United States Patent [19]

Clark

[11] **4,336,809**

[45] **Jun. 29, 1982**

[54] **HUMAN AND ANIMAL TISSUE PHOTORADIATION SYSTEM AND METHOD**

[75] Inventor: **William G. Clark**, Pittsford, N.Y.

[73] Assignee: **Burleigh Instruments, Inc.**, Fishers, N.Y.

[21] Appl. No.: **131,022**

[22] Filed: **Mar. 17, 1980**

[51] **Int. Cl.**[3] **A61B 6/00**

[52] **U.S. Cl.** **128/665**; 128/303.1; 128/398

[58] **Field of Search** ..... 128/303.1, 395, 632–634, 128/630, 635, 664, 665, 6, 7, 23, 397, 398, 207.21, 207.22; 200/61.52, 61.47, 63.30; 219/121 L, 121 LM, 121 LB, 121 LT, 121 LA, 121 LP

[56] **References Cited**

U.S. PATENT DOCUMENTS

1,791,794	2/1931	Chesney	128/398
2,056,990	10/1936	Symonds	128/398
3,417,745	12/1968	Sheldon	128/6
3,750,670	8/1973	Palanos et al.	128/303.1
3,769,963	11/1973	Goldman et al.	128/303.1
3,821,510	6/1974	Muncheryan	128/207.22
3,834,391	9/1974	Block	128/303.1
3,843,865	10/1974	Nath	128/395
3,936,631	2/1976	Muska	250/227
4,043,033	8/1977	Yeo	200/61.52
4,072,147	2/1978	Hett	128/6
4,120,293	10/1978	Muckerheide	128/395
4,161,944	7/1979	Muckerheide	128/654
4,170,997	10/1979	Pinnow et al.	128/303.1
4,207,874	6/1980	Choy	128/303.1
4,266,548	5/1981	Davi	128/303.1
4,266,549	5/1981	Kimura	128/303.1

FOREIGN PATENT DOCUMENTS

2542590	4/1977	Fed. Rep. of Germany	350/96.10
2647618	4/1978	Fed. Rep. of Germany	219/121 L

OTHER PUBLICATIONS

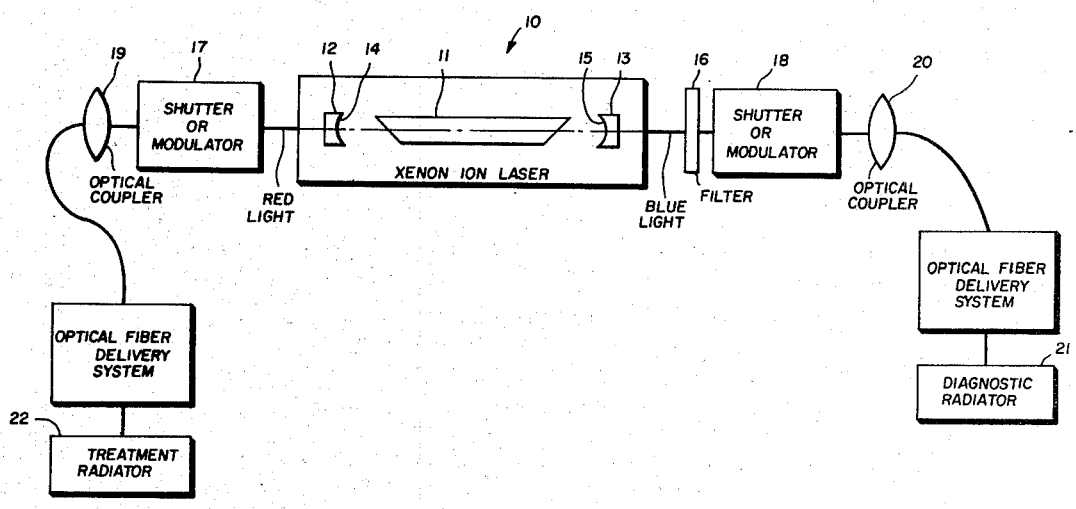
Dougherty, T. J.; *Photoradiation Therapy for the Treatment of Malignant Tumors,* in Cancer Research, vol. 38, pp. 2628–2635, 8/78.

Doiron, D. R.; *Fluorescence Bronchoscopy for Detection of Lung Cancer;* in Chest, 76; Jul. 1, 1979.

Primary Examiner—Lee S. Cohen

Attorney, Agent, or Firm—Martin Lukacher

[57] **ABSTRACT**

A tissue photoradiation system uses a hematoporphyrin or hematoporphyrin derivative dye in tissue to be irradiated and arranges a xenon ion laser **10** for simultaneous lasing. Deep blue light is produced at wavelengths of about 406–427 nanometers and red light at a wavelength of about 627 nanometers by using partially transmitting mirrors **12** and **13** arranged at opposite ends of the laser resonator. Mirror **12** has a coating **14** that substantially reflects blue light and partially transmits red light to produce a red light output, and the coating **15** of mirror **13** substantially reflects red light and partially transmits blue light producing a blue light output. The blue light output is transmitted to a diagnostic tissue irradiator **21** to illuminate the tissue and diagnose its condition. A transmission system using an optical fiber **25** delivers the red light to the tissue for treatment purposes. The red light is radiated out the side of an optical fiber region **30***a* to be directed into large area of tissue.

13 Claims, 5 Drawing Figures