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# United States Patent [19]

[11] **Patent Number:** **5,861,999**

**Tada**

[45] **Date of Patent:** **Jan. 19, 1999**

[54] **SUPER WIDE ANGEL LENS SYSTEM USING AN ASPHERICAL LENS**

3,856,385 12/1974 Takahashi ..... 359/751

4,952,040 8/1990 Igarashi ..... 359/708

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*Attorney, Agent, or Firm*—Greenblum & Bernstein, P.L.C.

[21] Appl. No.: **915,603**

[57] **ABSTRACT**

[22] Filed: **Aug. 21, 1997**

[30] **Foreign Application Priority Data**

Aug. 23, 1996 [JP] Japan ..... 8-222394

Jul. 28, 1997 [JP] Japan ..... 9-201903

A retrofocus type super wide angle lens system includes a front lens group of negative power and a rear lens group of positive power, arranged in this order from the object side. The front lens group consists of a negative meniscus first lens element with a convex surface facing the object side and a second lens element having at least one aspherical surface, arranged in this order from the object side. The aspherical second lens element is shaped such that it forms a biconcave lens in the vicinity of the optical axis and forms a negative meniscus lens with a convex surface located on the object side at a peripheral portion thereof.

[51] **Int. Cl.<sup>6</sup>** ..... **G02B 13/04; G02B 13/18**

[52] **U.S. Cl.** ..... **359/752; 359/713; 359/753**

[58] **Field of Search** ..... 359/749, 750, 359/751, 752, 753, 708, 713

[56] **References Cited**

**U.S. PATENT DOCUMENTS**

3,506,339 4/1970 Kazamaki ..... 359/751

**10 Claims, 9 Drawing Sheets**

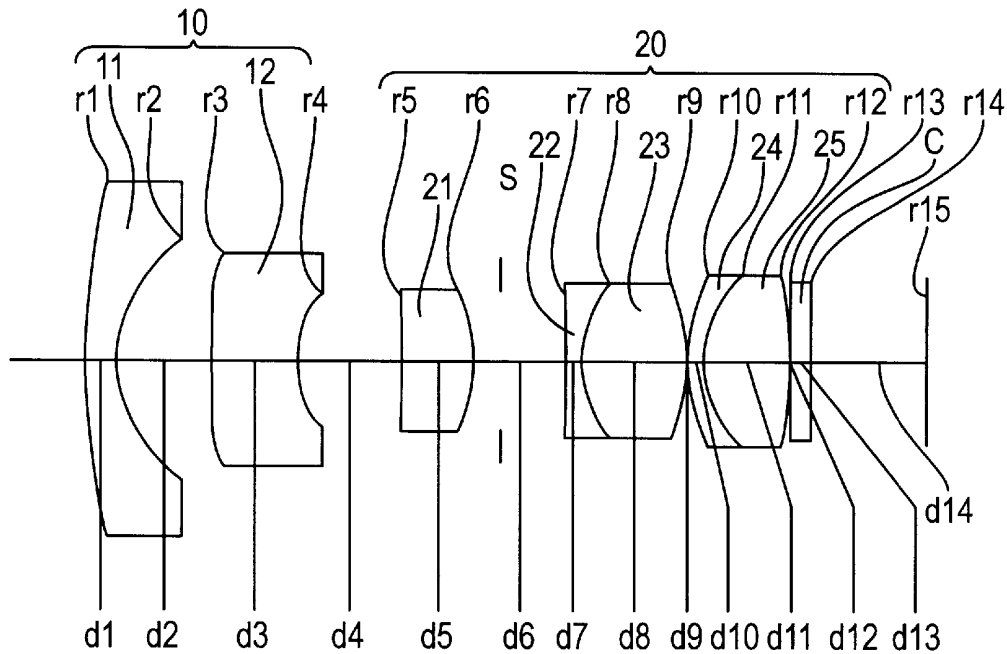


FIG. 1

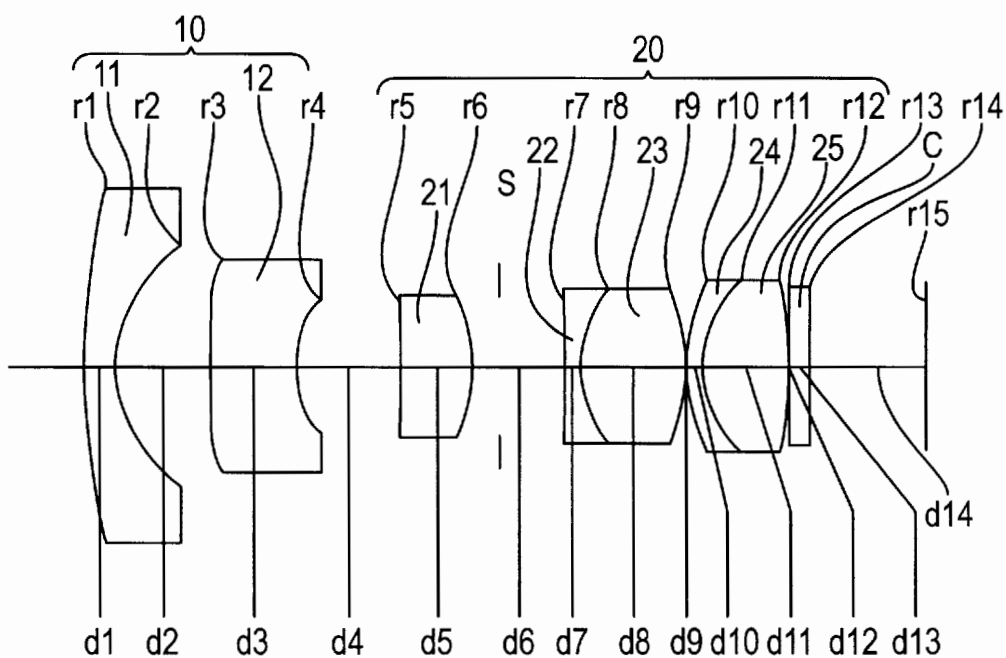


FIG. 2

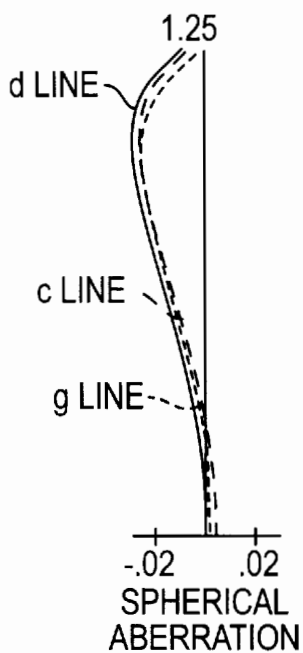


FIG. 3

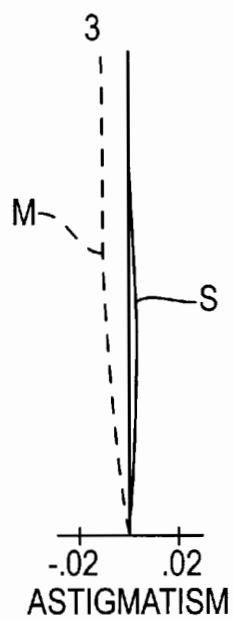


FIG. 4

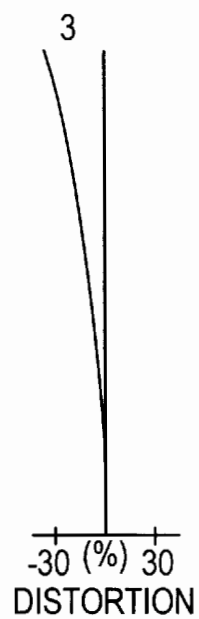


FIG. 5A

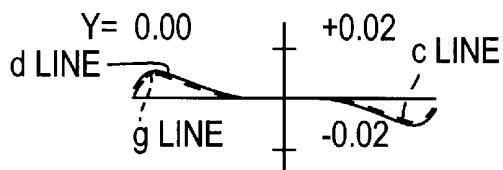


FIG. 5B

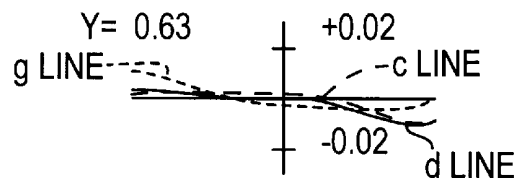


FIG. 5C

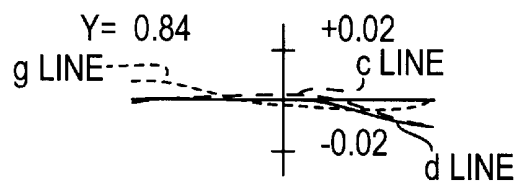


FIG. 5D

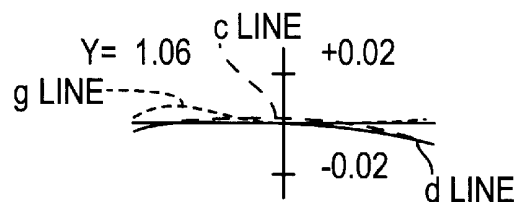


FIG. 6

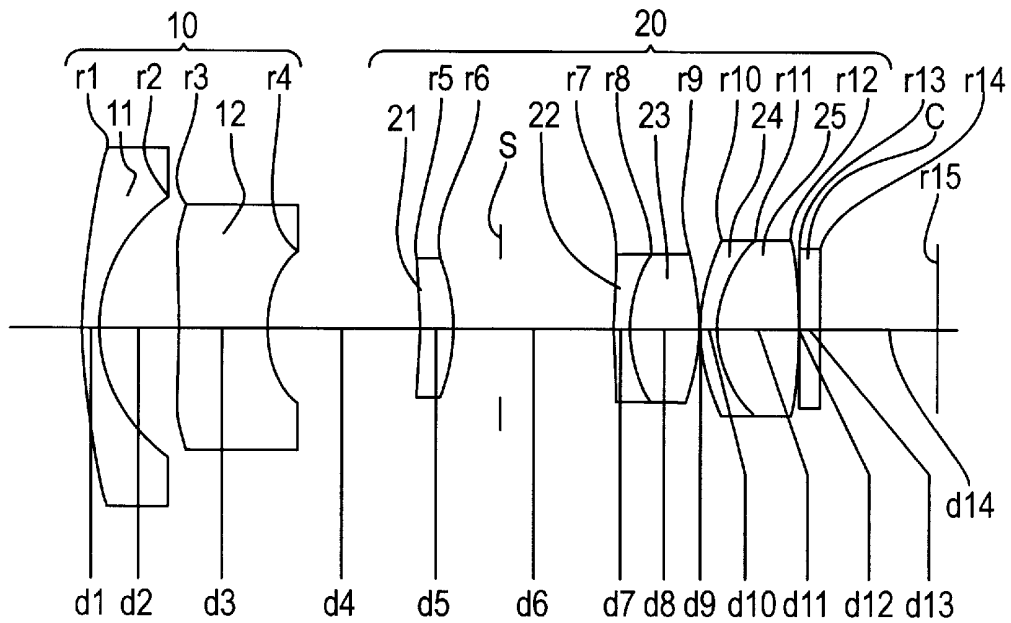


FIG. 7

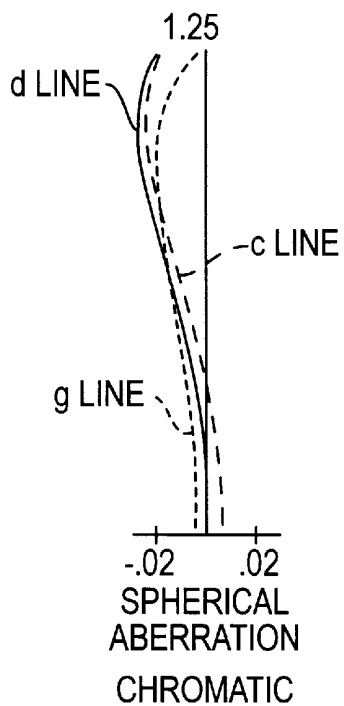


FIG. 8

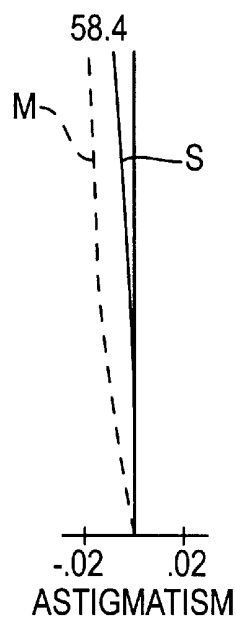


FIG. 9

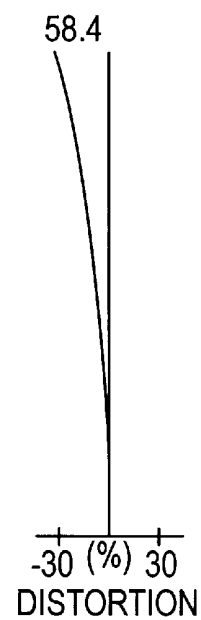


FIG. 10A

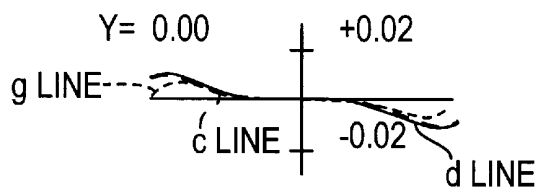


FIG. 10B

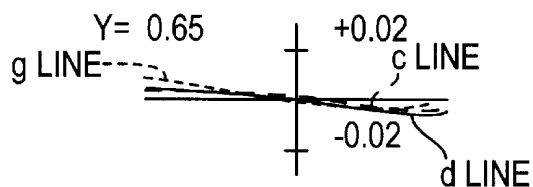


FIG. 10C

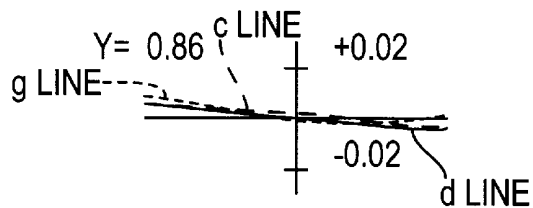
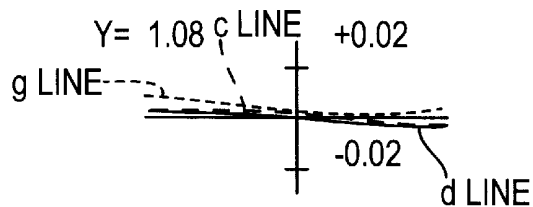


FIG. 10D



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