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United States Patent [19]

Komma et al.

[54] **COMPOUND OBJECTIVE LENS HAVING TWO FOCAL POINTS**

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[30] **Foreign Application Priority Data**

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[51] **Int. Cl.6** G02B 5/32; G11B 7/00
[52] **U.S. Cl.** **359/19**; 369/44.23; 369/94; 369/103; 369/112
[58] **Field of Search** 359/15, 16, 19; 369/94, 369/103, 109, 112, 44.23

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[57] **ABSTRACT**

A compound objective lens is composed of a hologram lens for transmitting a part of incident light without any diffraction to form a beam of transmitted light and diffracting a remaining part of the incident light to form a beam of first-order diffracted light, and an objective lens for converging the transmitted light to form a first converging spot on a front surface of a thin type of first information medium and converging the diffracted light to form a second converging spot on a front surface of a thick type of second information medium. Because the hologram lens selectively functions as a concave lens for the diffracted light, a curvature of the transmitted light differs from that of the diffracted light. Therefore, even though the first and second information mediums have different thicknesses, the transmitted light incident on a rear surface of the first information medium is converged on the its front surface, and the diffracted light incident on a rear surface of the second information medium is converged on the its front surface. That is, the compound objective lens has two focal points.

34 Claims, 43 Drawing Sheets
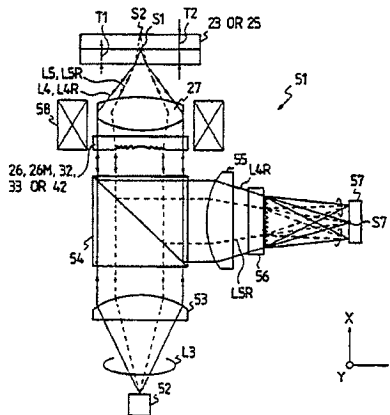
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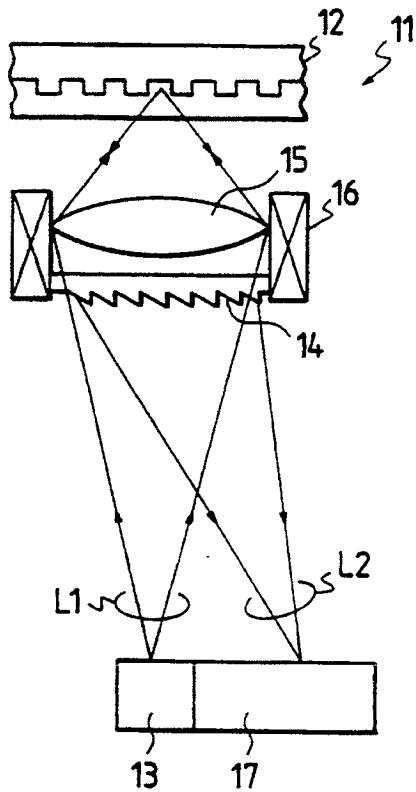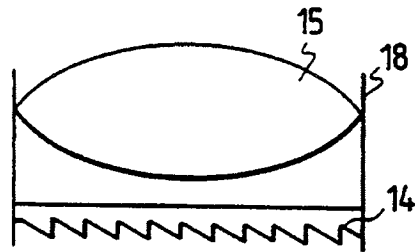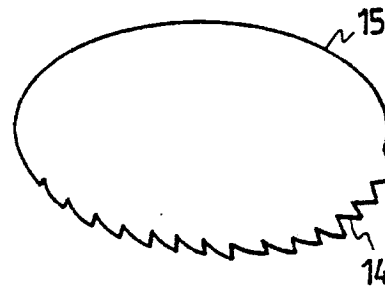
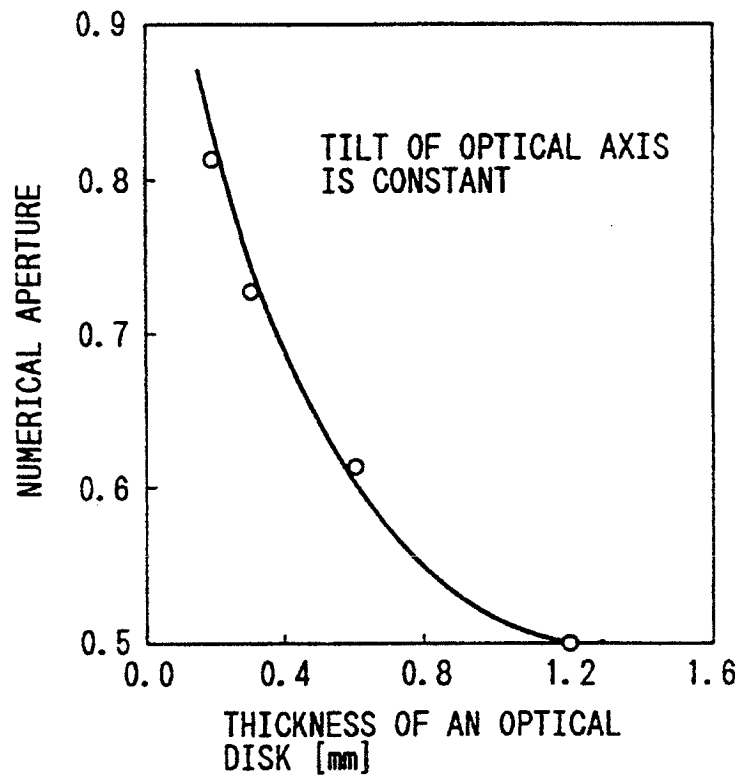FIG. 1
PRIOR ART

FIG. 2A
PRIOR ART

FIG. 2B
PRIOR ART

FIG. 3　　PRIOR ART

TILT OF OPTICAL AXIS
IS CONSTANT

NUMERICAL APERTURE

0.9
0.8
0.7
0.6
0.5

0.0　0.4　0.8　1.2　1.6

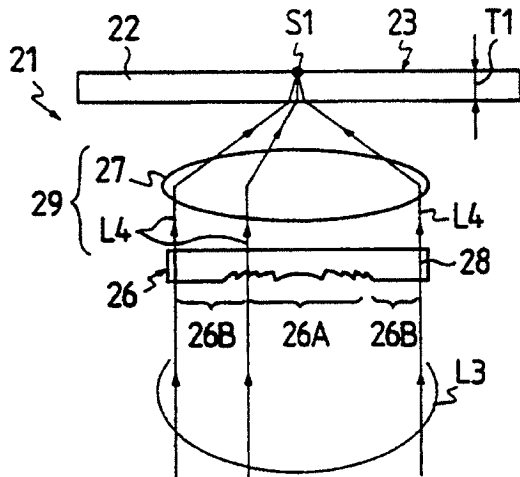THICKNESS OF AN OPTICAL
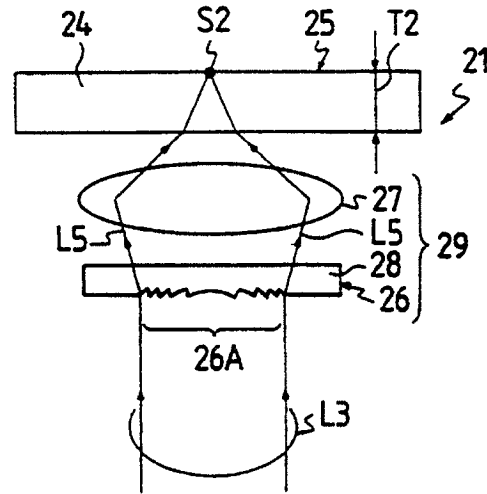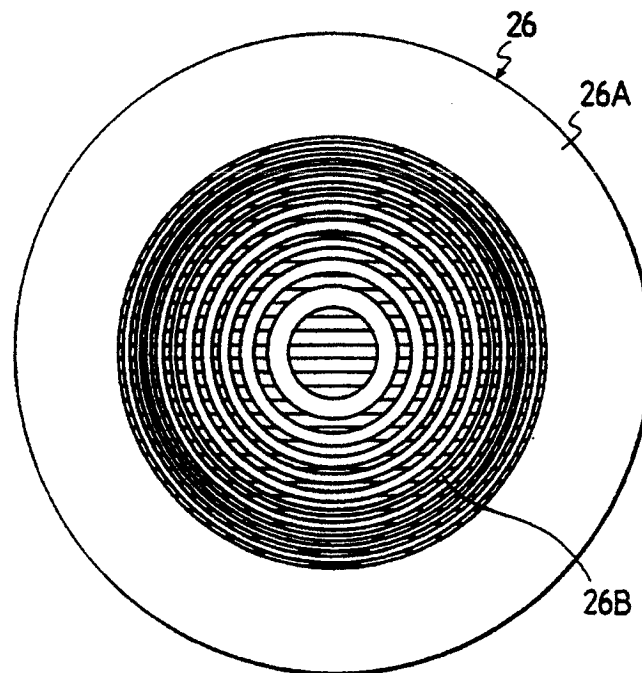DISK [mm]

FIG. 4A

FIG. 4B

FIG. 5

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