United States Patent [19]

Norton et al.

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[54] **BROADBAND MICROSPECTRO-REFLECTOMETER**

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Related U.S. Application Data

[63] Continuation of Ser. No. 899,666, Jun. 16, 1992, abandoned.

[51] Int. Cl.^{6} **G01N 21/33**

[52] U.S. Cl. **250/372**; 250/339.11; 356/448

[58] Field of Search 250/372, 339.11; 356/448, 326, 328

[56] **References Cited**

U.S. PATENT DOCUMENTS

Re. 34,783	11/1994	Coates .	
3,214,596	10/1965	Schwerdt, Jr. et al. .	
3,752,559	8/1973	Fletcher et al. .	
3,975,084	8/1976	Block .	
3,999,855	12/1976	Hirschfeld .	
4,106,856	8/1978	Babish .	
4,158,505	6/1979	Mathisen et al. .	
4,645,349	2/1987	Tabata	356/382
4,712,912	12/1987	Messerschmidt .	
4,758,088	7/1988	Doyle .	
4,770,530	9/1988	Van Aken et al.	356/323
4,795,256	1/1989	Krause et al.	356/320
4,844,617	7/1989	Kelderman et al.	356/372
4,848,904	7/1989	Sapp et al. .	
4,899,055	2/1990	Adams .	
4,906,844	3/1990	Hall .	
4,945,220	7/1990	Mallory et al. .	
4,983,823	1/1991	Isobe .	
5,067,805	11/1991	Corle et al. .	

FOREIGN PATENT DOCUMENTS

29 05 727 A1	11/1979	Germany	356/448
57-106846	7/1982	Japan	356/326
1-308930	12/1989	Japan	356/328

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[57] **ABSTRACT**

An improved method and apparatus for measuring the relative reflectance spectra of an observed sample (3) and method and apparatus for autofocussing the sample (3). A broadband visible and ultraviolet beam (42) is split into a sample beam (46) and a reference beam (48). The sample beam (46) is reflected off the surface of the sample (3), and the spectrum of the reflected sample beam (46) is compared to the spectrum of the reference beam (48) to determine the relative reflectance spectrum of the sample (3). A video camera (96) is provided for viewing the sample (3). The autofocus system has a course-focus mode and a fine-focus mode. In the course-focus mode, the sample (3) is focused when the centroid of the sample image is centered on a position sensitive detector (99). In the fine-focus mode, the sample is focused when the intensity of light reaching the detector (99) is minimized.
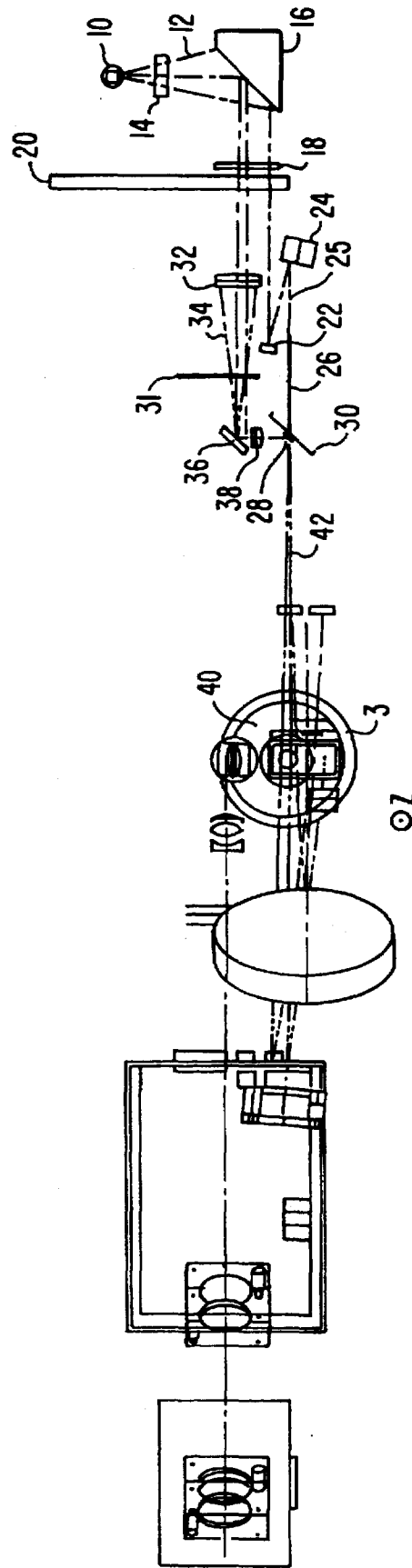
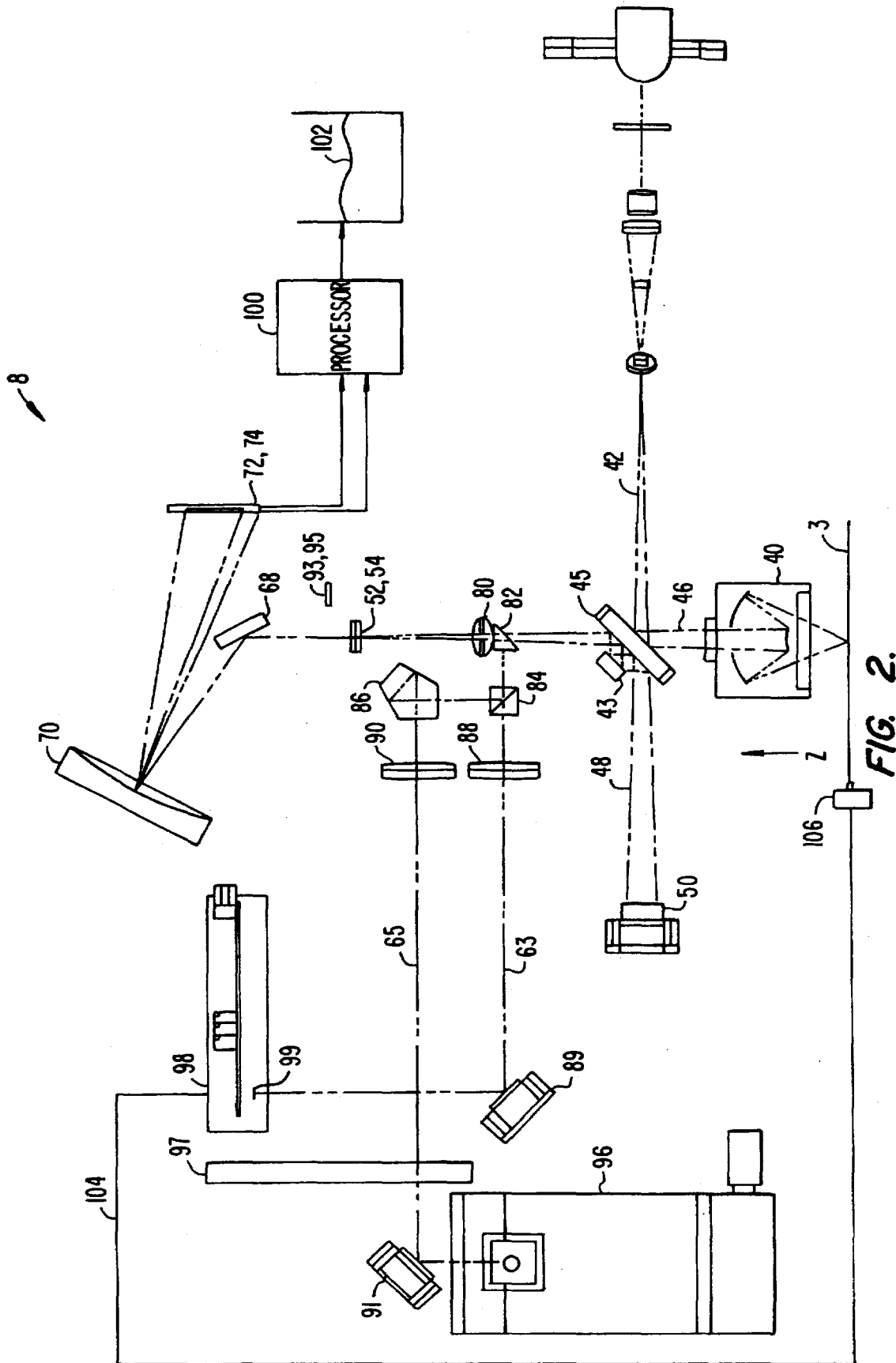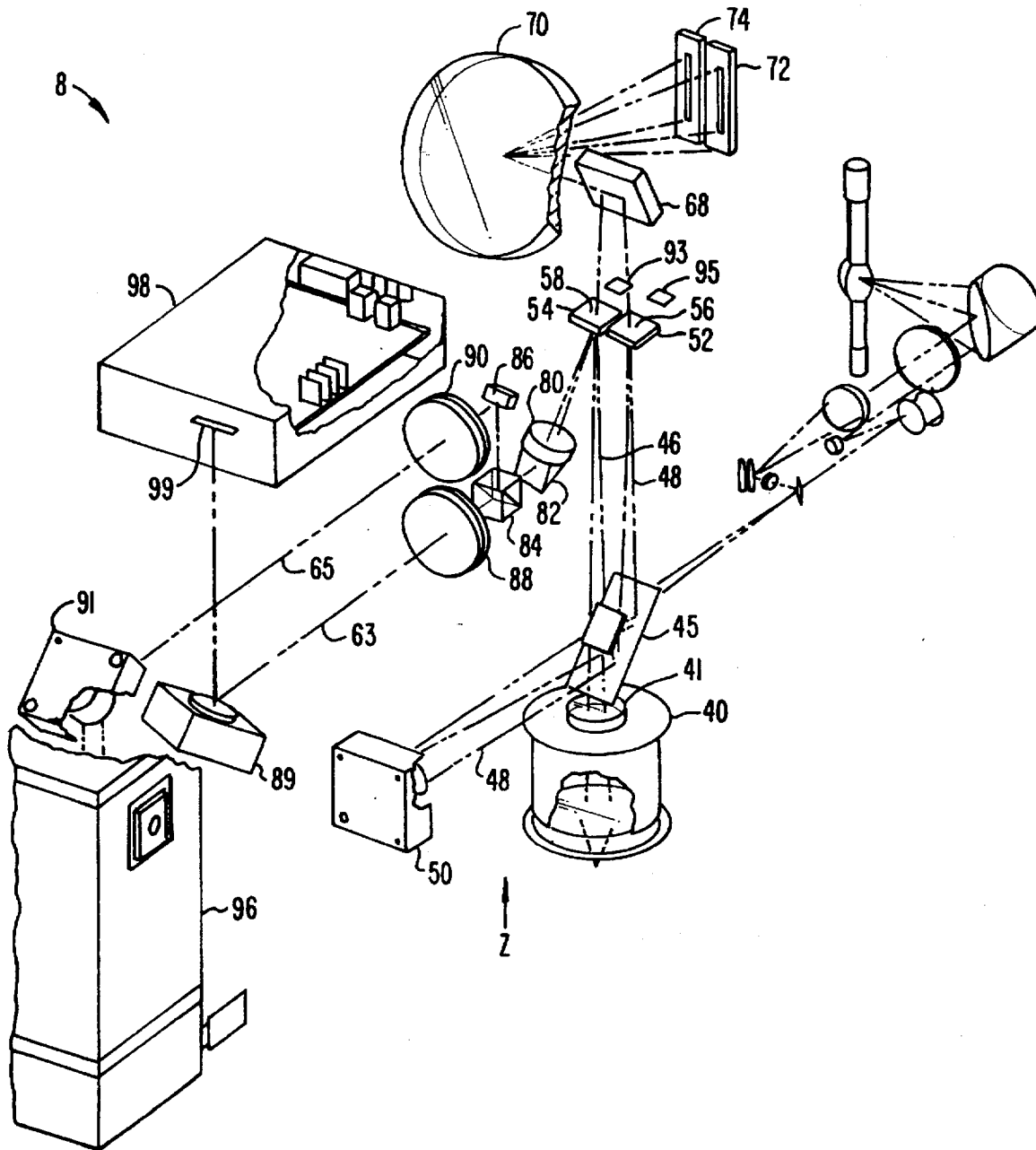**57 Claims, 7 Drawing Sheets**

FIG. 1.

FIG. 2.

FIG. 3.
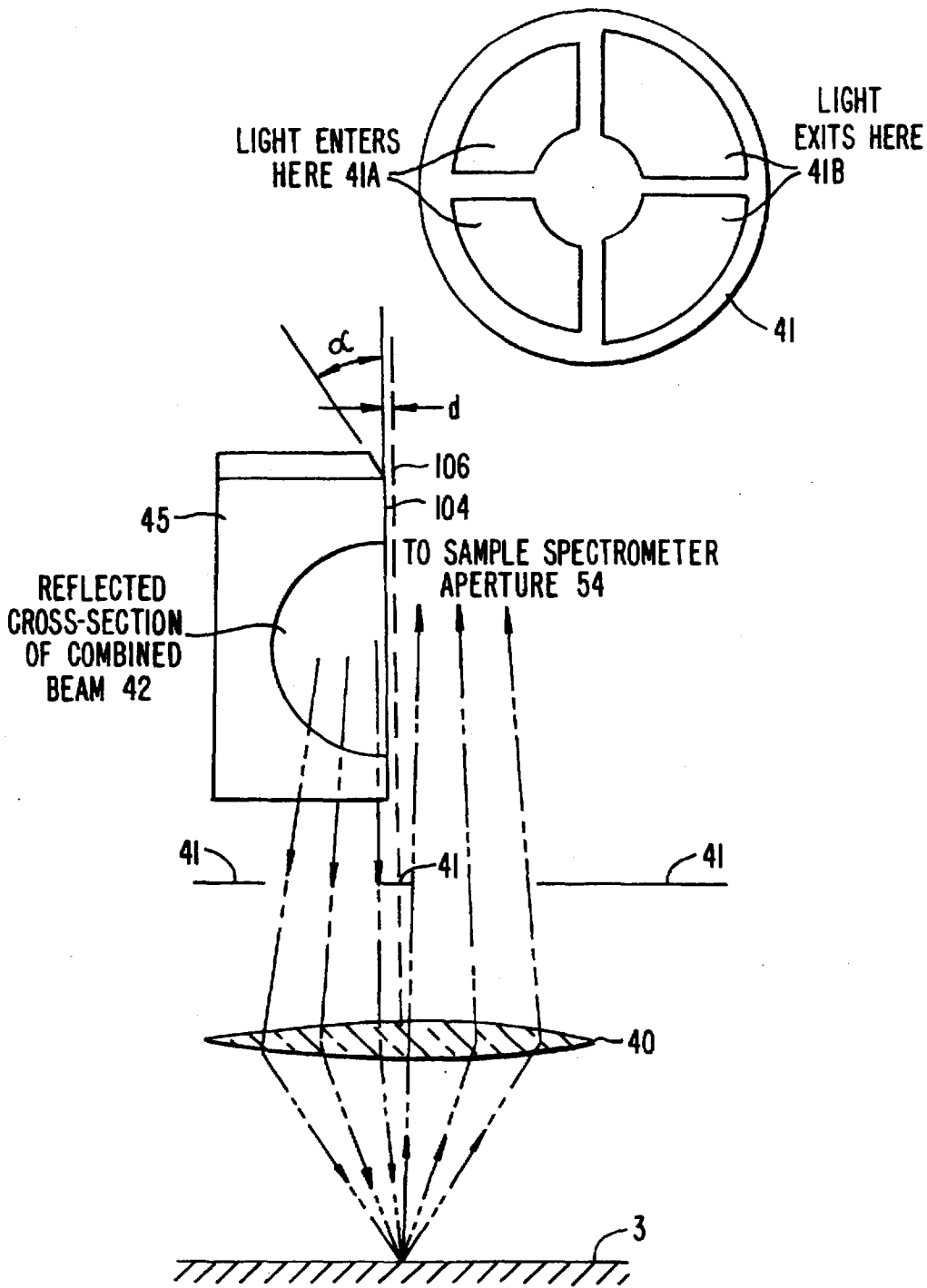
LIGHT ENTERS HERE 41A

LIGHT EXITS HERE 41B

41

α

d

106

104

45

TO SAMPLE SPECTROMETER APERTURE 54

REFLECTED CROSS-SECTION OF COMBINED BEAM 42

41

41

41

40

3
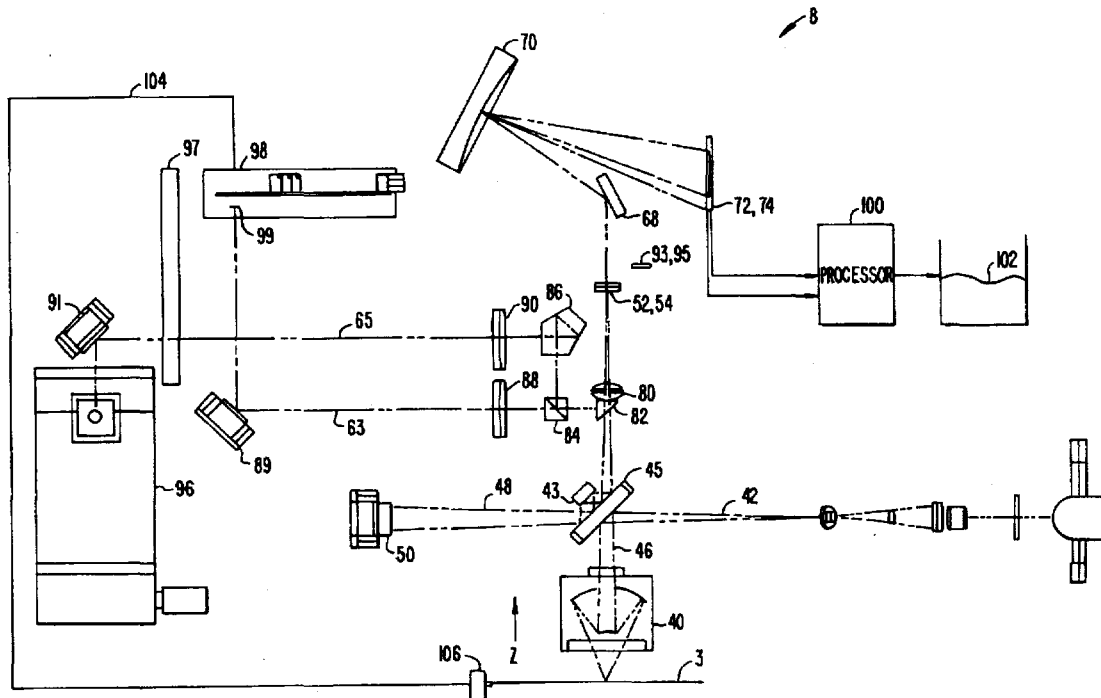
FIG. 4.

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