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Ide et al.

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(54) **DISCRETE PATTERN, APPARATUS, METHOD, AND PROGRAM STORAGE DEVICE FOR GENERATING AND IMPLEMENTING THE DISCRETE PATTERN**

(51) **Int. Cl.**⁷ **G02B 6/04**; G02B 6/00
(52) **U.S. Cl.** **385/120**; 385/147; 345/30
(58) **Field of Search** 385/120-126, 385/141, 147; 257/14, 24, 321; 345/30

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(57) **ABSTRACT**

A discrete pattern, formed by dots discretely arranged in two dimensions, is provided wherein the dots are generated in a low discrepancy sequence. The dots are preferably generated in a discrete pattern wherein the square of discrepancy D satisfies the formula,

$$D \leq 0.13N^{-1.15} \quad (1)$$

Further, the method provides for generation of, and the apparatus provides implementation of, a discrete pattern even when the filling factor rapidly changes by automatically generating or deleting dots.

31 Claims, 49 Drawing Sheets

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Related U.S. Application Data

(63) Continuation-in-part of application No. 10/127,102, filed on Apr. 19, 2002, now Pat. No. 6,754,419.

(30) **Foreign Application Priority Data**

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