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STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1100 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

EXAMINER
DINH, LYNDA

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte MAXIM PISARENCO and IRWAN DANI SETIJA

Appeal 2016-006075
Application 13/490,416[1]
Technology Center 2800

Before BEVERLY A. FRANKLIN, WESLEY B. DERRICK, and BRIAN D. RANGE, *Administrative Patent Judges*.

RANGE, *Administrative Patent Judge*.

DECISION ON APPEAL

SUMMARY

Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's decision rejecting claims 2–10. We have jurisdiction. 35 U.S.C. § 6(b).

We REVERSE.

[1] According to the Appellants, the real party in interest is ASML NETHERLANDS B.V. Appeal Br. 3.

STATEMENT OF THE CASE[2]

Appellants describe the invention as relating to a method of inspecting and calculating electromagnetic scattering properties of a structure. Spec. ¶ 2. The method could be used as part of a lithographic integrated circuit manufacturing technique. *Id.* at ¶ 3. The technique can be used to monitor the lithographic process. *Id.* at ¶ 4. The inspection apparatus is used to identify errors in an exposed substrate so, for example, a correction can be made prior to exposing later substrates. *Id.* at ¶ 55.

Claim 8, reproduced below with emphasis added to certain key recitations, is illustrative of the claimed subject matter:

> 8. A method of reconstructing an approximate structure of a finite periodic structure having a direction of periodicity, the method comprising:
>
> illuminating, using an illumination system, the finite periodic structure with radiation;
>
> detecting, using a detection system, an electromagnetic scattering property arising from the illumination;
>
> estimating, using a processing unit, at least one structural parameter;
>
> **determining, using the processing unit, at least one model electromagnetic scattering property from the at least one structural parameter;**
>
> comparing, using the processing unit, the detected electromagnetic scattering property to the at least one model electromagnetic scattering property; and
>
> determining, using the processing unit, an approximate structure of the finite periodic structure based on result of the comparison,

[2] In this decision, we refer to the Final Office Action dated May 5, 2015 ("Final Act."), the Appeal Brief filed December 3, 2015 ("Appeal Br."), the Examiner's Answer dated April 14, 2016 ("Ans."), and the Reply Brief filed May 25, 2016 ("Reply Br.").

> wherein the model electromagnetic scattering property is calculated by numerically calculating electromagnetic scattering properties using spatial discretization of the finite periodic structure in the direction of periodicity and numerically calculating electromagnetic scattering properties using spectral discretization of the finite periodic structure in a direction orthogonal to the direction of periodicity.

Appeal Br. 17–18 (Claims App'x).

Figure 5 of the Specification, reproduced below, provides a flowchart that parallels many of the recitations of claim 8.

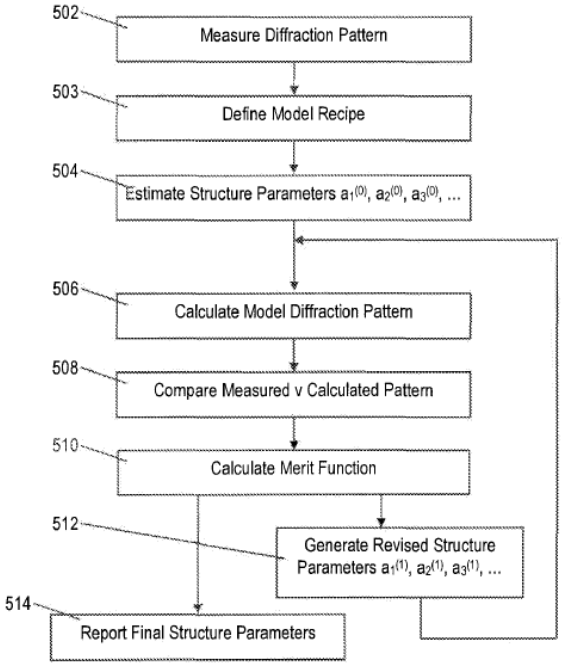

Fig. 5

Figure 5 depicts an example process for reconstruction of a structure from scatterometer measurements. Spec. ¶ 15.

REJECTIONS AND REFERENCES

On appeal, the Examiner maintains the rejection of claims 2–10 under 35 U.S.C. § 102 as anticipated by Den Boef et al., US 2006/0066855 A1, March 30, 2006 (hereinafter "Den Boef"). Final Act. 3.

The Examiner also maintains the rejection of claim 5 under 35 U.S.C. § 103(a) as obvious over Den Boef in view of B. Friedlander et al., Scattering Theory and Linear Least Squares Estimation Part II: Discrete Time Problems, Decision and Control including the 14th Symposium on Adaptive Processes, 1975 IEEE Conference (Dec. 10–12 1975) (hereinafter "Friedlander").

ANALYSIS

Rejection 1. The Examiner rejects claims 2–10 as anticipated by Den Boef. Independent claim 8 recites "estimating . . . at least one structural parameter." Appeal Br. 17 (Claims App'x). The recited "structural parameter" may refer to, for example, "the overlay error between successive layers formed in or on the patterned substrate and critical linewidth of developed photosensitive resist." Spec. ¶ 4. Claim 8 further recites "determining . . . at least one model electromagnetic scattering property from the at least one structural parameter." Appeal Br. 17 (Claims App'x). Thus, determination of the model electromagnetic scattering property must be based upon the *estimated* structural parameter previously recited. Claim 8 also recites "wherein the model electromagnetic scattering property is calculated by . . . ." *Id.* at 18. This recitation further restricts how the recited model electromagnetic scattering property must be determined.

Appellants argue that Den Boef does not teach or suggest calculating a model property based on the claim 8's recited method of determining the model electromagnetic scattering property. Appeal Br. 8–12; Reply Br. 3–5. Appellants further argue that the Examiner errs by analogizing modeling electromagnetic scattering property (as recited) to measuring parameters (as in Den Boef). Reply Br. 3–5. As explained below, we agree that the

Examiner has not adequately explained how Den Boef meets the recitations of claim 8 concerning how the electromagnetic scattering property is modeled.

The Examiner makes a variety of findings relating to various passages of Den Boef when explaining how Den Boef teaches the recited modeling of an electromagnetic scattering property. For example, the Examiner finds that, in Den Boef, "[m]easured parameters are compared with modeled parameters." Ans. 2–3 (citing Den Boef ¶ 149). The cited portion of Den Boef, however, does not reference determining a model electromagnetic scattering property based upon an estimated structural parameter.

The Examiner also finds that Den Boef teaches gratings that are "periodic in two directions. . . ." Ans. 4 (citing Den Boef ¶ 68). The Examiner does not, however, adequately explain how the teachings regarding gratings relate to calculating a model electromagnetic scattering property from an estimated structural parameter or how the teachings relate to calculating the property numerically "using spatial discretization of the finite periodic structure in the direction of periodicity" or "in a direction orthogonal to the direction of periodicity," as recited in both independent claim 8 and independent claim 10.

The Examiner finds that Den Boef teaches "structure giving rise to a reflected spectrum is reconstructed by comparing to a library of patterns derived from simulation" (Ans. 4), but this portion of Den Boef (Den Boef ¶ 8) relates to how structure is calculated. The Examiner does not adequately explain how this relates to calculating a model electromagnetic scattering property from an estimated structural parameter. Appeal Br. 8. Similarly, the Examiner cites paragraphs 91–95 of Den Boef (Final Act. 6;

Ans. 4), but again does not adequately explain how these paragraphs relate to modeling a model scattering property based on estimated structure. Appeal Br. 9.

Because the Examiner does not adequately establish that Den Boef teaches each recitation of claim 8, we do not sustain the Examiner's rejection of this claim. We also do not sustain the Examiner's rejection of claims 2–7 and 9 because those claims depend from claim 8.

The other independent claim on appeal, claim 10, recites a processor configured to perform operations similar to the recitations of claim 8. Appeal Br. 18–19 (Claims App'x). For the reasons explained above with respect to claim 1, we also do not sustain the Examiner's rejection of claim 10.

Rejection 2. The Examiner rejects claim 5 as obvious over Den Boef in view of Friedlander. The Examiner's explanation of Friedlander does not cure the error addressed above. Final Act. 8–9; *see also* Appeal Br. 12–13. We therefore do not sustain this rejection.

DECISION

For the above reasons, we reverse the Examiner's rejection of claims 2–10.

REVERSED