

THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today
(1) was not written for publication in a law journal and
(2) is not binding precedent of the Board.

Paper No. 22

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte CRAIG R. SIMPSON and MARC S. LUCAS

Appeal No. 1996-2284
Application No. 08/228,889¹

ON BRIEF

Before THOMAS, MARTIN, and FLEMING, Administrative Patent
Judges.

MARTIN, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the

¹ Application for patent filed April 18, 1994.

Appeal No. 1996-2284
Application No. 08/228,889

examiner's final rejection² of claims 1-5, all of the pending claims, under 35 U.S.C. § 103. We affirm-in-part.

The claims before us are the claims as reproduced in Appendix I to the opening brief (hereinafter, brief).³ Appendix II shows the claims as they would appear had the examiner approved the entry of the proposed "Amendment after Final Rejection" received by the PTO on January 17, 1995.⁴ Appellants complain that the proposed amendment was refused entry by the examiner "for failure to show why the proposed amendment was not presented earlier, even though the Final Rejection specified the examiner was using 'new grounds of rejection'" (Brief at 2 n.1). The examiner's refusal to enter a proposed amendment is a matter to be raised by petition for

² Paper No. 5. The examiner responded to the appellants' brief with the "Examiner's Answer" mailed August 2, 1995 (Paper No. 12) (hereinafter, Answer) and responded to appellants' reply brief with the "Examiner's Answer" mailed November 21, 1995 (Paper No. 14) (hereinafter, Supplemental Answer). Consequently, the "Supplemental Examiner's Answer" mailed October 27, 1999 (Paper No. 21) following the board's remand (Paper No. 18) is the second supplemental examiner's answer, which is not referred to hereinafter.

³ Paper No. 11.

⁴ Paper No. 6.

Appeal No. 1996-2284
Application No. 08/228,889

consideration by a Group Director (MPEP § 1002.02(c), para. 3a) (7th ed. July 1998) rather than an appealable matter for consideration by this board.

The invention

The invention relates to the correction of alignment errors occurring within the lens portion of a lithographic system as a result of environmental changes, such as changes in temperature or atmospheric pressure. In contrast to prior art systems which correct alignment errors between reference marks on a reticle and reference marks on a wafer, the disclosed invention corrects errors in the positions of the reticle reference marks in the output image of the lens without regard to the positions of any reference marks on a wafer. Referring to Figure 1 as filed, this is accomplished with the use of folding mirrors (65, 67) and detectors (59, 61), which are attached by mounting brackets 63 to a metrology plate 49 that is "mounted on the lens system itself, slightly below it" (Specification as filed at 3, lines 24-25). By means of an "Amendment after Final Rejection" received

Appeal No. 1996-2284
Application No. 08/228,889

March 6, 1995,⁵ Figure 1 was amended to add two members 57 connecting metrology plate 49 to lens 3. The detectors thus supported are located in the image plane of the lens as reflected by the folding mirrors so as to receive images of the alignment marks. The servo system shown in Figure 3 corrects any detected positional errors by actuating linear motors 19 to shift the position of the reticle chuck 15 and thereby reticle 13 relative to the metrology plate, folding mirrors, and detectors.

The claims

Claims 1 and 5, the only independent claims, read as follows:

1. A lithographic alignment system to correct misalignments resulting from environmental effects on the lens, said alignment system including,

a lens for projecting images from an object plane to an image plane,

a reticle, a reticle chuck to hold said reticle in said object plane, alignment means to align said reticle and thereby align said reticle, said reticle bearing a working pattern and a first pair of fiducial marks positioned on opposite sides of said working pattern, illumination means for

⁵ Paper No. 8, entered pursuant to the advisory action mailed March 15, 1995 (paper No. 9).

Appeal No. 1996-2284
Application No. 08/228,889

illuminating said fiducial marks and projecting images thereof through said lens,

a pair of folding mirrors secured to said lens and positioned to receive and reflect said images, a detector associated with each said mirror and positioned to receive said reflected images, said detectors being in planes which are reflections by said mirrors of said image plane, and

a feedback system operatively associating said detectors with said alignment means,

whereby misalignment caused by environmental changes in said lens can be detected and corrected.

5. A method of correcting misalignments in lithographic systems resulting from environmental effects upon the lens of the system, said method including

projecting fiducial marks from a reticle through the system lens, said fiducial marks being on opposite sides of said reticle,

intercepting the images of said fiducial marks with folding mirrors after they have passed through said lens, said mirrors directing each said image to a detector positioned in the image plane of said lens as said image plane is reflected by said mirrors,

using said detectors to determine whether said images are in alignment, and, if not in alignment, using alignment means operatively associated with said detectors to move said reticle into alignment.

The references, rejections, and level of skill in the art

The examiner relies on the following references:

Mitome et al. (Mitome)	4,901,109	Feb. 13, 1990
Sakamoto et al. (Sakamoto)	4,999,669	Mar. 12,

Appeal No. 1996-2284
Application No. 08/228,889

1991
Kosugi et al. (Kosugi) 5,262,822 Nov.
16, 1993

Claims 1-5 stand rejected under 35 U.S.C. § 103 as unpatentable for obviousness over Mitome alone and alternatively for obviousness over Kosugi in view of Sakamoto.

The level of skill in the art is represented by the references. In re Oelrich, 579 F.2d 86, 91, 198 USPQ 210, 214 (CCPA 1978) ("the PTO usually must evaluate both the scope and content of the prior art and the level of ordinary skill solely on the cold words of the literature"). In re GPAC Inc., 57 F.3d 1573, 1579, 35 USPQ2d 1116, 1121 (Fed. Cir. 1995) (Board did not err in adopting the approach that the level of skill in the art was best determined by the references of record).

The rejection based in Mitome

Figure 2 of Mitome shows a system for aligning reference marks on a reticle 8 with alignment marks on a workpiece or wafer 11 (col. 4, lines 57-61). Comparing claim 1 to Mitome's Figure 2, the examiner apparently reads the claimed lens on projection lens system 9, the claimed reticle on reticle 8, the claimed alignment means on reticle drive 21, the claimed

first pair of fiducial marks of the reticle on the "one or more alignment marks" mentioned at column 3, lines 17-21, the claimed "pair of folding mirrors secured to said lens" on the two unnumbered mirrors that are located between objective lenses 7 and 7' and reticle 8, the claimed detectors on detectors 12 and 12', which are used to detect the positions of the reticle alignment marks (col. 3, lines 31-35), and the claimed feedback system on processing unit 20. Although Mitome does not mention a reticle chuck, which is recited in claim 1, appellants do not deny the obviousness of using a reticle chuck to hold the reticle. Nor do appellants question the examiner's contention that it would have been obvious to place Mitome's detectors in the image plane. Indeed, appellants appear to concede this point by stating that Mitome "has detectors in a reflected image plane, because the detectors are receiving images of fiducial marks, not diffracted light" (Brief at 4, lines 10-11).⁶

Appellants criticize the rejection on a number of

⁶ It is not necessary to address the examiner's contention that the detectors in fact do receive diffracted light (Answer at 4, 1st full para).

Appeal No. 1996-2284
Application No. 08/228,889

grounds, the first being that Mitome is not concerned with correcting misalignments resulting from environmental effects on the lens, as recited in the preamble of claims 1 and 5 and also in the "whereby" clause in claim 1. This argument is unconvincing because appellants have not explained why Mitome's system will not inherently correct misalignments of this type while it is correcting misalignment errors between the reticle and the wafer. This argument is also inconvincing with respect to claim 5 on the ground that the body of that claim fails to specify that the misalignment to be corrected is due environmental effects on the lens. The recitation to this effect in the preamble of the claim is, in our view, a statement of intended use and thus entitled to no weight. In re Paulsen, 30 F.3d 1475, 1479-80, 31 USPQ2d 1671, 1673 (Fed. Cir. 1994).

Appellants also characterize Mitome as "directed to correcting positioning of the wafer" (Brief at 4). This characterization is only partly correct; Mitome corrects the positions of the reticle and the wafer. See col. 4, line 68 to col. 5, line 3 ("the processing unit 20 controls the reticle driving system 21 and the wafer driving system 22 so

Appeal No. 1996-2284
Application No. 08/228,889

as to avoid, reduce or eliminate the detected positional deviation").⁷ Thus, Mitome's processing unit 20 (corresponding to the claimed feedback system) controls the reticle drive 21 (corresponding to the claimed alignment means), as required to satisfy claim 1.

Appellants next argue that Mitome's folding mirrors are not "secured to said lens," as recited in claim 1,⁸ which language appellants construe as requiring that the folding mirrors be "carried by" the lens (Brief at 4) and "movable with" the lens (Reply Brief at 1). The examiner, on the other hand, argues that "the components in figure 2 are not, in reality, suspended in space; each component is secured in the system. The mirror may not be directly attached to the lens, but it is secured to the lens, albeit through intermediate components." (Answer at 4.)

In our view, this interpretation of "secured to said lens" is a reasonable one. As explained in In re Hyatt, 54 USPQ2d 1664, 1667 (Fed. Cir. 2000),

⁷ The term "avoid" was deleted from this passage by a Certificate of Correction issued September 10, 1991.

⁸ Claim 5 does not include this or a similar requirement.

Appeal No. 1996-2284
Application No. 08/228,889

during examination proceedings, claims are given their broadest reasonable interpretation consistent with the specification. See In re Graves, 69 F.3d 1147, 1152, 36 USPQ2d 1697, 1701 (Fed. Cir. 1995); In re Etter, 756 F.2d 852, 858, 225 USPQ 1, 5 (Fed. Cir. 1985) (en banc). That last proposition "serves the public interest by reducing the possibility that claims, finally allowed, will be given broader scope than is justified," In re Yamamoto, 740 F.2d 1569, 1571, 222 USPQ 934, 936 (Fed. Cir. 1984), and it is not unfair to applicants, because "before a patent is granted the claims are readily amended as part of the examination process," Burlington Indus., Inc. v. Quigg, 822 F.2d 1581, 1583, 3 USPQ2d 1436, 1438 (Fed. Cir. 1987).

See also In re Morris, 127 F.3d 1048, 1054, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997):

the PTO applies to the verbiage of the proposed claims the broadest reasonable meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art, taking into account whatever enlightenment by way of definitions or otherwise that may be afforded by the written description contained in the applicant's specification.

Appellants' specification does not define the phrase "secured to" to mean "mounted on," "carried by," or "movable with." Nor have appellants cited any authority, such as a dictionary definition, for giving "secured to" such a narrow construction. It would have been obvious to support Mitome's lens system 9, lenses 7 and 7', and folding mirrors with interconnected support elements, such as elements mounted on a

Appeal No. 1996-2284
Application No. 08/228,889

common base, with the result that the folding mirrors would be "secured to" the lens system.

Appellants note that claim 1 recites

"(a) a pair of folding mirrors (b) secured to said lens and (c) positioned to receive and reflect said images, (d) a detector associated with each said mirror and (e) positioned to receive said reflected images, said detectors (f) being in planes which are reflections by said mirrors of said image plane" (parenthetical letters added)[Brief at 4]

and contend that "Mitome doesn't show or suggest or teach these elements because it is not a 'system to correct misalignments resulting from environmental effects on the lens'" and notes that claim 5 recites similar limitations (id.). This argument is unconvincing because, as already noted, appellants have not demonstrated that Mitome's system will not inherently correct such misalignments while correcting misalignments between the reticle and the wafer.

For the foregoing reasons, the § 103 rejection of claims 1 and 5 based on Mitome is affirmed.

As for claims 2-4, which depend on claim 1, appellants argue that Mitome discloses none of the features recited in these claims. The examiner did not specifically address any of these features in the final rejection, the Answer, or the

Appeal No. 1996-2284
Application No. 08/228,889

Supplemental Answer. Consequently, we are reversing the rejection of claims

2-4 based on Mitome.

The rejection based on Kosugi and Sakamoto

Kosugi's system corrects any detected misalignment between two alignment marks on the reticle and two corresponding alignment marks on the wafer by adjusting the position of the wafer. The alignment marks on the reticle are cross-shaped transparent areas 32 (Fig. 3B). Light projected through these areas produces cross-shaped latent images in corresponding light-sensitive alignment areas 35 (Fig. 6A) on the wafer. Figure 1 shows an alignment optical system C, including a movable mirror 27 and an image pickup tube 29, for detecting the position of the latent image within one of the two wafer alignment areas 35. Mirror 27 is in the solid-line position during formation of the latent images and in the dashed-line position during scanning of the latent image by image pickup tube 29 (col. 7, lines 32-45). Kosugi explains that a second optical alignment system C (not shown) is required to detect the position of the latent image in the other of the two wafer alignment areas 35 (col. 5, lines

Appeal No. 1996-2284
Application No. 08/228,889

58-63). As a result, the examiner is incorrect to state that "Kosugi doesn't teach using two mirrors with detectors" (Final Rejection at page 3) and to therefore rely on Sakamoto as teaching this feature (Final Rejection at pages 3-4).⁹

Appellants' argument (Brief at page 5) that Kosugi does not correct alignment errors resulting from environmental effects on the lens is unpersuasive. The types of alignment errors corrected by Kosugi's system include "[a]n error with respect to the displacement caused by any change in temperature of the components, vibration or the like during the time period from the alignment to the exposure" (col. 2, lines 4-7). Appellants have not explained why Kosugi's system will not correct errors resulting from a change in the temperature of the lens while the system is correcting misalignment errors between the reticle and the wafer.

Appellants' narrow interpretation of "secured to said lens," recited in claim 1, is unconvincing for the reasons given above in the discussion of Mitome.

Appellants also argue that Kosugi's detector is not in

⁹ As Sakamoto is not relied on for any other teaching, it will be given no further consideration.

Appeal No. 1996-2284
Application No. 08/228,889

the image plane of the lens used for projecting images from the object plane to the image plane of the lithography system (Brief at page 5), as required by claims 1 and 5. The examiner has not addressed this argument, which we find persuasive. Detector 29 is not located in a part of the image plane of lens 5, which contains only wafer 4. Instead, the detector 29 is located in a different image plane which is optically coupled to the image plane of lens 5 (which contains only wafer 4) by mirror 27, objective lens 26, prism 25, and relay lens 28. Consequently, we are reversing the rejection of claims 1 and 5 based on Kosugi in view of Sakamoto as well as the 103 rejection of dependent claims 2-4 over those references.

Summary

The rejection based on Mitome is affirmed as to claims 1 and 5 and reversed as to claims 2-4. The rejection based on Kosugi in view of Sakamoto is reversed as to claims 1-5.

Appeal No. 1996-2284
Application No. 08/228,889

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

AFFIRMED-IN-PART

JAMES D. THOMAS)	
Administrative Patent Judge)	
)	
)	
)	BOARD OF PATENT
JOHN C. MARTIN)	
Administrative Patent Judge)	APPEALS AND
)	
)	INTERFERENCES
)	
MICHAEL R. FLEMING)	
Administrative Patent Judge)	

Appeal No. 1996-2284
Application No. 08/228,889

JCM:lmb

JAMES M. SMITH, ESQ.
HAMILTON, BROOK, SMITH & REYNOLDS, P.C.
TWO MILITIA DRIVE
LEXINGTON, MA 02173

Appeal No. 1996-2284
Application No. 08/228,889

cc:
James M. Smith, Esq.
[insert address]