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(54) **METHOD FOR COMPENSATING PROXIMITY EFFECTS OF PARTICLE BEAM LITHOGRAPHY PROCESSES**

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See application file for complete search history.

(56)

References Cited

U.S. PATENT DOCUMENTS

3,943,281 A	3/1976	Keller et al.
4,099,062 A	7/1978	Kitcher
4,264,711 A	4/1981	Greeneich
4,426,564 A	1/1984	Steigerwald et al.
4,426,584 A	1/1984	Bohlen et al.
4,498,010 A	2/1985	Biechler et al.
4,504,558 A	3/1985	Bohien et al.
4,520,269 A	5/1985	Jones
4,644,170 A	2/1987	Komatsu
4,801,843 A	1/1989	Mensies
4,823,046 A	4/1989	Sluyterman
4,943,729 A	7/1990	Ando et al.
5,051,598 A	9/1991	Ashton et al.
5,086,398 A	2/1992	Moriizumi
5,182,718 A	1/1993	Harafuji et al.

(Continued)

OTHER PUBLICATIONS

Mihir Parikh, "Self-consistent proximity effect correction technique for resist Exposure (SPECTRE)", J. Vac. Sci. Technol., vol. 15, No. 3, pp. 931-933, May/June 1978.

(Continued)

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ABSTRACT

A method for compensating proximity effects of particle beam lithography processes is provided. The method includes the following steps. A control pattern is provided. A dissection process is provided. A set of control points are provided. The control pattern is defined as an input pattern of a lithography process. A target pattern is provided. A set of target points are produced. A set of target measurement values are provided. An actual pattern is defined. A set of actual measurement values are provided. A set of comparison values are calculated. An adjusting strategy is provided. A corrected pattern is produced. The corrected pattern is defined as an updated input of the lithography process.

13 Claims, 3 Drawing Sheets

