

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte TORU TANIGUCHI, ISOROKU ONO, and SEIJI HARADA

Appeal 2008-1840
Application 10/296,498
Technology Center 3700

Decided: August 19, 2008

Before HUBERT C. LORIN, LINDA E. HORNER, and
MICHAEL W. O'NEILL, *Administrative Patent Judges*.

O'NEILL, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Toru Taniguchi, et al. (Appellants) seek our review under 35 U.S.C. § 134 of the final rejection of claims 15-19. We have jurisdiction under 35 U.S.C. § 6(b) (2002).

SUMMARY OF DECISION

We REVERSE.¹

THE INVENTION

The claimed invention relates to an improved process of polishing semiconductor wafers using a double-sided polisher. (Spec. 1.) The Appellants have found that improvements in wafer flatness occur when the wafer is protruded from the polishing cloths “in the range of three to fifteen millimeters (3 – 15 mm).” (Spec. 10.). If the protrusion is less than three millimeters, polish-sagging may be greater. (*Id.*) If the protrusion is greater than fifteen millimeters, ring shaped steps would be created on the wafer’s surface. (*Id.*)

Claims 15, reproduced below, is representative of the subject matter on appeal.

15. A method for polishing a semiconductor wafer by using a double-sided polisher, in which a semiconductor wafer is held in a wafer holding through-hole formed in a carrier plate, and said carrier plate is moved in a circle within a plane parallel with a surface of said carrier plate, without said carrier plate rotating on its own axis, between an upper surface plate and a lower surface plate having polishing cloths extending over opposing surfaces thereof while supplying a polishing agent to said semiconductor wafer, so that a front and a back surface of said semiconductor wafer can be polished simultaneously, said method being characterized in that said semiconductor wafer is

¹ Our decision will refer to Appellants’ Appeal Brief (“App. Br.,” filed Apr. 12, 2007), Reply Brief (“Reply Br.,” filed Sep. 4, 2007), and the Examiner’s Answer (“Answer,” mailed Jul. 3, 2007).

polished in a state where a part of an outer periphery of said semiconductor wafer is protruded by 3 - 15 mm beyond said polishing cloths.

THE PRIOR ART

The Examiner relies upon the following as evidence of unpatentability:

Bello	US 5,643,405	Jul. 1, 1997
Inada	US 6,361,418 B1	Mar. 26, 2002
Saito	JP 2000-141213	May 23, 2000

THE REJECTIONS

The following rejections are before us for review:

Claim 15-19 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Inada and Saito.

Claim 16, 17/16, 18/16 and 19/17/16 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Inada, Saito, and Bello.

ISSUES

The first issue is whether the Appellants have shown that the Examiner erred in rejecting claims 15-19 as being unpatentable over Inada and Saito. The second issue is whether the Appellants have shown that the Examiner erred in rejecting claims 16, 17/16, 18/16 and 19/17/16 as being unpatentable over Inada, Saito, and Bello. Both issues turn on whether one of ordinary skill in the art would have been led to modify Inada's polishing method such that the outer periphery of a semiconductor wafer is protruded "by 3 – 15 mm beyond [the] polishing cloths" (claim 15).

FINDINGS OF FACT

We find that the following enumerated findings of fact (FF) are supported by at least a preponderance of the evidence. *Ethicon, Inc. v. Quigg*, 849 F.2d 1422, 1427 (Fed. Cir. 1988) (explaining the general evidentiary standard for proceedings before the Office).

1. Inada describes an abrasive system for simultaneously abrading both faces of each work piece, i.e. silicon wafers or semiconductor wafers, in a carrier. (Inada, col. 1, ll. 4-6.) The work pieces are pinched between the abrasive plates, which include abrasive cloths to constitute an abrasive face, so that both faces of each work piece can be simultaneously abraded. (Inada, col. 3, ll. 17-26.)
2. Inada does not describe protruding the outer periphery of a semiconductor wafer beyond the cloths.
3. Saito describes a lapping device and method for semiconductor wafer lapping. Saito describes the wafer loading holes within the carrier are established at specific locations and, as a result, the semiconductor wafers “locally protrude or absolutely does [sic] not protrude” from the surface plates, the lapping plates, during the rotation of the carrier. (Saito, page 13, lines 12-15, of the PTO translation.)
4. Saito describes protruding the wafer “locally.” (*Id.*)
5. Saito does not define a distance that the wafer may protrude from the lapping device such that it would be defined as protruding “locally.”
6. Saito describes that flatness of the semiconductor wafers is possible as a result of the independent control of the wafer position relative to the

- surface plates of the lapping device. (Saito, page 13, lines 15-20, of PTO translation.)
7. Bello describes a process where a double-sided polisher is used to produce one-sided polished silicon wafer. (Bello, col. 2, ll. 53-67.)
 8. Bello does not describe protruding the outer periphery of a semiconductor wafer.

PRINCIPLES OF LAW

“Section 103 forbids issuance of a patent when ‘the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.’” *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1734 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, and (3) the level of skill in the art. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). *See also KSR*, 127 S.Ct. at 1734 (“While the sequence of these questions might be reordered in any particular case, the [*Graham*] factors continue to define the inquiry that controls.”) The Court in *Graham* further noted that evidence of secondary considerations “might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented.” 383 U.S. at 17-18.

ANALYSIS

The rejection of claims 15-19 under §103(a) as being unpatentable over Inada and Saito.

The sole independent claim 15 is drawn to a “method for polishing a semiconductor wafer by using a double-sided polisher ... characterized in that said semiconductor wafer is polished in a state where a part of an outer periphery of said semiconductor wafer is protruded by 3 –15 mm beyond said polishing cloths.” Put simply, the claims describe a semiconductor wafer polishing method that requires a part of an outer periphery of the wafer to protrude by a minimum of 3 mm beyond the polishing cloths.

The Examiner argued that Inada meets all the limitations of claim 15 except for the semiconductor wafer being protruded 3 – 15 mm beyond the polishing cloths during the polishing of the wafer. (Answer 3.) To make up for this deficiency in Inada, the Examiner relies on Saito. (*Id.*) Saito describes a method for lapping a semiconductor wafer. Saito describes permitting the semiconductor wafer to “locally protrude or [the wafer] absolutely does not protrude” from surface plates, lapping plates, of a lapping device during the rotation of a carrier for the wafer. (FF 3.) Accordingly, Saito describes protruding the outer periphery of a semiconductor wafer from the lapping device to the extent that the wafer “locally protrudes.” (FF 4.) However, Saito does not define a distance that the wafer may protrude from the lapping device such that it would be defined as protruding “locally.” (FF 5.)

The Examiner determined that the claimed method would have been obvious to one of ordinary skill in the art because Saito teaches “preventing partial wear of the upper and lower plates are [sic] by lapping a wafer

protruding from the edges of the plates” (Answer 3) and, with respect to the specific range claimed, that discovering the optimum or workable range involves only routine skill in the art. (*Id.*)

The Appellants argued that the combination of Inada and Saito could not have predicted protruding part of an outer periphery of the semiconductor wafer by 3 – 15 mm beyond the polishing cloths when using a double-sided polisher (App. Br. 7, 13, and 14, and Reply Br. 5 and 6.) Further, the Appellants argued that, while Saito mentions protrusion, Saito does not provide a description of “setting of the amount of protrusion ... necessary for exhibiting the effects described in the specification ... [e.g.] the flatness becomes insufficient with a protrusion of less than 3 mm.” (Reply Br. 5-6; see e.g., Spec. 29: “[a]s is obvious from this graph [Fig. 12] the length of protrusion of the outer periphery of the wafer lower than 3 mm indicates the greater polish sagging in the outer periphery.) We understand from this that the Appellants are contending that Saito fails to describe the claimed range of protrusion for a part of the outer periphery of the semiconductor wafer beyond the polishing cloths.

The Appellants have also argued that the prior art fails to show a sun gear. We can dispose of that argument on the ground that there is no limitation in the claim to a sun gear. *In re Self*, 671 F.2d 1344, 1348 (CCPA 1982).

However, we agree with the Appellants that the Examiner has failed to establish, in the first instance, that one of ordinary skill in the art, given Inada and Saito, would have been led to modify Inada’s polishing method in light of Saito such that a part of the outer periphery of the semiconductor wafer is protruded by 3 - 15 mm beyond the polishing cloths.

We are satisfied that, given Inada and Saito, one of ordinary skill in the art would have been led to polish a wafer whose outer periphery protrudes “locally” beyond a polishing cloth. However, we do not find that Inada and Saito would have led one of ordinary skill in the art to further protrude a part of the outer periphery of the wafer by at least 3 mm beyond the polishing cloths.

In making the obviousness determination, the Examiner stated that Saito teaches “preventing partial wear of the upper and lower plates are [sic] by lapping a wafer protruding from the edges of the plates.” (Answer 3.) This is inaccurate. Saito nowhere describes preventing partial wear of the upper and lower plates by lapping a wafer protruding from the edges of the plates. The Examiner also stated “that [Saito describes] correcting a partial wear of the upper and lower plates improves the flatness of a lapped wafer.” (Answer 8.) That is also not accurate. Saito describes permitting the wafer to protrude from the plates of the lapping device during lapping of the wafer. (FF 6.) Saito suggests the wafer may be “locally” protruded. Accordingly, Saito provides an apparent reason for one of ordinary skill in the art to “locally” protrude the outer periphery of the wafer during polishing when conducting the Inada process. However, it does not provide any suggestion as to how far a part of the outer periphery should protrude from the polishing cloths; let alone protruding a part of the outer periphery by at least 3 mm from the polishing cloths.

In making the obviousness determination, the Examiner further stated with respect to the claimed range of protrusion, “it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges [sic] involves only routine skill in the art.”

(Answer 3.) In effect, the Examiner is arguing that, based on the cited prior art, it would have been obvious to try various protrusions beyond the polishing cloths for a part of the outer periphery of the wafer and, therefrom, discover an optimum distance that would fall within the claimed range.

It is true that “the discovery of an optimum value of a variable in a known process is normally obvious.” *In re Antonie*, 559 F.2d 618, 620 (CCPA 1977). But that is not the case when “the parameter optimized was not recognized to be a result-effective variable.” *Id.* We do not find sufficient evidence on the record in support of the Examiner’s underlying contention that wafer protrusion is a variable, a value for which there is a reason to optimize.

Here the evidence discloses either nothing about protrusion (Inada, FF 2) or, at best, “locally protrude” (Saito, FF 4) the wafer from a particular lapping device. The references do not explain the benefits of protruding a part of the outer periphery of the wafer, let alone beyond polishing cloths. Saito describes the possibility of achieving flatness of the wafer. FF 6. But this benefit is achieved as a result of the independent control of the wafer position in the wafer carrier of the lapping device. By this control, the Saito wafer carrier can cause the wafer to “locally protrude or absolutely does not protrude from the surface plates [during rotation of the carrier]” (Spec. 13, [0013]; FF 6) but Saito indicates that it is the wafer position which acts as a variable in determining the flatness of the wafer, not the extent of protrusion. One of ordinary skill in the art given these references would have little reason to consider wafer protrusion as a variable open to optimization. Accordingly, we do not see, as the Examiner appears to contend, that the cited prior art renders obvious optimizing wafer protrusion.

Given the insufficient evidence of wafer protrusion as a variable and a reason to optimize it, the Examiner's position amounts to an argument that it would have been obvious for one of ordinary skill in the art to try various protrusion distances, including any within the range claimed. But "obvious to try is not the standard of 35 U.S.C. § 103." *Antonie*, 559 F.2d at 620 (citing *In re Tomlinson*, 363 F.2d 928 (CCPA 1966)). "The controlling question is simply whether the differences [i.e., the claimed range of protrusion] between the prior art and appellant's invention as a whole are such that appellant's invention as a whole would have been obvious." (*Id.*) *KSR* recognized that "[w]hen there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp." *KSR*, 127 S.Ct. at 1732. In such circumstances, "the fact that a combination was obvious to try might show that it was obvious under § 103." *Id.* But in this case, there is no problem or solution that would lead one of ordinary skill to consider the option to protrude a part of an outer periphery of a wafer beyond polishing cloths at various distances. This is not a case where there are numerous parameters to try. We have one reference (Inada) with no indication of any protrusion and another reference (Saito) suggesting at best "local protrusion" beyond a lapping device. Saito does not explain what it means by the phrase "locally protrudes (FF 5) but Saito uses the phrase to describe a possible result of locating the wafers in the lapping device in conjunction with describing another possible result, i.e., where the wafer "absolutely does not protrude". FF 3. This would suggest to one of ordinary skill in the art that Saito intends wafer protrusion from the lapping device to be kept at a minimum. Given

this evidence, there is no good reason for one of ordinary skill in the art to pursue protruding a part of an outer periphery of a wafer beyond polishing cloths to any great extent, and especially not to the extent claimed which, at a minimum of 3 mm, could account for 1% of the wafer's diameter (see Spec. 5). The mere possibility that one would try to protrude the wafer to a distance extending to one falling within the claimed range does not demand a conclusion of obviousness where one of ordinary skill in the art would have no expectation of successfully obtaining a useful wafer. "To have a reasonable expectation of success, one must be motivated to do more than merely to vary all parameters or try each of numerous possible choices until one possibly arrived at a successful result, where the prior art gave either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful." *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed.Cir.2006)(internal quotations omitted).

For the foregoing reasons, we find that the Examiner has not made out a prima facie case of obviousness. Accordingly, we will not sustain the rejection.

The rejection of claims 16, 17/16, 18/16 and 19/17/16 under §103(a) as being unpatentable over Inada, Saito, and Bello.

This rejection is directed to claims dependent on claim 15, whose rejection we have reversed above. For the same reasons, we will not sustain the rejection of claims 16, 17/16, 18/16 and 19/17/16 over the cited prior art. *Cf. In re Fritch*, 972 F.2d 1260, 1266 (Fed. Cir. 1992) ("[D]ependent claims are nonobvious if the independent claims from which they depend are nonobvious.").

Appeal 2008-1840
Application 10/296,498

CONCLUSIONS OF LAW

We conclude the Appellants have shown that the Examiner erred in rejecting claims 15-19 under 35 U.S.C. § 103(a) as being unpatentable over Inada and Saito, and claims 16, 17/16, 18/16 and 19/17/16 under § 103(a) as being unpatentable over Inada, Saito, and Bello.

DECISION

The Examiner's decision to reject claims 15-19 is reversed.

REVERSED

Appeal 2008-1840
Application 10/296,498

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