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| Riverside Law LLP/Universal Display Corporation<br>Glenhardie Corporate, Center Glenhardie Two<br>1285 Drummers Lane, Suite 202<br>Wayne, PA 19087 |             |                      | LUND, JEFFRIE ROBERT |                  |
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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* STEPHEN FORREST  
and RICHARD LUNT

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Appeal 2019-003567  
Application 12/974,070  
Technology Center 1700

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Before GEORGE C. BEST, ELIZABETH M. ROESEL, and  
MICHAEL G. McMANUS, *Administrative Patent Judges*.

BEST, Administrative Patent Judge.

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellant<sup>1</sup> appeals from the Examiner's decision to reject claims 1, 2, 6–19, 21–24, 26–28, 31, and 32 of Application 12/974,070. Final Act. (January 25, 2018). We have jurisdiction under 35 U.S.C. § 6.

For the reasons set forth below, we *affirm*.

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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 Regents of the University of Michigan and the Trustees of Princeton University as the real parties in interest. Appeal Br. 3.

## I. BACKGROUND

The '070 Application describes systems and methods for the deposition of materials on substrate using organic vapor jet deposition. Spec. ¶ 3. These systems and methods are useful for manufacturing organic light emitting devices (OLEDs). *Id.* OLEDs are useful in applications such as flat panel displays, illumination, and back lighting. *Id.* ¶ 6.

In particular, the systems described in the '070 Application's Specification are used for organic vapor jet deposition (OVJD). *Id.* ¶ 11. In these systems, an exhaust is present between adjacent nozzles. *Id.* According to Appellant, "[i]t is believed that the exhaust reduces pressure in the region of the nozzle openings and between the nozzles and substrate, leading to improved resolution and deposition profiles." *Id.*

Claim 1 is representative of the '070 Application's claims and is reproduced below from the Claims Appendix of the Appeal Brief.

1. A system comprising:

a substrate;

a plurality of nozzles each having an outlet disposed over the substrate, each of the plurality of nozzles in fluid communication with:

a source of organic material to be deposited on the substrate; and

a source of non-reactive carrier gas adapted to carry the organic material through the nozzle to the substrate; and

an exhaust having an inlet disposed adjacent to a first nozzle of the plurality of nozzles and to a second nozzle of the plurality of nozzles;

wherein the substrate is separated from the outlets of the plurality of nozzles by less than 100 microns;

wherein the inlet of the exhaust is separated from the substrate by a distance that is greater than a distance between the first and second nozzle outlets and the substrate;

wherein the system is configured to deposit the same organic material from the first nozzle and the second nozzle;

wherein the exhaust is configured to create an adjustable, localized vacuum between the first nozzle and the second nozzle; and

wherein the exhaust is in fluid communication with an independent vacuum source.

Appeal Br. 17 (some indentation added).

## II. REJECTIONS

On appeal, the Examiner maintains the following rejections:

1. Claims 1, 2, 6–13, 15–19, 21–24, 26–28, 31, and 32 are rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Kurokawa,<sup>2</sup> Shtein,<sup>3</sup> Lindner,<sup>4</sup> and Gianoulakis.<sup>5</sup> Final Act. 3.
2. Claim 14 is rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Kurokawa, Shtein, Lindner, Gianoulakis, and McLeod.<sup>6</sup> Final Act. 9.
3. Claims 1, 2, 6–13, 15–19, 21–24, 26–28, 31, and 32 are rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Gianoulakis, Shtein, and Lindner. Final Act. 9–10.

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<sup>2</sup> JP 2004 103630, published April 2, 2004.

<sup>3</sup> US 2008/0233287 A1, published September 25, 2008.

<sup>4</sup> US 5,122,394, issued June 16, 1992.

<sup>5</sup> US 2006/0234514 A1, published October 19, 2006.

<sup>6</sup> US 6,808,741 B1, issued October 26, 2004.

4. Claim 14 is rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Gianoulakis, Shtein, Lindner, and McLeod.  
Final Act. 14.

### III. DISCUSSION

*A. Rejection of claims 1, 2, 6–13, 15–19, 21–24, 26–28, 31, and 32 as unpatentable over the combination of Kurokawa, Shtein, Lindner, and Gianoulakis*

Appellant argues that this rejection should be reversed based upon the Examiner's failure to establish the prima facie obviousness of independent claims 1 and 23. Appeal Br. 14. Dependent claims 2, 6–13, 15–19, 21, 22, 24, 26–28, 31, and 32 are alleged to be patentable based upon their dependence from claims 1 and 23. *Id.* We, therefore, limit our discussion to independent claims 1 and 23.

In rejecting claims 1 and 23 as unpatentable over the combination of Kurokawa, Shtein, Lindner, and Gianoulakis, the Examiner found that Kurokawa describes a system comprising a shower head having a plurality of nozzles disposed over a substrate and having an exhaust inlet disposed adjacent to a first nozzle and a second nozzle of the plurality of nozzles. Final Act. 3. The Examiner also found that Shtein describes the use of a nozzle to carry out deposition in a pattern of organic material on a substrate. *Id.* at 4 (citing Shtein Figs. 6, 9, 10; ¶¶ 14, 56, 67, 79). The Examiner further found that

[t]he motivation for supplying a source of organic material to be deposited on the substrate and a non-reactive carrier gas . . . to carry the organic material through the nozzle of Kurokawa et al[.] is to enable the apparatus of Kurokawa et al[.] to deposit an organic material on the substrate as taught by Shtein et al.

The motivation for placing the substrate of Kurokawa et al[.] less [than] the 100 [ $\mu\text{m}$ ] from the nozzle is to reduce the diffusion of the organic matter and improve the pixel edge sharpness as taught by Shtein et al[.] (paragraph 0056).

*Id.* at 5.

Appellant argues that the Examiner has not established the prima facie obviousness of claims 1 and 23 because (1) the Examiner erred by finding that a person having ordinary skill in the art at the time of the invention would have been motivated to use Kurokawa's shower head in Shtein's organic vapor deposition process because Kurokawa has little technical relevance to organic vapor deposition, (2) the Examiner erred by considering claims 1 and 23 on an element by element basis, (3) a person having ordinary skill in the art at the time of the invention would not have had a reasonable expectation that Kurokawa's shower head nozzles could be used successfully in Shtein's organic vapor deposition process to provide a pattern of separate elements, and (4) "Appellant demonstrates improved deposition of organic material into patterned separate elements . . . over a similar nozzle design of Shtein/Forrest having no exhaust features." App. Br. 11–14.

We address these arguments in turn. For the reasons set forth below, we affirm the rejection of claims 1, 2, 6–13, 15–19, 21–24, 26–28, 31, and 32 over the combination of Kurokawa, Shtein, Lindner, and Gianoulakis.

1. No motivation to combine

Appellant argues that a person of ordinary skill in the art would not have combined Kurokawa with Shtein because Kurokawa's apparatus is used to oxidize a substrate rather than deposit organic materials on the substrate. Appeal Br. 11–12. According to Appellant, the rejection

mistakenly equates Kurokawa's oxide film formation process with Shtein's organic vapor deposition, but does not point to any teaching in the art that a person of skill would have recognized the equivalence of these two deposition processes. *Id.* at 12. In other words, Appellant is arguing that Kurokawa is non-analogous art to the claimed invention.

We are not persuaded by this argument because Kurokawa is in the inventor's field of endeavor.

To rely upon a reference as a basis for an obviousness rejection, the reference must either (1) be in the field of the inventor's endeavor or (2) be reasonably pertinent to the particular problem with which the inventor was concerned. *In re Oetiker*, 977 F.2d 1443, 1447 (Fed. Cir. 1992). The scope of analogous art is to be construed broadly. *Wyers v. Master Lock Co.*, 616 F.3d 1231, 1238 (Fed. Cir. 2010).

The inventor's field of endeavor is determined by considering the explanations of the invention's subject matter in the patent application, "including the embodiments, function, and structure of the claimed invention." *In re Bigio*, 381 F.3d 1320, 1326 (Fed. Cir. 2004); *see also In re Mettke*, 570 F.3d 1356, 1359 (Fed. Cir. 2009) (relying on specification to determine applicant's field of endeavor).

The '070 Application's Specification states that the invention "relates to systems and methods for deposition of materials onto substrates utilizing organic vapor jet deposition." Spec. ¶ 3. Vapor jet deposition is one of a plethora of related techniques for transforming a substrate either via reaction of a gas phase entity with the substrate or by deposition of a material from the gas phase onto the substrate. Before the substrate is subjected to a deposition process, it is cleaned. For example, ozone can be used to oxidize surface impurities. *See, e.g., Surface Preparation for Film and Coating*

*Deposition Processes, in Handbook of Deposition Technologies for Films and Coatings: Science, Applications and Technology* 103 (Peter M Martin, ed., 2010).

As Appellant states, Kurokawa is concerned with uniform application of ozone across a substrate surface. Appeal Br. 10. Kurokawa, therefore, addresses a subject that would be of concern to a person of ordinary skill in the art working in the field of OVJD. Thus, Kurokawa is within the inventors' field of endeavor.

We do not reverse the rejection of claims 1 and 23 on this basis.

2. Failure to consider claims as a whole

Appellant argues that the Examiner erred by failing to consider the claims as a whole and by analyzing the claims on an element-by-element basis. Appeal Br. 12–13. In particular, Appellant argues that the Examiner relied upon Appellant's own teachings to arrive at the combination of prior art used in the rejection. *Id.* at 13.

This argument is not persuasive. The Examiner divides each claim into individual elements for the purpose of explaining where the prior art describes or suggests each claim element. At the end of the process, the Examiner has found that each claim element is described or suggested by the prior art. Thus, there are no differences between the prior art and the subject matter of the claim as a whole.

To protect against the improper use of hindsight, the Examiner is required to explain why a person having ordinary skill in the art at the time of the invention would have had reason to combine the prior art's teachings in the manner proposed by the Examiner. *In re Rouffet*, 149 F.3d 1350, 1358 (Fed. Cir. 1998) (inferring "hindsight" when the specific understanding or

principal within the knowledge of one of ordinary skill in the art leading to modification of prior art to arrive at appellant's claimed invention has not been explained).

In this case, the Examiner stated that a person of ordinary skill in the art would have combined Kurokawa and Shtein to use Shtein's techniques for depositing organic molecules in a pattern via Kurokawa's apparatus. Final Act. 5.

In short, Appellant has not demonstrated that the Examiner improperly relied upon hindsight to formulate this rejection of claims 1 and 23. Thus, we do not reverse the rejection on this basis.

3. No reasonable expectation of success

Appellant argues that the rejection should be reversed because a person having ordinary skill in the art at the time of the invention would not have had a reasonable expectation of success in using Kurokawa's nozzle in Shtein's organic vapor deposition process. Appeal Br. 13–14.

We are not persuaded by this argument. In rejecting claims 1 and 23, the Examiner relies upon Kurokawa to describe the structure of the nozzle/exhaust assembly and upon Shtein to describe the deposition of organic materials through the nozzle assembly and the relative positioning of the nozzle assembly and the substrate. Final Act. 3–4. In particular, Shtein teaches that if the nozzle is separated from the substrate by only a few microns, the organic material can be deposited in a pattern. Answer 19–21. Appellant has not explained why a person of ordinary skill in the art at the time of the invention would not have had a reasonable expectation that Shtein's teaching regarding the effect of spacing between the nozzle and the

substrate would not have applied to organic vapor jet deposition using Kurokawa's nozzle/exhaust apparatus.

Thus, we do not reverse the rejection of claims 1 and 23 on this basis.

#### 4. Improved results

Appellant argues that the subject matter of claims 1 and 23 is patentable because Appellant has demonstrated improved deposition of organic material into patterned separate elements over Shtein's similar nozzle design without exhaust features. Appeal Br. 14 (citing Spec. Fig. 15, ¶ 79).

This is not a sufficient basis for us to reverse the rejection of claims 1 and 23. An apparatus may represent an improvement over the prior art, but evidence of the improved performance is only relevant to the question of patentability if that improved performance is shown to be unexpected. As the Federal Circuit's predecessor stated:

[F]or a showing of "unexpected results" to be probative evidence of non-obviousness, it falls upon the applicant to at least establish: (1) that there actually is a difference between the results obtained through the claimed invention and those of the prior art, *In re Klosak*, 455 F.2d 1077, 59 CCPA 862 (1972); and (2) that the difference actually obtained would not have been expected by one skilled in the art at the time of invention, *Id.*; *In re D'Ancicco*, 439 F.2d 1244, 58 CCPA 1057 (1971).

*In re Freeman*, 474 F.2d 1318, 1324 (CCPA 1973) (italics added).

In this case, Appellant does not present attorney argument, let alone actual evidence, that the allegedly improved results would have been unexpected by a person of ordinary skill in the art at the time of the invention. *See* Appeal Br. 14.

Thus, we do not reverse the rejection of claims 1 and 23 on this basis.

*B. Rejection of claim 14 as unpatentable over the combination Kurokawa, Shtein, Lindner, Gianoulakis, and McLeod*

Appellant argues that claim 14 is patentable because it depends from claim 1 and McLeod fails to cure the alleged deficiencies in the combination of Kurokawa, Shtein, Lindner, and Gianoulakis. Appeal Br. 14–15.

For the reasons discussed in § III(A), we have affirmed the rejection of claim 1 as obvious over the combination of Kurokawa, Shtein, Lindner, and Gianoulakis. We, therefore, also affirm the rejection of claim 14 over the combination of Kurokawa, Shtein, Lindner, Gianoulakis, and McLeod.

*C. Rejection of claims 1, 2, 6–13, 15–19, 21–24, 26–28, 31, and 32 as unpatentable over Gianoulakis, Shtein, and Lindner*

Appellant argues that this rejection should be reversed based upon the Examiner’s failure to establish the *prima facie* obviousness of independent claims 1 and 23. Appeal Br. 14. Dependent claims 2, 6–13, 15–19, 21, 22, 24, 26–28, 31, and 32 are alleged to be patentable based upon their dependence from claims 1 and 23. *Id.* We, therefore, limit our discussion to independent claims 1 and 23.

With respect to independent claims 1 and 23, Appellant’s complete argument is reproduced below:

For the same reasons as outlined above with respect to claims 1 and 23 and the summarized teachings of Kurokawa, Shtein, Lind[n]er, and Gianoulakis, Appellant respectfully submits that Gianoulakis, Shtein, and Lind[n]er fail to establish a *prima facie* case for obviousness.

For at least the reasons set forth above, Appellant submits that claims 1 and 23 are not obvious over Gianoulakis, Shtein, and Lind[n]er. Claims 2, 6–13, 15–19, 21–22, 24, 26–28, 31 and 32 all depend directly or indirectly from claims 1 and 23, and are therefore not obvious over Gianoulakis, Shtein, and Lind[n]er at least for the reasons set forth above for claims

1 and 23. Appellant therefore respectfully requests that the rejection under section 103(a) be withdrawn.

Appeal Br. 15.

As we discussed in § III(A), Appellant argues that the rejection of independent claims 1 and 23 as unpatentable over the combination of Kurokawa, Shtein, Lindner, and Gianoulakis should be reversed for four reasons.

The first of those reasons is particular to the combination of Kurokawa and Shtein. Thus, it is not relevant to the rejection over the combination of Gianoulakis, Shtein, and Lindner.

The remaining three arguments—failure to consider the claims as a whole, no reasonable expectation of success, and improved results—were not persuasive with respect to the rejection over Kurokawa, Shtein, Lindner, and Gianoulakis. Nor are they persuasive with respect to this rejection.

We, therefore, affirm the rejection of claims 1, 2, 6–13, 15–19, 21–24, 26–28, 31, and 32 as unpatentable over the combination of Gianoulakis, Shtein, and Lindner.

*D. Rejection of claim 14 as unpatentable over the combination of Gianoulakis, Shtein, Lindner, and McLeod*

Appellant argues claim 14, which depends from claim 1, is allowable over the combination of Gianoulakis, Shtein, Lindner, and McLeod for the same reasons provided for claim 1. Appeal Br. 15.

For the reasons set forth above, we have affirmed the rejection of claim 1 as unpatentable over the combination of Gianoulakis, Shtein, and Lindner. Thus, we are not persuaded by Appellant's arguments with respect to claim 14. We, therefore, affirm the rejection of claim 14 as unpatentable over the combination of Gianoulakis, Shtein, Lindner, and McLeod.

IV. CONCLUSION

In summary:

| Claims Rejected                         | 35 U.S.C. § | Reference(s)/Basis                             | Affirmed                                | Reversed |
|---|-------------|--|---|----------|
| 1, 2, 6-13, 15-19, 21-24, 26-28, 31, 32 | 103(a)      | Kurokawa, Shtein, Lindner, Gianoulakis         | 1, 2, 6-13, 15-19, 21-24, 26-28, 31, 32 |          |
| 14                                      | 103(a)      | Kurokawa, Shtein, Lindner, Gianoulakis, McLeod | 14                                      |          |
| 1, 2, 6-13, 15-19, 21-24, 26-28, 31, 32 | 103(a)      | Gianoulakis, Shtein, Lindner,                  | 1, 2, 6-13, 15-19, 21-24, 26-28, 31, 32 |          |
| 14                                      | 103(a)      | Gianoulakis, Shtein, Lindner, McLeod           | 14                                      |          |
| <b>Overall Outcome</b>                  |             |  | 1, 2, 6-19, 21-24, 26-28, 31, 32        |          |

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

AFFIRMED