Docket #: S11-473A

Printing Lens

Stanford researchers have developed a method for manufacturing a UV curable epoxy micro lens. Apertures of arbitrary size can be manufactured for micro lenses using this method. This micro lens is particularly useful in microscopes having a shorter optical path length over conventional optical microscopes.

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Prakash et al.

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(54) **OPTICAL LENS FABRICATION**

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CPC G02B 21/02; G02B 3/0087; G02B 5/005; G02B 21/0008; G02B 3/00; B29D 11/00432; B29D 11/00365
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,789,460 A 4/1957 Kaufman
2,986,830 A 6/1961 Underberg et al.
(Continued)

FOREIGN PATENT DOCUMENTS

DE 2644949 A1 4/1977
DE 19531819 A1 2/1997
(Continued)

OTHER PUBLICATIONS

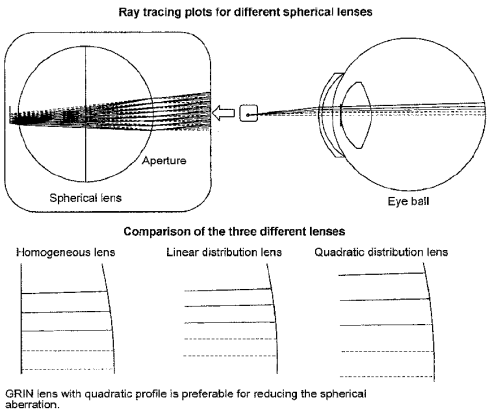
Lorusso et al.; Experimental resolution measurement in critical dimension scanning electron microscope metrology; Scanning; 25(4); Dec. 6, 2003 (Abstract Only).

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(57) **ABSTRACT**

Optical lenses and methods for manufacturing optical lenses are disclosed herein. Lenses having a reduced aperture size are also disclosed herein along with methods for making the same. The optical lenses disclosed herein can be made having improved optical properties. The lenses can be used in optical microscopes, including optical microscopes with a shorter optical path relative to conventional optical microscopes.

20 Claims, 17 Drawing Sheets



Patents

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