3, and does not argue any remaining claim separate from the arguments advanced in support of claims 1 and 3. *See id.* Therefore, consistent with the provisions of 37 C.F.R. § 41.37(c)(1)(iv) (2013), we limit our discussion to claims 1 and 3, and all other claims stand or fall together with the claim from which they depend.

³ Liu et al., US 2010/0027188 A1, published February 4, 2010 (“Liu”).

⁴ Tuckness et al., US 2010/0219592 A1, published September 2, 2010 (“Tuckness”).

⁵ Mike Foster, US 2014/0312570 A1, published October 23, 2014 (“Foster”).

⁶ Schaefer et al., US 2013/0097840 A1, published April 25, 2013 (“Schaefer”).

OPINION

We review the appealed rejections 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 evidence presented in this Appeal and each of Appellant’s arguments, we are not persuaded that Appellant identifies reversible error in the Examiner’s rejections. Thus, we affirm the Examiner’s rejections and do so based on the fact-finding and for the reasons expressed by the Examiner in the Final Office Action and the Answer. We add the following for emphasis.

Claim 1

The Examiner rejects claim 1, among others, as obvious over the combination of Liu (as evidenced by Tuckness) and in view of Foster and Schaefer. Final Act. 2. The Examiner finds that Liu teaches an electrostatic chuck that includes upper and lower layers with adhesive bonding in the layers. *Id.* The layers form an annular slot and an edge seal is positioned within the annular slot. *Id.* The Examiner finds that the edge seal includes an annular body, radially inner and outer surfaces, and top and bottom surfaces where the radially inner surface is convex, as Tuckness evidences. *Id.* The Examiner acknowledges that Liu does not expressly teach a sealing ring having a radially inner surface that has a continuous convex curvature or an intermediate adhesive layer between the top and bottom layers. *Id.* at 2–3. However, the Examiner finds “a change of shape is generally

considered to be within the skill of one of ordinary skill in the art,” and Liu explains alternative shapes may be used. *Id.* at 3. The Examiner further finds that Foster teaches a seal having an inner surface with continuous convex curvature. *Id.* The Examiner reasons that one skilled in the art would have had reason to “modify the inner surface of Liu to include a continuous convex curvature because Foster demonstrates this is an art recognized functional alternative for the same purpose of sealing to a surface and Liu has taught [that] the shape may be changed as needed.” *Id.* The Examiner also finds that Schaefer teaches an ESC with an intermediate adhesive layer that joins the top and bottom layers. *Id.* at 4. The Examiner reasons that one skilled in the art would have had motive to provide an additional layer of adhesive “because Schaefer teaches this as an alternative ESC structure for a top layer bonded to a lower layer which also allows for the inclusion of heater for temperature control.” *Id.*

Appellant disagrees with the Examiner’s interpretation of “convex” to include surfaces like those taught in Tuckness but, nevertheless, Appellant contends it amended its claim to clarify that the convex curvature is *continuous*. Appeal Br. 9–10. Appellant argues that Liu’s o-ring, which the Examiner identifies as evidence that Liu contemplates using different shapes, does not meet the additional limitations of the claimed edge ring required by claim 1. *Id.* at 10. In particular, Appellant asserts that an o-ring has “only a single surface” and Liu does not disclose use of an o-ring in combination with a beveled shape as shown in Figures 1B and D. *Id.* Appellant explains that the convex curvature is not “a design choice” but

rather has particular advantages including to reduce outward radial stress during compression and to resist deformation. *Id.* 10–11.

Appellant’s arguments regarding Liu and Tuckness, alone, are not persuasive of reversible error in the Examiner’s rejection. The Examiner relies on Liu to teach *nearly all* aspects of claim 1, but concedes that Liu does not *expressly* describe an inner surface having a continuous convex curvature. Final Act. 3. However, the Examiner finds that Liu suggests alternate possible surface shapes may be used. By way of example, Liu explains that “replaceable sidewall shield 12 is formed of a shape and material such that the elasticity of replaceable sidewall shield 12 secures it in place within indentation 10, thereby preventing slippage.” Liu ¶ 26; *see also id.* ¶ 33 (identifying both circular and rectangular shapes and explaining that the shape “is selected such that [the] replaceable sidewall shield . . . will substantially fill an indentation in an ESC . . . or will substantially cover the sidewall of the ESC.”). Therefore, the Examiner determines that changing the shape of inner surface to be a continuous convex curvature would have been within the ordinary skill level of one practicing in the relevant art. Final Act. 3.

We further determine that, in the absence of evidence regarding criticality or unexpected results associated with claimed continuous convex curvature, the record supports the Examiner’s findings. We recognize Appellant’s argument that the shape of the seal surface is “not simply a design choice,” but rather one that has numerous attributable advantages. Appeal Br. 10–11; Reply Br. 3. But, Appellant has not shown that the identified advantages produce unexpected results over the prior art.

Appellant also argues that Foster fails to disclose an edge seal like that recited in claim 1. Appeal Br. 12. Specifically, Appellant contends that “surface 146 that the Examiner suggests is the inner surface is actually the surface of backup ring 132 and is adjacent to the outer surface 150 of the sealing element 108.” *Id.* at 13. Therefore, Appellant “submits that Foster fails to disclose an edge seal that includes an annular body including a radially inner surface.” *Id.*

On this record, we do not find Appellant’s arguments persuasive of reversible error in the Examiner’s rejection. The Examiner clarifies that it is *outer surface 150* of Foster that corresponds to the *inner surface* having a continuous convex curvature. Ans. 12; *compare* Fig. 4 (identifying element 310 as “the radial inner surface”, i.e., the surface facing an inward direction) and Spec. ¶ 41 (“[t]he radially inner surface 310 faces in a radially inwardly direction”), *with* Foster, Figs. 1–10 (element 150, that is, the surface facing an inward direction). As the Examiner explains, it would have been obvious to modify the surface of Liu “because Foster demonstrates this is an art recognized functional alternative for the same purpose of sealing to a surface.” Final Act. 3; *see also* Foster ¶ 61 (explaining that “more curved or contoured . . . surfaces . . . allow for a greater mechanical engagement [as] compared to the more planar or less curved surfaces”). Appellant’s argument that the Examiner failed to identify a reason to modify Liu with Foster is unpersuasive because “[e]xpress suggestion to substitute one equivalent for another need not be present to render such substitution obvious.” *In re Fout*, 675 F.2d 297, 301 (CCPA 1982); *see also In re Mayne*, 104 F.3d 1339, 1340 (Fed. Cir. 1997) (“Because the applicants

merely substituted one element known in the art for a known equivalent, this court affirms [the rejection for obviousness].”). Further, Appellant does not challenge the Examiner’s findings regarding known alternative structures taught in Foster. We, therefore, adopt the Examiner’s finding as fact. *Cf. In re Kunzmann*, 326 F.2d 424, 425 n.3 (CCPA 1964) (a finding Appellant fails to show is erroneous may be accepted as fact).

Accordingly, we sustain the Examiner’s rejection of claim 1.

Claim 3

Claim 3 depends from claim 1 and additionally requires

the radially outer surface of the body is generally planar between a first corner between the top surface and the radially outer surface and a second corner between the bottom surface and the radially outer surface;

the top surface of the body is generally planar between a third corner between the top surface and the radially inner surface and the first corner between the top surface and the radially outer surface;

the bottom surface of the body is generally planar between a fourth corner between the bottom surface and the radially inner surface and the second corner between the bottom surface and the radially outer surface; and

the radially inner surface of the body has the continuous convex curvature between the third corner between the top surface and the radially inner surface and the fourth corner between the bottom surface and the radially inner surface.

Appeal Br. 20 (Claims App.).

In addition to the findings above with respect to claim 1, the Examiner further finds that “Liu teaches the top surface and bottom surfaces are generally planar . . . and the combination as applied teaches the radially inner surface is convex from the third corner to the fourth corner where the

convex surface meets the top and bottom surfaces respectively.” Final Act. 4 (referring to Liu Figs. 1B and 1D, element 12; Foster Fig. 8).

Appellant argues that Liu, teaching use of an o-ring, describes “only a single continuous curved surface” and not a generally planar outer surface, top surface, and bottom surface. Appeal Br. 15–16. Appellant further contends that surface 150 of Foster “is an outer surface not an inner surface.” *Id.* at 16. Therefore, Appellant contends neither reference describes the seal assembly of claim 3.

Appellant’s contentions are not persuasive if reversible error in the Examiner’s rejection. Appellant’s argument that the neither Liu nor Foster independently suggests a seal having a continuous convex inner surface, and planar top, bottom, and outer surfaces is an attack on the references individually and not in *combination* as the Examiner has presented. *In re Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986). “[T]he test [for obviousness] is what the combined teachings of the references would have suggested to those [having] ordinary skill in the art.” *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). As the Examiner finds, both Liu and Foster teach a seal having planar top, bottom, and outside surfaces. Final Act. 4; *see also* Liu Figs. 1B, 1D (same); Foster Fig. 8 (same). The Examiner also finds that Liu describes an o-ring cross section, i.e., a seal that would have a continuous convex curvature, and Foster depicts sealing surface 150 having a continuous convex curvature. Final Act. 3–4. And, in light of both Liu’s (Liu ¶ 26) and Foster’s (Foster ¶ 61, Figs. 1–10) teachings that the shape of the seal assembly can be adjusted to maintain a functioning seal, we determine that the record adequately supports the Examiner’s findings.

Appellant’s argument that surface 150 of Foster refers to an “outer surface” as opposed to an inner surface is similarly unpersuasive. As noted above, each of Foster’s surface 150 and the claimed inner surface faces inwardly regardless of the label Foster provides. *Compare* Fig. 4 (identifying element 310 as “the radial inner surface”, i.e., the surface facing an inward direction) and Spec. ¶ 41 (“[t]he radially inner surface 310 faces in a radially inwardly direction”), *with* Foster, Figs. 1–10 (element 150, that is, the surface facing an inward direction). Further, we agree with the Examiner’s finding that Foster is applicable “because it is teaching the surface to seal another surface” may have different shapes, including a convex surface. Ans. 12.

Accordingly, we sustain the Examiner’s rejection of claim 3.

CONCLUSION

Appellant failed to identify a reversible error in the Examiner’s rejection of claims 1–10 under 35 U.S.C. § 103 as unpatentable over Liu as evidenced by Tuckness and in view of Foster and Schaefer.

Appellant failed to identify a reversible error in the Examiner’s rejection of claims 11 and 13 under 35 U.S.C. § 103 as unpatentable over Liu as evidenced by Tuckness, and in view of Foster.

Appellant failed to identify a reversible error in the Examiner’s rejection of claims 12 and 14–20 under 35 U.S.C. § 103 as unpatentable over Liu as evidenced by Tuckness, and in view of Foster and further in view of Schaefer.

DECISION

For the above reasons, the Examiner's rejection of claims 1–20 is affirmed as summarized below.

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1–10	103	Liu, Tuckness, Foster, Schaefer	1–10	
11, 13	103	Liu, Tuckness, Foster	11, 13	
12, 14–20	103	Liu, Tuckness, Foster, Schaefer	12, 14–20	
Overall Outcome			1–20	

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).

AFFIRMED