



US005696750A

# United States Patent [19] Katayama

[11] Patent Number: **5,696,750**  
[45] Date of Patent: **Dec. 9, 1997**

[54] **OPTICAL HEAD APPARATUS FOR DIFFERENT TYPES OF DISKS**

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### OTHER PUBLICATIONS

[75] Inventor: **Ryuichi Katayama**, Tokyo, Japan

Y. Komma et al., "Dual Focus Optical Head for 0.6 mm and 1.2 mm Disk", Optical Review vol. 1, No. 1, pp. 27-29, 1994.

[73] Assignee: **NEC Corporation**, Japan

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*Attorney, Agent, or Firm*—Hayes, Soloway, Hennessey, Grossman & Hage, P.C.

[21] Appl. No.: **658,373**

[22] Filed: **Jun. 5, 1996**

### [57] ABSTRACT

### [30] Foreign Application Priority Data

Jun. 5, 1995	[JP]	Japan	.....	7-137675
Aug. 15, 1995	[JP]	Japan	.....	7-208026
Sep. 7, 1995	[JP]	Japan	.....	7-230099
Mar. 7, 1996	[JP]	Japan	.....	8-049781

In an optical head apparatus for two or more different types of discs, there are provided a first light source for a first wavelength light beam, a second light source for a second wavelength light beam, and an objective lens for leading the first and second wavelength light beams to one of the discs. A holographic optical element is provided to converge or diverge only one of the first and second wavelength light beams. Or, an aperture limiting element is provided to adjust an effective numerical aperture of the objective lens for only one of the first and second wavelength light beams.

[51] Int. Cl.<sup>6</sup> ..... **G11B 7/00**

[52] U.S. Cl. .... **369/112; 369/109**

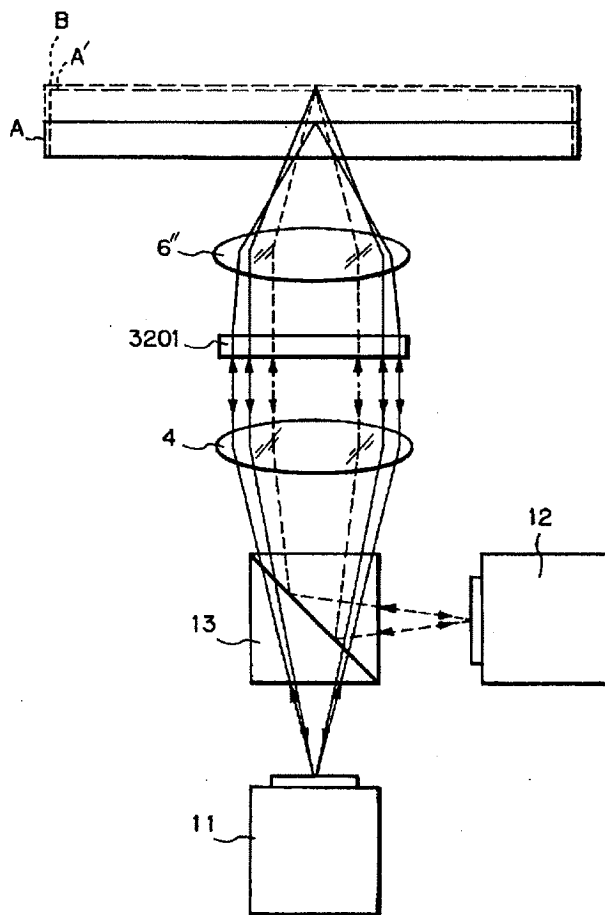
[58] Field of Search ..... 369/112, 103,  
369/109, 110, 44.12, 120, 121

### [56] References Cited

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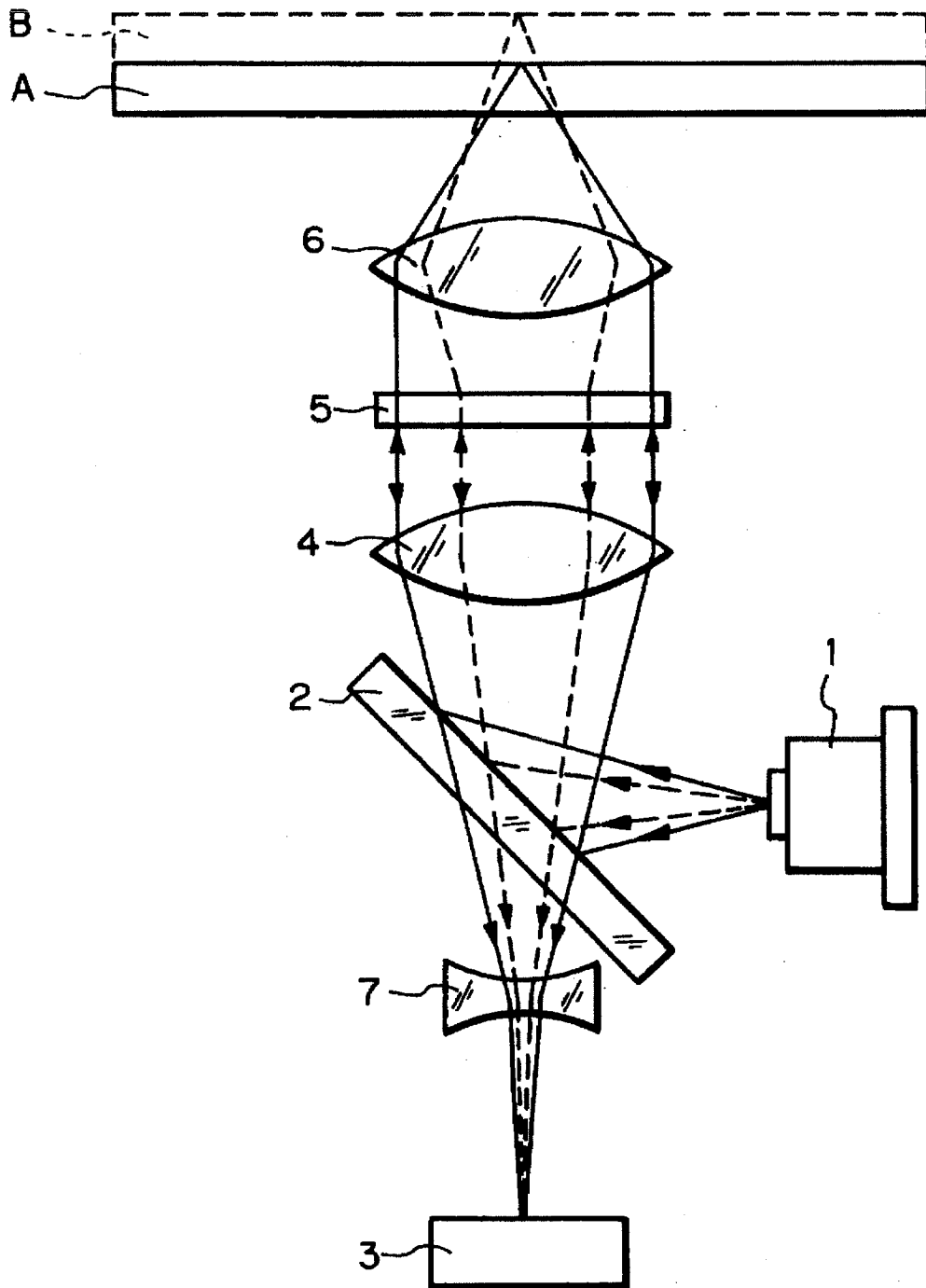
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**24 Claims, 34 Drawing Sheets**

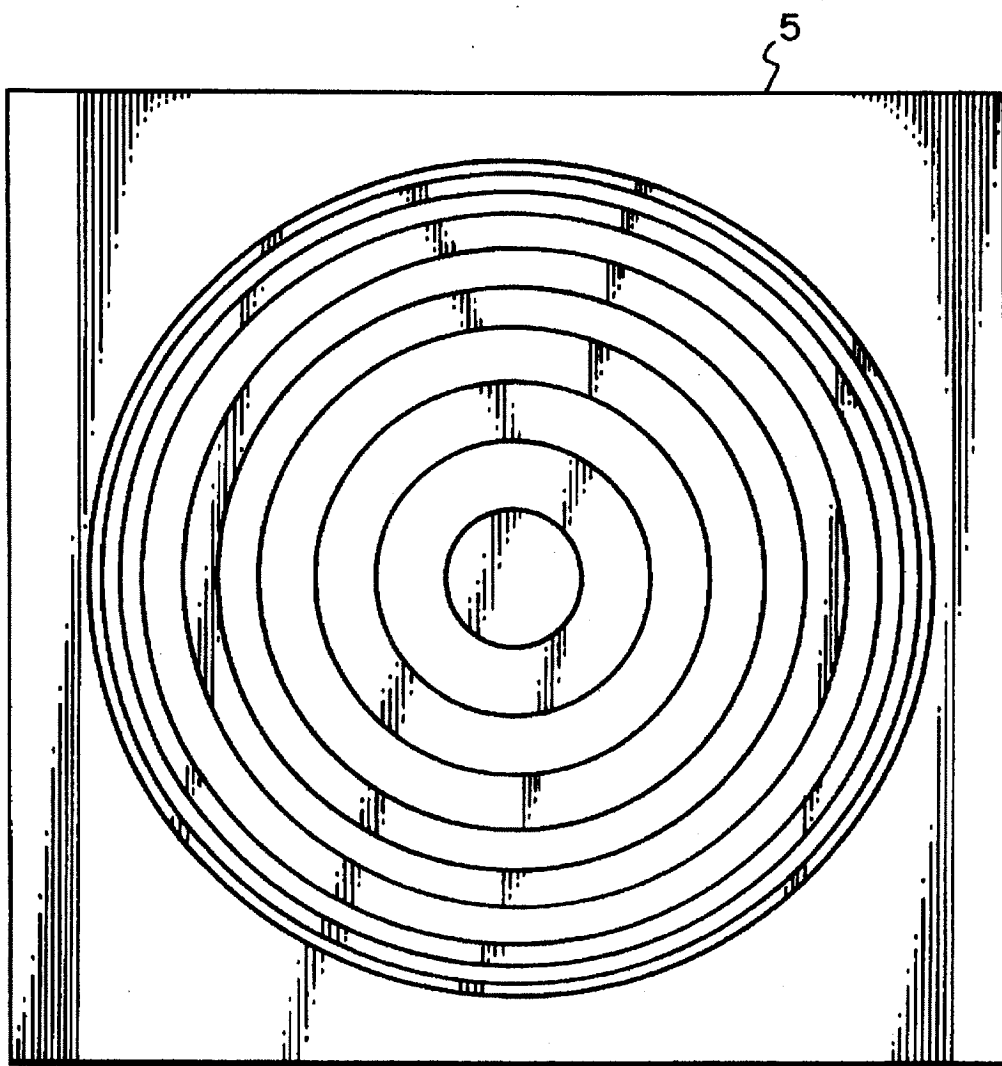


LG Electronics, Inc. et al.  
**EXHIBIT 1002**

**Fig. 1** PRIOR ART



*Fig. 2* PRIOR ART



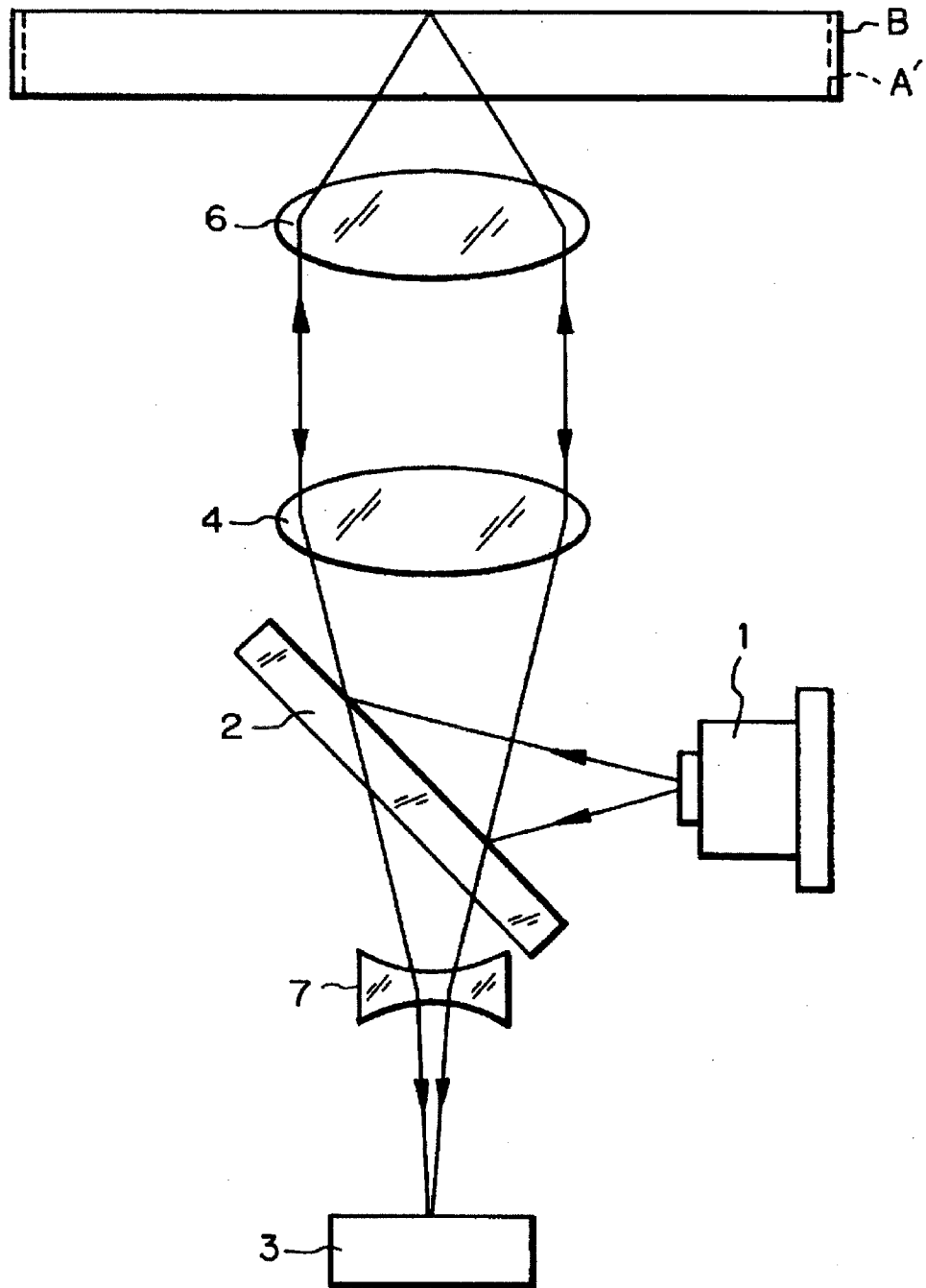


**Fig. 3A**  
PRIOR ART



**Fig. 3B**  
PRIOR ART

**Fig. 4** PRIOR ART



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