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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte ALLAN RONNE, MICHAEL TSENG, and HENRY WANG

Appeal 2019-006631
Application 14/984,178
Technology Center 3700

Before STEFAN STAICOVICI, JEREMY M. PLENZLER, and
SUSAN L. C. MITCHELL, *Administrative Patent Judges*.

PLENZLER, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant¹ appeals from the Examiner's decision to reject claims 1, 2, and 9–11. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

¹ We use the word Appellant to refer to “applicant” as defined in 37 C.F.R. § 1.42(a). Appellant identifies the real party in interest as Lam Research Corporation. Appeal Br. 3.

CLAIMED SUBJECT MATTER

The claims are directed to a thermal management system. Claim 1, reproduced below, is illustrative of the claimed subject matter:

1. A thermal management system for a substrate processing tool located in a fabrication room, the thermal management system comprising:

a plurality of blowers, wherein each of the plurality of blowers is configured to draw air from the fabrication room and cause the air to flow through a respective one of a plurality of process modules of the substrate processing tool, wherein each of the plurality of process modules is in fluid communication with a different one of the plurality of blowers, and wherein heat is transferred from the plurality of process modules to the air and the air is exhausted from the plurality of process modules; and

a plurality of heat exchangers, wherein each of the plurality of heat exchangers is connected to a respective one of the plurality of blowers and is configured to receive the air exhausted from a respective one of the plurality of process modules via the respective one of the plurality of blowers, cool the air, and provide the cooled air to at least one of the fabrication room, a subfloor of the fabrication room, and the respective one of the plurality of process modules, and wherein each of the plurality of process modules is in fluid communication with a different one of the plurality of heat exchangers.

REFERENCES

The prior art relied upon by the Examiner is:

Name	Reference	Date
Semba	US 6,338,474 B1	Jan. 15, 2002
Yamazaki	US 7,118,780 B2	Oct. 10, 2006
Ho	US 2007/0295012 A1	Dec. 27, 2007

REJECTIONS

Claims 1, 2, and 9–11 are rejected under 35 U.S.C. § 112(b) as being indefinite.

Claims 1, 2, and 9–11 are rejected under 35 U.S.C. § 103 as being unpatentable over Semba, Ho, and Yamazaki.

OPINION

Indefiniteness

The Examiner explains that claim 1's

“fabrication room” and “substrate processing tool” elements are recited in the preamble, and the title of the invention is given as a “thermal management system for a substrate processing tool located in a fabrication room”, implying that these elements are not intended to form part of the scope of the claim; subsequent recitations regarding blowers that draw air “from the fabrication room”, heat exchangers that receive air from “the process module” of the substrate processing tool imply that the processing tool and fabrication room are part of the claim scope.

Final Act. 2–3. The Examiner explains that “[f]or the purposes of comparison with the prior art, it will be assumed that claim 1 is drawn to the combination of a fabrication room, provided with a substrate processing tool and a thermal management system comprising a blower and heat exchanger.” *Id.* at 3.

Appellant disagrees that the claim requires a fabrication room and a substrate processing tool, but contends that “other claim limitations (e.g. the blowers and heat exchangers) are defined and limited based on their respective relationship to the fabrication room and the substrate processing tool.” Appeal Br. 7. The “process modules” recited in the claim are part of

the “substrate processing tool.” Accordingly, because Appellant contends that the “substrate processing tool” is not required by the claim, the “process modules,” also, are not required according to Appellant.

A claim is properly rejected as indefinite if, after applying the broadest reasonable interpretation in light of the Specification, the metes and bounds of a claim are not clear because the claim contains words or phrases whose meaning is unclear. *In re Packard*, 751 F.3d 1307, 1310 (Fed. Cir. 2014) (per curiam); *see also Ex parte McAward*, Appeal No. 2015-006416, 2017 WL 3669566, at *5 (PTAB Aug. 25, 2017) (precedential) (adopting the approach for assessing indefiniteness approved by the Federal Circuit in *Packard*).

Notably, Appellant does not adequately explain specifically what limits are imposed on the blowers and heat exchangers by their respective relationships with the fabrication room and the substrate processing tool or process modules, or what structure is required by the claim phrases “each of the plurality of process modules [being] in fluid communication with a different one of the plurality of blowers” and “each of the plurality of process modules [being] in fluid communication with a different one of the plurality of heat exchangers.” Nor does Appellant offer any explanation as to what specific structure makes “each of the plurality of blowers . . . configured to draw air from the fabrication room and cause the air to flow through a respective one of a plurality of process modules of the substrate processing tool,” as recited in claim 1. Appellant also fails to explain what

each of the plurality of heat exchangers . . . configured to receive the air exhausted from a respective one of the plurality of process modules . . . and provide the cooled air to at least one

of the fabrication room, a subfloor of the fabrication room, and the respective . . . process module[]

adds to the structure of claim 1 beyond the general structure of a heat exchanger.

Also, our review of the Specification does not provide any more clarity as to what additional structure is required for the “blowers” and “heat exchangers” by their respective relationship to the “fabrication room” or the “process modules of the substrate processing tool” recited in claim 1. Rather, the Specification references blowers 224 and heat exchangers 228, which Appellant maps to the recited “blowers” and “heat exchangers” (Appeal Br. 5), without describing any particular structure associated with those elements and depicting only generic schematic illustrations of those elements. *See* Spec. ¶¶ 28–32.² The “process modules,” too, lack any meaningful description in the Specification. Blowers 224 and heat exchangers 226 are connected to respective process modules 208 via conduits 120. *See* Spec. ¶ 28. Those conduits are not recited in the claim. As is clear from the above discussion, there is no structure associated with blowers 224 or heat exchangers 226 in the Specification, other than that associated with a generic blower or a generic heat exchanger.

We agree with the Examiner that the scope of claim 1 is unclear concerning whether the terms “fabrication room” and “substrate processing tool” are limiting. Although Appellant alleges that “the blowers and heat exchangers[] are defined and limited based on their respective relationship to the fabrication room and the substrate processing tool in claim 1” (Appeal

² Our references to the Specification are to the Substitute Specification submitted on January 25, 2016.

Br. 7), the claim is unclear as to any specific structure required by those relationships that would limit the scope of generic blowers or heat exchangers. As noted above, Appellant, too, fails to articulate any particular additional structure required by those relationships. Appellant has the opportunity to resolve ambiguities during prosecution. *See, e.g., McAward*, at *6–7.

For at least the reasons set forth above, we are not apprised of error in the Examiner’s decision to reject claims 1, 2, and 9–11 as indefinite.

Obviousness

The Examiner finds that Semba teaches the limitations recited in claim 1, but for a single fan (blower) and a single heat exchanger, rather than a “plurality of blowers” and a “plurality of heat exchangers” as recited in claim 1. Final Act. 3–4. Appellant does not dispute the Examiner’s findings related to Semba. *See* Appeal Br. 9–10 (asserting that Semba does not teach a plurality of blowers or a plurality of heat exchangers, but acknowledging that the Examiner’s rejection does not rely on such teachings).

With respect to the “plurality of blowers” recited in claim 1, the Examiner finds that “it is known in the art as shown by Ho . . . that a recirculating air conditioning system for fabricating semiconductor devices can be provided with dedicated flow paths and fluid moving devices associated with each individual processing module (see fans 210, 212 of Ho et al.)” Final Act. 3. The Examiner additionally finds that “[t]his is explicitly disclosed (see paragraph [0035] of Ho et al.) as an obvious alternative to using a single fan and splitting the flow to direct it to separate modules/chambers as in Semba (Fig. 11).” *Id.* The Examiner reasons that “[i]n view of this, it would have been obvious at the time of filing of the

instant application for one of ordinary skill in the art to have done the same in Semba, providing multiple fans for supplying controlled conditioned air to plural processing modules 2, 3, 4.” *Id.*

Appellant responds that “Ho fails to disclose a plurality of blowers and heat exchangers configured to draw and cool air in the manner recited in claim 1.” Appeal Br. 11. Initially, we note that the Examiner does not rely on Ho teaching a plurality of heat exchangers as recited in claim 1.

Appellant does not address the Examiner’s finding that Ho teaches a plurality of fans. Rather, Appellant contends that “Ho is explicitly directed to a system that expressly does not use ambient air and instead uses a dedicated fluid such as nitrogen.” *Id.* at 12. Without persuasive explanation, Appellant alleges that Ho’s use of nitrogen somehow disqualifies its teaching of multiple fans from being relevant to Semba’s system. *See, e.g., id.* (“[O]ne skilled in the art presented with Semba would not be motivated to modify the single blower and heat exchanger system of Semba in view of the teachings of Ho, which is directed to using nitrogen instead of ambient air.”).

Appellant further contends that “the Examiner has fail[ed] to identify any purported motivation . . . to modify the system of Semba, which is directed to recirculating clean room air, with the teachings of Ho, which is specifically directed to using nitrogen gas in a closed system and teaches away from using ambient air.” Appeal Br. 13. Appellant concludes that “the combination of Semba and Ho at best relies upon impermissible hindsight reasoning to make up for the absence of evidence for actual motivation for one skilled in the art.” *Id.* at 14.

Appellant's contentions are not persuasive. Paragraph 35 of Ho explains that "it is not necessary to have one blower for each module or chamber, as a single blower, for example, could be used to provide a flow that is subsequently bifurcated and directed to separate modules and/or chambers." Regardless of whether Ho utilizes nitrogen as its cooling fluid, there is no dispute that it teaches use of a blower for each module (multiple blowers) as an alternative to a single blower used for multiple modules. This, itself, is sufficient basis for the Examiner's proposed modification, which is simply using individual blowers for each module instead of a single blower in Semba's system. Ho provides an express teaching of modifying a single blower system to include individual blowers for modules. Appellant's argument that Ho utilizes nitrogen as its cooling fluid represents an individual attack on Ho, whereas the rejection is based on a combination of Semba and Ho. Moreover, obviousness does not require that all of the features of Ho, i.e., nitrogen cooling fluid, be bodily incorporated into the Semba. *See In re Keller*, 642 F.2d 413, 425 (CCPA 1981).

As for the "plurality of heat exchangers" recited in claim 1, the Examiner finds that "it is known in the art as shown by Yamazaki . . . (see Fig. 3) that plural heat exchanger devices can be provided which either correspond to a single processing module, or are shared by multiple processing modules (see discussion in bridging paragraph of columns 9-10 of Yamazaki." Final Act. 4. The Examiner finds that this "discussion [from Yamazaki] implies that having individual exchangers allows for treatment at different desired temperatures to be accomplished easily." *Id.* The Examiner reasons that "[i]n view of this, it would have been obvious . . . to replace the single shared refrigerator /heat exchanger of Semba with

individual exchangers associated with each of the plurality of processing modules if the desired operating temperatures varied from one module to another.” *Id.*

Appellant responds that “the cited portions of Yamazaki at best only discloses a plurality of heat exchangers configured to heat and circulate gas within processing chambers, not a plurality of heat exchangers in fluid communication with different ones of a plurality of processing modules and configured to cool fabrication room air and provide the cooled air in the manner recited in claim 1.” Appeal Br. 14.

Appellant’s contention is not persuasive. The portion of Yamazaki cited by the Examiner explains that “[i]t is not necessary to have a one-to-one correspondence between heat exchangers and the reaction chambers, and therefore a heat exchanger 1205 may correspond to the reaction chambers 1201 and 1202, and a heat exchanger 1206 may correspond to the reaction chambers 1203 and 1204.” Yamazaki 9:61–66. Yamazaki goes on to explain that “[t]his type of structure is possible if the performance of heat treatment at the same temperature in the plurality of reaction chambers is taken as a prerequisite.” *Id.* 9:66–10:1. That is, Yamazaki expressly teaches using multiple heat exchangers in a system where different regions may have different cooling requirements. Yamazaki’s discussion of reaction chambers, rather than using the similar terminology, “process modules,” does not diminish this express teaching.

For at least these reasons, we are not apprised of Examiner error in the rejection of claim 1.³ Appellant does not present separate arguments for claims 2 and 9–11.

CONCLUSION

The Examiner’s rejections are affirmed.

DECISION SUMMARY

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1, 2, 9–11	112(b)	Indefiniteness	1, 2, 9–11	
1, 2, 9–11	103	Semba, Ho, Yamazaki	1, 2, 9–11	
Overall Outcome			1, 2, 9–11	

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

³ Moreover, we note that use of multiple blowers and heat exchangers in Semba’s system appears to be nothing more than design choice.