UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DAVID ALUMOT, GAD NEUMANN,
RIVKA SHERMAN, and EHUD TIROSH

Appeal 2008-1145
Application 10/852,996
Technology Center 2600

Decided: May 27, 2008

Before KENNETH W. HAIRSTON, ROBERT E. NAPPI, and KARL D. EASTHOM, *Administrative Patent Judges.*

EASTHOM, *Administrative Patent Judge.*

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 6(b) of the final rejection of claims 96-99, 101-109, 111-122, 124-127, 129-134, 136, and 139-155. Independent claim 156 has been allowed, and no other claims are pending (App. Br. 5-6).

We affirm.

INVENTION

Appellants' invention relates to an electro-optical inspection apparatus for wafer defect detection. An understanding of the invention can be derived from a reading of exemplary claim 96, which is reproduced below.

96. A method for inspecting a semiconductor wafer of dies for a defect, the method comprising:

illuminating at least one area in each of at least two dies using a pulsating light source;

acquiring images of the at least one area in each of the at least two dies using an electro-optical camera including at least one two-dimensional matrix photo-detector; and

detecting a wafer defect by comparing the images using a die-to-die comparison method.

REFERENCES

Levy	US 4,247,203	Jan. 27, 1981
Levy ("Levy '455")	US 4,579,455	Apr. 1, 1986
Lin	US 4,806,774	Feb. 21, 1989[1]

[1] The Examiner cited Lin in support of taking Official Notice that the use of two dimensional photo detectors are conventionally utilized in digital processing. (*See* Ans. 4, 13; Final Office Action: 4, 10, mailed January 9, 2006). Appellants do not challenge the Examiner's Official Notice (*see* App. Br. 12-16).

"Sequencing Oblique Light" IBM Tech. Disc. Bulletin, NN79112284, V. 22, Is. 6, pp. 2284-85, November 1, 1979 ("IBMTDB").

REJECTIONS

1. Claims 96-99, 101-105[2], 108-109, 111-112, 114, 116-118, 122, 124-127, 129-131, 133-134, 136, 139-141, 144, and 146-155 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the collective teachings of Levy, the IBMTDB, and Lin.[3]

2. Claims 106, 107, 113, 115, 119-121, 132, 142, 143, and 145 are rejected under 35 U.S.C. §103(a) as being unpatentable over Levy, the IBMTDB, Lin[4], and Levy '455.

Throughout the opinion, we make reference to the Brief filed March 22, 2006 ("App. Br."), the Reply Brief filed July 10, 2006 ("Reply Br.") and the Answer mailed June 15, 2006 ("Ans.").[5]

PRINCIPLES OF LAW

On appeal, Appellants bear the burden of showing that the Examiner erred. Appellants may sustain this burden by showing that, where the

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[2] We note that the statement of the rejection does not identify claim 102 as rejected, however the reasoning associated with the rejection identifies claim 102 as being included in the rejection. Thus, it is clear that claim 102 is included in the rejection.
[3] While Lin is not specifically listed in the statement of rejection (Ans. 3-4), it is referenced therein by the designation of "Official Notice" and thereafter cited, *see* n. 1 above.
[4] See n. 2, *supra*.
[5] We also note that Appellants identify related Application No. 10/852,798 (Appeal No. 2007-3705) as containing related claims (Reply Br. 3).

Examiner relies on a combination of disclosures, the Examiner failed to provide sufficient evidence to show that one having ordinary skill in the art would have done what Appellants did. *United States v. Adams*, 383 U.S. 39, 47 (1966); *In re Kahn*, 441 F.3d 977, 987-88 (Fed. Cir. 2006). Appellants may also show that the Examiner has failed to meet his initial burden of presenting a prima facie case of obviousness. *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992). If that initial burden is met, then the burden shifts to the Appellants to overcome the prima facie case with argument and/or evidence. *See Id*.

The Examiner's articulated reasoning in the rejection must possess a rational underpinning to support the legal conclusion of obviousness. *In re Kahn*, 441 F.3d at 988 (Fed. Cir. 2006).

On the issue of obviousness, the Supreme Court has recently stated that "[t]he obviousness s analysis cannot be confined by a formalistic conception of the words teaching, suggestion, and motivation." *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1741 (2007). Further, the Court stated "[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. at 1739.

OPINION

Appellants' main contentions with respect to claim 96 are that the Examiner has not identified a teaching or suggestion nor a reasonable expectation of success for including a pulsed light source and a two-dimensional matrix photo-detector in Levy's system for inspecting a semiconductor wafer (App. Br. 12). Appellants maintain that such a

teaching or suggestion, and a reasonable expectation of success, must be found in the prior art (*id*.).

The Examiner's reasons for combining the IBMTDB with Levy are that they teach analogous systems for solving similar problems of wafer inspection (Ans. 4) and that "[u]sing a strobe light source in place of the light source of Levy can result in better yield in the wafer inspection" (Ans. 13). The Examiner's reasons for combining Lin's teaching are that two-dimensional matrix photo-detectors are conventional photo detectors routinely utilized in digital image processing (Ans. 4), and that Lin suggests that matrix photodetectors "provide a reliable defect inspection system" (Ans. 13, citing Lin at col. 2, ll. 24-25).

We determine that the Examiner's rationale supports a legal conclusion of obviousness. We begin with the Examiner's finding that the IBMTDM pulsating light sources create better wafer detection yields as compared to prior art non-pulsating lights. Appellants challenge this finding (Reply Br. 4), contending that the yield is improved because the light rotates, not because it pulsates (Reply Br. 4). The argument lacks merit because the light only appears to rotate - it pulsates or strobes via a sequential illumination of successive lights in a circle (IBMTDB, p. 2285, Fig. 2). Moreover, such a pulsating light improves yields and light conditions over the prior art non-pulsing "Dampol-type" 360 degree illumination system as well as the prior art wafer rotating technique (*see id*. at p. 2284).

Appellants state that "[t]he Examiner seems to rely on IBM-TD as teaching that the use of a strobe light increases the number of wafers that are inspected by the human eye." (Reply Br. 4). We are unable to find such reliance in the Examiner's Answer. Appellants' arguments boil down to the

assertion that the IBMTDB teaches a better yield count for human eye inspections as opposed to automatic inspections, and, as such, there is no motivation to employ the IBMTDB's pulsating light in Levy's system (*see* App. Br. 13, Reply Br. 4). We do not find Appellants' arguments to be persuasive.

The pulsed light system provides "optimum scattered light integration by *the detector* and best contrast conditions provided by the particle shadow" (p. 2285) (emphasis supplied). The generic reference to "the detector" with the disclosed benefits of optimum scattered light integration, best contrast conditions, and better yield, suggest that any light-sensitive detector, including Levy's "light-sensitive diodes" (col. 9, ll. 17-21) (i.e., one-dimensional matrix photo-detectors as modified by Lin's two-dimensional matrix photo-detectors), would have predictably benefited from a pulsating light system.[6] Moreover, Levy describes numerous interrelated inherent problems associated with prior art manual wafer inspection systems, including long inspections times, low confidence levels, lack of detection of small defects, and human operator fatigue, subjectivity and bias (col. 1, ll. 48-65). Levy's solution to these problems, an automatic wafer inspection apparatus (col. 1, ll. 7-12), teaches that the beneficial uses from generic wafer inspection sub-systems, which includes the IBMTDB pulsed

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[6] Appellants also admit that existing systems analyze images with opto-electric converters: "The existing inspection systems for inspecting patterned wafers are generally based on analyzing high resolution two-dimensional images of the patterned wafer utilizing an opto-electric converter, such as a CCD (charge-coupled device), on a pixel-by-pixel basis." (Spec.: para. 04).

light sub-system, more favorably redound to automatic as opposed to manual systems.

Similarly, we are not persuaded by Appellants' statement that "the official notice does not suggest [the] combination of the two dimensional optical detector with a pulsed light source or with a die-to-die or pixel to pixel comparison of images" (App. Br. 13). We have already determined as sufficient the Examiner's reasons to employ the IBMTDB pulsed light source in Levy's wafer detection system. Appellants' statement, without more, regarding the lack of a suggestion for Lin's two-dimensional matrix, does not rise to the level of argument alleging particular error in the Examiner's stated reasons for using the well-known two-dimensional matrix in Levy's system.[7]

As noted *supra*, the Supreme Court recently stated that "[t]he obviousness analysis cannot be confined by a formalistic conception of the words teaching, suggestion, and motivation." *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1741 (2007). Further, the Court stated that "[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR*, 127 S. Ct. at 1739. The Examiner reasoned, without challenge, as noted *supra*, that Lin's two-dimensional matrix was well known in image detection systems, and implemented to produce a reliable detection system.[8] Levy employs a

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[7] Appellants' further statements regarding what Levy and the IBMTDM teaches (App. Br. 12-13) are not material to the claimed invention.

[8] Lin's photo-detector matrix 58 is disclosed as having dimensions suitable to support a tenfold magnification to detect wafer defects in the three millimeter range (col. 6, ll. 9-21). The disclosure bolsters the Examiner's

similar, albeit one-dimensional, photo detector matrix in an image detection system (*see* col. 9, ll. 17-21). The replacement of Levy's one-dimensional matrix photo-detector with Lin's similar two-dimensional photo-detector array all employed conventionally in the wafer detection art for the same purpose of converting optical images into electricity for processing would have resulted in an "improvement [that] is [no] more than the predictable use of prior art elements according to their established functions." *KSR*, 127 S. Ct. at 1739.

Appellants also argue, as indicated *supra*, that the Examiner has not demonstrated a reasonable expectation of success in combining the references. As noted *supra*, *KSR* mandates that obviousness cannot be confined to formalistic conceptions. As the Examiner determined, it was well known to use pulsed light sources in wafer detection systems for obtaining better yields. Other beneficial reasons are documented as noted *supra* in the limited teachings of the IBMTDB, including better yield, contrast, and scattering. Levy also employs a pulsed laser system.[9] We determine that such well-known uses having documented benefits constitute

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finding that Lin suggests the use of such an array for the purpose of providing a reliable wafer defect inspection system.

[9] Levy teaches a pulsed light laser used to focus the lens on the image plane using laser light from laser 250 sent through chopper 251 and associated optics (col. 10, ll. 5-68; Fig. 4). Modulated light from pulsed laser 250 is used to illuminate and reflect from a portion of the wafer or photomask being inspected (*see* col. 10, ll. 39-40 - "a photomask is a specular reflector"). The reflected light is used to determine the spacing between the objective and the object. Hence, Levy teaches that pulsed light is used to illuminate "at least one area in each of two dies using a pulsating light", as claimed. Therefore, we find that Levy teaches and fairly suggests the use of a pulsed light source in wafer inspection systems.

evidence of a reasonable expectation of success, especially where there is nothing to suggest inordinate difficulty in using such systems.

Similarly, the Examiner's unchallenged finding that Lin's two-dimensional matrix photo-detectors were well known in the art of photo imagery and useful to provide a reliable defect system, combined with the fact that Levy's similar one-dimensional matrix photo-detector was employed in the same wafer inspection field of endeavor evidences a reasonable expectation of success for such a familiar substitution.

Therefore, Appellants have not shown error in the Examiner's obviousness determination. We have carefully considered all of Appellants' arguments, including allegations of "impermissible hindsight" (App. Br. 13, 14), "a conclusion . . . gleaned from the Applicants' own specification" (App. Br. 14), and others, all of which we categorize here as general statements attacking the Examiner's reasons for making the combination.

We summarize as follows. "Common sense teaches . . . that familiar items may have obvious uses beyond their primary purposes, and in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle." *KSR*, 127 S.Ct. at 1742. We find the *KSR* description apt here. There is no dispute, as the Examiner generally found, that Lin's two-dimensional array and the IBMTDB pulsed light were "familiar items" commonly employed for their "primary purposes" - wafer detection. Moreover, just as "[t]echnological developments made it clear that engines using computer-controlled throttles would become standard," *KSR*, 127 S.Ct. at 1744, Levy makes it clear that automatic wafer detection systems would replace manual systems, thereby rendering even more predictable the improvements rendered by employing the IBMTDB's pulsed

light sub-system in Levy's automatic wafer detection system, such predictable improvements including better contrast, scattering integration, and yields.

For the reasons outlined above, we will sustain the rejection of independent claim 96. Since Appellants have merely repeated claim limitations without making separate arguments for the patentability of independent claims 108, 116, 125, and 134, we also will sustain the rejection of those claims. Likewise, we will sustain the rejections for their respective dependent claims: 97-99, 101-105, and 146-147; 109, 111-112, 114, and 148-149; 117-118, 122, 124, and 150-151; 126, 127, 129-131, 133, and 152-153; 136, 139-141, 144, and 154-155, which also have not been separately argued.

With respect to dependent claims 106, 107, 113, 115, 119-121, 132, 142, 143, and 145, Appellants rely upon the same argument advanced with respect to independent claims 96, 108, 116, 125, and 134, and state that the additional teachings of Levy '445 do not remedy the asserted deficiency of the base combination (App. Br. 16). Since we find no deficiency in the base combination as discussed above, we also will sustain the rejection of dependent claims 106, 107, 113, 115, 119-121, 132, 142, 143, and 145.

CONCLUSION

Appellants failed to convince us of error in the rejection of representative claim 96 and, therefore, we sustain the Examiner's rejections of claims 96-99, 101-109, 111-122, 124-127, 129-134, 136, and 139-155. Based on the arguments made in the Brief and Reply Brief, we have no basis for questioning the unchallenged findings of the Examiner. Appellants have

not sustained their burden on appeal of showing that the Examiner erred in rejecting the claims on appeal.

ORDER

The decision of the Examiner is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

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