UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte CHARLES N. ARCHIE

Appeal 2007-3815
Application 09/902,374
Technology Center 2800

Decided: September 3, 2008

Before KENNETH W. HAIRSTON, JOSEPH F. RUGGIERO,
and MAHSHID D. SAADAT, *Administrative Patent Judges*.
HAIRSTON, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant appeals under 35 U.S.C. § 134 from a final rejection of claims 1 to 26. We have jurisdiction under 35 U.S.C. § 6(b).

We will reverse the rejection.

STATEMENT OF THE CASE

Appellant has invented a method of producing an optimum critical dimension value that comprises structural measurements of a critical dimension structure that are only relevant to a critical dimension of the critical dimension structure (Figures 7 and 8; Specification 7, 8, and 11 to 13).

Claim 1 is representative of the claims on appeal, and it reads as follows:

1. A method of producing an optimum critical dimension value, said method comprising:

acquiring a waveform of data for a critical dimension structure;

determining a stepper focus parameter for said critical dimension structure;

calculating an approximate critical dimension measurement for said critical dimension structure;

calibrating said data of said waveform by determining at least three best fit data parameters for improving a linearity of said waveform;

combining said stepper focus parameter with said approximate critical dimension measurement and said best fit data parameters, wherein said combining removes structural bias parameters from said approximate critical dimension measurement; and

generating said optimum critical dimension value from said combining, wherein said optimum critical dimension value comprises structural measurements of said critical dimension structure that are only relevant to a critical dimension of said critical dimension structure.

The prior art relied upon by the Examiner in rejecting the claims on appeal is:

Su	US 6,388,253 B1	May 14, 2002 (filed Jun. 29, 1999)
Tanaka	US 6,616,759 B2	Sep. 9, 2003 (filed Sep. 6, 2001)

The Examiner rejected claims 1 to 26 under 35 U.S.C. § 103(a) based upon the teachings of Su and Tanaka.

ISSUE

Appellant contends that neither Su nor Tanaka, whether considered singly or in combination, discloses the claimed steps of generating an optimum critical dimension value based on three best fit data parameters in combination with a stepper focus parameter (Br. 15 and 20). Thus, the issue before us is whether the applied prior art teaches or would have suggested to the skilled artisan generating an optimum critical dimension value based on three best fit data parameters in combination with a stepper focus parameter as set forth in the claims on appeal?

FINDINGS OF FACT

1. Appellant has not challenged the Examiner's findings (Ans. 3 to 5) that Su discloses the claimed steps of "acquiring a waveform of data for a critical dimension structure," "determining a stepper focus parameter for said critical dimension structure," and "calculating an approximate critical dimension measurement for said critical dimension structure."

2. The Examiner has acknowledged (Ans. 5 and 6) that "Su (253) as applied above fails to teach a method of calibrating the waveform data by determining at least three best-fit data parameters, and combining the best-fit data parameters with a stepper focus parameter and a critical dimension measurement to improve the linearity of the critical dimension waveform, as recited in claims 1, 8, 10, 12, 19, and 20."

3. Tanaka describes a method and system for monitoring a semiconductor processing apparatus 1 by sensing the processing state of the apparatus via sensing unit 3 (Figure 1A; Abstract; col. 3, ll. 31 to 43). The sensed data is stored in storage unit 4 (col. 3, ll. 58 and 59). A storage unit 6 preserves measured values of processing results for each of a variety of semiconductor devices (col. 4, ll. 1 and 12). A model equation generation unit 7 fetches sensed data from storage unit 4 and measured values for a sample of the same type of semiconductor device undergoing processing by the semiconductor processing apparatus 1 from storage unit 6, and "generates a model equation for predicting measured values of processing results using the sensed data as explanatory variables" (col. 4, ll. 13 to 21). The generated model equation is stored in model equation storage unit 8 along with other model equations generated for other semiconductor devices (col. 5, ll. 38 to 43). Thereafter, when a semiconductor device of a certain type is loaded into the semiconductor processing apparatus 1, and sensed by sensor 3, a model equation corresponding to the loaded semiconductor device is fetched from model equation storage unit 8 and loaded into model equation based prediction unit 9 (col. 5, ll. 43 to 46). The model equation prediction unit 9 calculates predicted values for processing results for the

semiconductor device, and the calculated results are sent to process recipe control unit 10 (col. 5, ll. 47 to 56). The calculated processing results are fed back to semiconductor processing apparatus 1 (Fig. 1A).

4. The model equation generation unit 7 in Tanaka uses normal multiple regression to generate a model equation from sensed data for prediction of processing results (Figs. 6 and 7; col. 5, ll. 8 to 34).

5. The model equation regression analysis may lead to a linear result (Fig. 6; col. 5, ll. 34 to 37).

PRINCIPLES OF LAW

The Examiner bears the initial burden of presenting a prima facie case of obviousness. *In re* Oetiker, 977 F.2d 1443, 1445 (Fed. Cir. 1992). If that burden is met, then the burden shifts to the Appellant 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 977, 988 (Fed. Cir. 2006).

ANALYSIS

Although we agree with the Examiner that Tanaka improves the linearity of the monitored semiconductor manufacturing data (Ans. 6; Findings of Fact 4 and 5), we do not, however, agree with the Examiner that "Tanaka (759) discloses a method of monitoring semiconductor manufacturing that includes the generation of a model equation from three parameters of sensed data, and using the best fit of the three parameters via

multiple regression to improve linearity of the data" (Ans. 6), or that "[i]t is implied . . . that removing faulty process shapes in accordance with Tanaka (759) is equivalent to improving linearity, as recited in claims 1, 8, 10, 12, 19, and 20" (Ans. 6). As indicated *supra* (Finding of Fact 3), Tanaka is completely silent as to calibrating data of a waveform of data for a critical dimension structure by determining at least three best fit data parameters for improving linearity of that waveform, combining a stepper focus parameter with an approximate critical dimension measurement for the critical dimension structure and the best fit data parameter to remove structural bias parameters from the approximate critical dimension measurement, and generating an optimum critical dimension value from the combined parameters and critical dimension measurement wherein the optimum critical dimension value comprises structural measurements of the critical dimension structure that are only relevant to a critical dimension of the critical dimension structure as set forth in the claims on appeal.

In view of the foregoing, we agree with the Appellant that the applied references neither teach nor would have suggested to the skilled artisan the generation of an optimum critical dimension value based on three best fit data parameters in combination with a stepper focus parameter as set forth in the claims on appeal without the benefit of impermissible hindsight (Br. 15, 20, and 21).

CONCLUSION OF LAW

The Examiner has not established the obviousness of independent claims 1, 8, 10, 12, 19, and 20, and the claims that depend therefrom.

ORDER

The obviousness rejection of claims 1 to 26 is reversed.

REVERSED

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