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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte ANIRUDDHA PAL, MARTIN JEFFREY SALINAS, JARED AHMAD LEE, PAUL B. REUTER, and IMAD YOUSIF

Appeal 2019-003276
Application 13/408,810
Technology Center 1700

Before ROMULO H. DELMENDO, JEFFREY T. SMITH, and LILAN REN, *Administrative Patent Judges*.

SMITH, *Administrative Patent Judge*.

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellant[1] appeals from the Examiner's decision to reject claims 1–20, which constitute all the claims pending in this application. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

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[1] 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 Applied Materials, Inc. Appeal Br. 3.

STATEMENT OF THE CASE

Appellant's invention is generally directed to a "processing system with the capability to a single vacuum pump to service vacuum processing regions having different pumping requirements." (Spec. ¶ 4.) Independent claim 1 is representative of the appealed subject matter and is reproduced below:

> 1. A system for processing substrates, comprising:
>
> a chamber body having a first substrate transfer chamber isolated from a second substrate transfer chamber, wherein the first substrate transfer chamber is vertically disposed above the second substrate transfer chamber;
>
> a vacuum pump coupled to the first and the second transfer chambers through a single foreline;
>
> a high conductance pumping conduit having a first conduit, the first conduit having a first end and a second end, the first conduit having a first conduit diameter, the second end of the first conduit coupled directly to the first substrate transfer chamber;
>
> and
>
> a low conductance pumping conduit having a second conduit, the second conduit having an up end and a low end, the second conduit of the low conductance pumping conduit having a second conduit diameter smaller than the first conduit diameter, the first end of the first conduit and the low end of the second conduit connected to a first end of the single foreline, the up end of the second conduit coupled directly to the second substrate transfer chamber, wherein the high conductance pumping conduit and the low conductance pumping conduit share the same single foreline coupled directly to the vacuum pump, wherein the foreline has a second end coupled to the vacuum pump.

Claims Appendix.

The following rejections are presented for our review: [2]

I. Claims 1, 3–5, and 7–10 are rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Lee (2007/0166133 A1, published July 19, 2007) in view of Kasai (US 2005/0189074 A1, published Sept. 1, 2005).

II. Claims 2 and 11 are rejected under 35 U.S.C. § 103(a) as unpatentable over Lee in view of Kasai and further in view of Kurita (US 7,207,766 B2, issued Apr. 24, 2007).

III. Claims 6 and 12 are rejected under 35 U.S.C. § 103(a) as unpatentable over Lee in view of Kasai and further in view of Yieh (US 6,114,216, issued Sept. 5, 2000).

IV. Claims 13–16 are rejected under 35 U.S.C. § 103(a) as unpatentable over Yamagishi (US 2010/0147396 A1, published June 17, 2010) in view of Kasai.

V. Claim 20 is rejected under 35 U.S.C. § 103(a) as unpatentable over Yamagishi in view of Kurita and further in view of Yieh.

VI. Claim 17 and 19 are rejected under 35 U.S.C. § 103(a) as unpatentable over Yamagishi in view of Kurita.

VII. Claim 18 is rejected under U.S.C. § 103(a) as unpatentable over Yamagishi in view of Kurita and further in view of Ohta (US 2004/0177810 A1, published Sept. 16, 2004).

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[2] The complete statement of the rejections on appeal appears in the February 15, 2018 Final Action. (Final Act. 2–16.)

OPINION

We consider whether Appellant has identified reversible error in the Examiner's rejections. *See 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," citing *Ex parte Frye*, 94 USPQ2d 1072, 1075 (BPAI 2010) (precedential)).

Rejections I–III

The Examiner rejects claims 1, 3–5, and 7–10 over the combination of Lee and Kasai; claims 2 and 11 over the combination of Lee in view of Kasai and further in view of Kurita; and claims 6 and 12 over the combination of Lee in view of Kasai and further in view of Yieh.

We limit our discussion to the independent claim 1 as argued by Appellant. 37 C.F.R. § 41.37(c)(1)(iv). Claims 2–12 stand or fall with independent claim 1. Although additional references are applied in the rejections of claims 2, 6, 11 and 12, the Appellant does not provide a substantive argument as to the separate patentability of those claims but, rather, argue that the additional references do not remedy the deficiency in the references applied to claim 1. (Appeal Br. 14–16).

The Examiner finds Lee described exhausting arrangements that accommodate non-equal flows, or conductances, from plural stacked chambers. (Final Act. 2–3.) The Examiner finds Lee teaches a high conductance pumping conduit (piping from top 548 to 158; Figures 5, 7) coupled directly to the first substrate transfer chamber, having a first conduit, with a first diameter having a first end (pipe-top 548 interface) and a second end (pipe-top 158 interface) and a low conductance pumping

conduit (piping from middle 548 to 158; Figures 5, 7) coupled directly to the second substrate transfer chamber having a up end and low end. (Final Act. 5). The Examiner finds Lee discloses the exhaust system 154 can be coupled to at least one exhaust port 162 and therefore suggests creating a single foreline as required by the claimed invention. (Final Act. 5–6; Lee ¶ 34.) The Examiner finds Lee does not show the low conductance pumping conduit (piping from middle 548 to 158; Figures 5, 7) having a second conduit diameter smaller than the first conduit diameter. (Final Act. 6.) The Examiner finds Kasai teaches a wafer processing apparatus including both high conductance pumping conduit with a larger diameter 34 and low conductance pumping conduit with a smaller diameter 42. (Final Act. 7; Kasai ¶ 10, Fig. 8.) The Examiner determines it would have been obvious to optimize the diameters of Lee's first and/or second conduit diameters and exhaust piping connections as taught by Kasai. (Final Act. 7.)

The dispositive issue for these rejections is the following:

Did the Examiner err in determining that Lee and Kasai would have suggested a system for processing substrates comprising high and low conductance pumping conduits with different diameters having one end coupled to a respective chamber and another end coupled to the same foreline, as required by independent claim 1?

We answer this question in the negative.

Appellant argues Lee and Kasai did not teach or suggest a high and low conductance pumping conduit with different diameters having one end coupled to a respective chamber and another end coupled to the same foreline, as required by independent claim 1. (Appeal Br. 12–14, Reply Br. 1–2.) Appellant argues Lee's teaching of using a valve in a conduit does not

suggest changing the diameter of a conduit with certain configuration and connection to the same foreline. (Appeal Br. 12, Reply Br. 2.) Appellant argues Kasai's bypass exhaust path 42 having a smaller diameter, which includes multiple valves, only provides an extra loop to the main exhaust line 34 and does not have one end directly coupled to a chamber. (Appeal Br. 13, Reply Br. 2–3.)

Appellant's arguments are not persuasive of reversible error. Appellant has not disputed the Examiner's position that Lee describes a system for processing substrates comprising high and low conductance pumping conduits. Lee and the present invention are both directed to vacuum chambers for processing substrates and are concerned with regulating the flow of gas from an interior chamber utilizing a single exhaust system. (Spec. ¶¶ 5–7; Lee ¶¶ 23, 30–35.) Lee discloses the exhaust system 154 is configured to remove gases from the interior of the chambers through the exhaust port 162. (Lee ¶ 34.) Lee discloses the exhaust system, which can be connected to multiple exhaust ports 162 and may comprise a single vacuum pump. (Lee ¶ 34.) The use of a single vacuum pump suggest that the exhaust lines from the various exhaust ports 162 are combined together into a single line (single foreline) prior to the pump. Lee discloses control valves 158 are utilize to selectively control the gas flow. (Lee ¶ 35.) According to the Specification the diameter of the exhaust system provides control of the gas flow exiting the internal volumes of the chamber. The Specification specifically states:

> As shown in Figure 1, the first exhaust conduit 138 is configured to have a high conductance to permit a larger volume of gases to be removed from the first chamber 104 as necessitated by the plasma processes performed therein. The second exhaust

> conduit 158 is configured to have a low conductance relative to the conductance of the first exhaust conduit 138, such that the different rates of gases pumped from the first and second chambers 104, 106 may be simultaneously pulled through a single foreline 142 by a single pumping system 144.
>
> (Spec. 5.)

The invention of Lee differs from the claimed invention by failing to disclose the size of the exhaust system exiting the high and low conductance chambers. The Examiner determined, as shown by Kasai, that regulating the flow of gas utilizing exhaust systems having differing diameters was known to persons of ordinary skill in the art. (Final Act. 6–7.) A person with ordinary skill in the art possesses a certain basic level of skill. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007) ("A person of ordinary skill is also a person of ordinary creativity, not an automaton."). It cannot be reasonably argued in view of the prior art cited, that one with ordinary skill would not have recognized the flow of gas could have been controlled through various methods including the use of control valves or the diameter of the exhaust system. A person of ordinary skill in the art would have reasonably understood that varying the diameter of the exhaust system, that provides control of the gas flow exiting the internal volumes, was a recognized alternative for the use of valves that perform the same function.

Accordingly we sustain the 35 U.S.C. § 103 rejections of claims 1–12 over the combination of Lee and Kasai as specified in rejections I–III.

Rejections IV–VII

The Examiner rejects claims 13–16 over the combination of Yamagishi and Kasai; claims 17 and 19 over the combination of Yamagishi in view of Kasai and further in view of Kurita; claim 18 over the combination of Yamagishi in view of Kasai and further in view of Ohta; and claim 20 over the combination of Yamagishi in view of Kasai and further in view of Yieh.

We limit our discussion to the independent claim 13 as argued by Appellant. 37 C.F.R. § 41.37(c)(1)(iv). Claims 14–20 stand or fall with independent claim 1. Although additional references are applied in the rejections of claims 17–20, the Appellant does not provide a substantive argument as to the separate patentability of those claims but, rather, argue that the additional references do not remedy the deficiency in the references applied to claim 13. (Appeal Br. 16–20).

The dispositive issue for these rejections is the following:

Did the Examiner err in determining that Yamagishi and Kasai would have suggested a system for processing substrates comprising high and low conductance pumping conduits with different diameters having one end coupled to a respective chamber and another end coupled to the same foreline, as required by independent claim 13?[3]

We answer this question in the negative.

Appellant argues Yamagishi and Kasai do not teach or suggest a high and low conductance pumping conduit with different diameters having one end coupled to a respective chamber and another end coupled to the same foreline, as required by independent claim 13. (Appeal Br. 16–17.)

[3] We limit our discussion to independent claim 13.

Appellant's arguments are not persuasive of reversible error. Appellant has not disputed the Examiner's position that Yamagishi describes a system for processing substrates comprising high and low conductance pumping conduits. Yamagishi and the present invention are both directed to vacuum chambers for processing substrates and are concerned with regulating the flow of gas from an interior chamber utilizing a single exhaust system. (Spec. ¶¶ 5–7; Yamagishi ¶9 Fig. 7.) Yamagishi teaches a method for controlling exhaust flow in multiple-substrate processing apparatus. (Yamagishi ¶ 9.) Yamagishi also discloses the reaction chamber may be provided with an exhaust port where the exhaust duct of one of the reaction station and the exhaust duct of another of the reaction station may be connected to each other, and one of the exhaust ducts may be connected to the exhaust port. (Yamagishi ¶ 26.) Describing the embodiment of figure 7, Yamaguchi discloses the multiple-substrate processing apparatus comprises a common exhaust line 78 connected to a dry pump 72 which is shared by the reaction chambers and the transfer chambers. (Yamagishi ¶ 46.) The exhaust lines 76 and 77 for the respective reaction chamber are connected downstream, leading to the dry pump 72 via a line 78 provided with an automatic pressure controller. (Yamagishi ¶ 46.) The Examiner cited Kasai for teaching a wafer processing apparatus including both high conductance pumping conduit with a larger diameter 34 and low conductance pumping conduit with a smaller diameter 42. (Kasai ¶ 10, Fig. 8.) As stated above, a person with ordinary skill in the art would have recognized the flow of gas could have been controlled through various methods including the use of control valves or the diameter of the exhaust system.

Accordingly we sustain the 35 U.S.C. § 103(a) rejections of claims

13–20 over the combination of Yamagishi and Kasai as specified in rejections IV–VII.

CONCLUSION

In summary:

Claims Rejected	**35 U.S.C. §**	**Reference(s)/Basis**	**Affirmed**	**Reversed**
1, 3–5, 7–10	103(a)	Lee, Kasai	1, 3–5, 7–10	
2, 11	103(a)	Lee, Kasai, Kurita	2, 11	
6, 12	103(a)	Lee, Kasai, Yieh	6, 12	
13–16	103(a)	Yamagishi, Kurita,	13–16	
20	103(a)	Yamagishi, Kurita, Yieh	20	
17, 19	103(a)	Yamagishi, Kurita,	17, 19	
18	103(a)	Yamagishi, Kurita, Ohta	18	
Overall Outcome			1–20	

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