UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte RAVINDER AGGARWAL and JAMES F. KUSBEL

Appeal 2007-2688
Application 10/434,534
Technology Center 3600

Decided: March 12, 2008

Before DONALD E. ADAMS, ERIC GRIMES, and RICHARD M. LEBOVITZ, *Administrative Patent Judges*.

LEBOVITZ, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on appeal from the final rejection of claims 1, 2, 6, 7, 24, 25, 31, and 32. We have jurisdiction under 35 U.S.C. § 6(b). We affirm.

STATEMENT OF THE CASE

The claims are directed to substrate processing systems. According to the Specification, a semiconductor device is fabricated on a thin slice of semiconductor material "termed a substrate or wafer" (Spec. 1: 11-13). The Specification states that when "manufacturing these devices, it is imperative that the substrate does not become contaminated by particulate. Accordingly, substrate processing systems typically include a load lock apparatus that provides a substantially particle free environment from which substrates may be selectively withdrawn by a substrate handling assembly for placement into one or more processing modules" (Spec. 1: 13-18). However, the Specification states that the load lock "tends to increase the footprint of the substrate processing station" (Spec. 1: 20-21). As a solution, the Specification describes placing a staging shelf above the load lock to allow the substrate to cool without reducing throughput or increasing the footprint size (Spec. 1: 29 to 2: 8).

Claims 1, 2, 6, 7, 24, 25, 31, and 32, which are all the pending claims, are appealed (App. Br. 4). Appellants request our review of the following rejections:

1) Claims 1 and 2 under 35 U.S.C. § 103(a) as obvious over Iwai (U.S. Pat. No. 5,829,939, Nov. 3, 1998) and Tabrizi (U.S. Pat. No. 6,647,665 B1, Nov. 18, 2003) (Ans. 4);

2) Claims 6 and 7 under 35 U.S.C. § 103(a) as obvious over Iwai, Tabrizi, and Flegal (U.S. Pat. No. 5,516,732, May 14, 1996) (Ans. 5);

3) Claims 24 and 25 under 35 U.S.C. § 103(a) as obvious over Iwai and Flegal (Ans. 5); and

4) Claims 31 and 32 under 35 U.S.C. § 103(a) as obvious over Iwai, Flegal, and Suda (U.S. Pat. No. 6,053,980, Apr. 25, 2000) (Ans. 6).

Claims 1, 6, 7, 24, 31, and 32, which are representative of the appealed subject matter, read as follows:

> 1. A substrate processing system comprising:
>
> a substrate handling chamber;
>
> a load lock chamber having a gated inlet for the transfer of a substrate into and out of the load lock chamber, and having a gated port for transferring a substrate between the load lock chamber and the substrate handling chamber;
>
> a staging shelf in the handling chamber positioned directly above the load lock chamber; and
>
> a first substrate handler in the substrate handling chamber for moving a substrate between the load lock chamber and the staging shelf.
>
> 6. The substrate processing system Claim 1, including a cooling station within the substrate handler chamber accessible by the substrate handler.
>
> 7. The substrate processing system of Claim 6, further comprising a rest station within the handling chamber that is accessible by the first substrate handler and a gated port adjacent the rest station for the transfer of substrates to an adjacent process chamber.
>
> 24. A substrate processing system comprising a substrate handling chamber, a load lock port in a wall of the substrate handling chamber for the transfer of a substrate from a load lock chamber to the substrate handling chamber, a staging shelf, a rest station, a cooling station all within the substrate handling chamber, and a first substrate handler configured to move the substrate to and from the load lock chamber, the staging shelf, the rest station and the cooling station.
>
> 31. The substrate processing system of Claim 1, wherein the first substrate handler is configured to handle a single substrate.

32. The substrate processing system of Claim 24, wherein the first substrate handler is configured to handle a single substrate.

DISCUSSION

Claims 1 and 2

Claims 1 and 2 stand rejected under 35 U.S.C. § 103(a) as obvious over Iwai in view of Tabrizi.

Claim 1 is directed to a substrate processing system comprising: 1) a substrate handling chamber; 2) a load lock; 3) "a staging shelf in the handling chamber positioned directly above the load lock chamber"; and 4) a first substrate handler.

The Examiner finds that Iwai describes all the elements of claim 1, including a substrate handling chamber (321), a load lock chamber (210), a staging shelf (320), and a first substrate handler (322), but does not describe the staging shelf "in the handling chamber positioned directly above the load lock chamber" as recited in claim 1 (Ans. 4; *see* Iwai, Fig. 24). However, the Examiner finds that Tabrizi describes a substrate processing system which comprises two load locks (406a and 406b) situated directly on top of each other (Ans. 4; Tabrizi, Fig. 4). The second load lock contains staging shelves 416 (Tabrizi, Fig. 4), which the Examiner finds are located "directly above" the first load lock chamber as in claim 1 (Ans. 4). The Examiner contends that it would have been obvious to persons of ordinary skill in the art "to use the area above the load lock taught by Iwai et al. by providing staging shelves as taught by Tabrizi et al. in order to increase the throughput of the device without increasing the footprint of the device" (*id.*).

Appellants argue that there is an opening device 234 and gas pipes 224 and 225 in the space directly above the load lock and thus "the modification suggested by the Examiner would radically alter the configuration taught by the Iwai patent" (App. Br. 10; *see* Reply Br. 1-2; *see* Iwai, at Fig. 24).

We are not persuaded by Appellants' argument that the Examiner erred in the obviousness determination. As the Examiner points out, the "space directly above the load lock (of which element 234 [and 224 and 225 are] . . . part) is open and . . . large enough to have . . . staging shelves mounted thereon. See figure 24 of the Iwai patent" (Ans. 8). We also agree with the Examiner that the phrase "directly above" as recited in claim 1 is reasonably interpreted to mean "overhead of the load lock" and that there is no language in the claim which would exclude there from being "an intervening structure between the load lock and the shelves" (*id*.). Thus, staging shelves could be fit into the space above Iwai's load lack chamber 210, without "radically" altering the handling chamber's configuration as asserted by Appellants.

Appellants also contend that the "Tabrizi patent merely teaches placing a pair of load lock chambers 406a, 406b positioned on top of each other" which does not satisfy the limitation of claim 1 that the shelves are in the handling chamber (App. Br. 10).

This argument is not persuasive. The Examiner relies on Tabrizi for its general teaching that vertical stacking of components in a substrate processing system saves space (Ans. 7; *see* Tabrizi, at col. 2, ll. 39-41; at col. 4, ll. 9-12). Thus, whether the claim is interpreted to exclude the staging shelves from being part of a second load lock "directly above" the first load

lock is not dispositive since Tabrizi would have reasonably suggested placing a component, such as a staging shelf, above Iwai's load lock to increase staging space to achieve high throughput. For instance, Tabrizi states

> the load locks may provide the capability to cool post process workpieces prior to or during their pressure transition from the reduced pressure of the load lock to atmospheric pressure. This functional independence makes such a system capable of providing a steady supply of pre-processed workpieces for the vacuum handler thus achieving high throughput in nearly continuous workpiece processing.

(Tabrizi, at col. 3, ll. 32-39) Thus, the load lock, when used to cool post process wafers, serves the same function as a staging shelf.

Appellants argue that "moving the shelves within the staging shelf 320 would not decrease the foot print of the system and thus one of skill in the art would not be motivated to make the suggested design change" because "shelves are positioned at the same elevation as the loading area 208 and are located between the load lock and the loading area 208" (Reply Br. 2).

We are not convinced by this argument that the Examiner erred. Given the wide variety of configurations which are described in the prior art for substrate handling systems (*see* generally Iwai and Tabrizi, e.g., Figs. 24 and 4, respectively), we find that the persons of ordinary skill in the art were familiar with their design and that it would have been within the scope of ordinary skill to mount staging shelves at any location in a transfer chamber in order to save space and increase throughput (*see* Ans. 7). When "a patent 'simply arranges old elements with each performing the same function it had been known to perform' and yields no more than one would expect from

such an arrangement, the combination is obvious." *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1740 (2007).

For the foregoing reasons, we affirm the rejection of claim 1. Claim 2 falls with claim 1 because separate reasons for its patentability were not provided. *See* 37 C.F.R. § 41.37(c)(1)(vii).

Claims 6 and 7

Claims 6 and 7 stand rejected under 35 U.S.C. § 103(a) as obvious over Iwai, Tabrizi, and Flegal.

Claims 6 and 7 further comprise a cooling and rest station, respectively. The Examiner finds that these elements are described in Flegal and that it would have been obvious to persons of ordinary skill in the art to have incorporated these elements into Iwai's apparatus to increase the system's throughput (Ans. 5).

Appellants do not challenge the Examiner's determination (*see* App. 12), and as we find no defect in it, we affirm the rejection of claim 6 and 7.

Claims 24 and 25

Claims 24 and 25 stand rejected under 35 U.S.C. § 103(a) as obvious over Iwai and Flegal.

Claim 24 is directed to a substrate processing system which comprises: 1) a substrate handling chamber; 2) a load lock port; 3) a staging shelf; 4) a rest station; 5) a cooling station; and 6) a substrate handler.

The Examiner finds that Iwai teaches a substrate handling chamber, a load lock, a staging shelf or rest station, and a substrate handler, but does not describe a cooling station as recited in claim 24 (Ans. 5-6). However, the

Examiner finds that Flegal teaches a cooling station in a substrate ("wafer") handling system. Thus, the Examiner concludes that it would have been obvious to persons of ordinary skill in the art to have incorporated the cooling station into Iwai's system

> in order to have a place to cool substrates outside of the process chamber so as to cool a processed substrate prior to placing it an [sic, on] a transfer cassette while at the same time freeing the process chamber for a second wafer to be processed, thereby increasing the throughput of the system.

(Ans. 6).

Appellants state that Iwai "is directed to a batch type reactor in which many wafers are processed in the reactor at one time" (App. Br. 12-13). Thus, Appellants contend that the "function" of a cooling station "is not required because of the large number of substrates that are moved into and out of the reactor at the same time" (App. Br. 13).

We agree with the Examiner that the "time saving" conferred by a cooling station "would apply no mat[t]er how many wafers are processed together" (Ans. 9). "It is well known in the art that increasing the throughput is important to a wafer manufacturer, therefore one of ordinary skill in the art would have contemplated using a cooling device in the Iwai reference to speed up cycle times, thereby increasing the yield of" wafers (*id*.). As Appellants have provided no evidence or arguments to the contrary, we affirm the rejection of claim 24. Claim 25 falls with claim 24 because separate reasons for its patentability were not provided. *See* 37 C.F.R. § 41.37(c)(1)(vii).

Claims 31 and 32

Claims 31 and 32 stand rejected under 35 U.S.C. § 103(a) as obvious over Iwai, Flegal, and Suda.

Claims 31 and 32 are directed to the substrate processing system of claims 1 and 24, respectively, but where "the first substrate handler is configured to handle a single substrate." The Examiner finds that Suda teaches "a substrate processing system substantially similar to that of Iwai et al. where a first substrate handler (20) can move both cassettes of wafers and single wafers based on predetermined needs of the system" (Ans. 6). The Examiner concludes that it would have been obvious to persons of ordinary skill in that art "to provide the device taught by Iwai et al. with the substrate handler as taught by Suda et al. in order to allow the handler to move either a plurality of substrates or a single substrate depending on the needs of the device" (Ans. 7).

Appellants contend that "Suda did not provide any disclosure, teaching or motivation for placing a cooling station within the substrate handling chamber as claimed in independent Claim 24 or for positioning a staging shelf in the handling chamber positioned directly above the load lock chamber as in independent Claim 1" (App. Br. 13).

The Examiner argues that such limitations are found in prior art references already cited and that Suda is relied upon for teaching a handler that moves a single wafer, and not for the limitations argued by Appellants (Ans. 9). As we agree with the Examiner that limitations argued by Appellants can be found in the prior art of record, we affirm the rejection of claims 31 and 32.

TIME PERIOD

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

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