



US007150834B2

(12) **United States Patent**
Mueth et al.

(10) **Patent No.:** **US 7,150,834 B2**
(45) **Date of Patent:** **Dec. 19, 2006**

(54) **MULTIPLE LAMINAR FLOW-BASED RATE ZONAL OR ISOPYCNIC SEPARATION WITH HOLOGRAPHIC OPTICAL TRAPPING OF BLOOD CELLS AND OTHER STATIC COMPONENTS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 54 days.

(21) Appl. No.: **10/867,328**

(22) Filed: **Jun. 13, 2004**

(65) **Prior Publication Data**

US 2005/0061962 A1 Mar. 24, 2005

Related U.S. Application Data

(63) Continuation-in-part of application No. 10/630,904, filed on Jul. 31, 2003.

(51) **Int. Cl.**
B01D 21/01 (2006.01)

(52) **U.S. Cl.** **210/732; 210/800; 210/802; 210/927; 435/173.1; 422/72; 422/82.05; 422/101; 436/177**

(58) **Field of Classification Search** 250/251; 435/173.1; 210/732, 800, 802, 804, 927; 436/177; 422/82.05, 72, 101

See application file for complete search history.

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(57) **ABSTRACT**

The invention provides a method and apparatus for separating blood into components, may be expanded to include other types of cellular components, and can be combined with holographic optical manipulation or other forms of optical tweezing. One of the exemplary methods includes providing a first flow having a plurality of blood components; providing a second flow; contacting the first flow with the second flow to provide a first separation region; and differentially sedimenting a first blood cellular component of the plurality of blood components into the second flow while concurrently maintaining a second blood cellular component of the plurality of blood components in the first flow. The second flow having the first blood cellular component is then differentially removed from the first flow having the second blood cellular component. Holographic optical traps may also be utilized in conjunction with the various flows to move selected components from one flow to another, as part of or in addition to a separation stage.

6 Claims, 7 Drawing Sheets

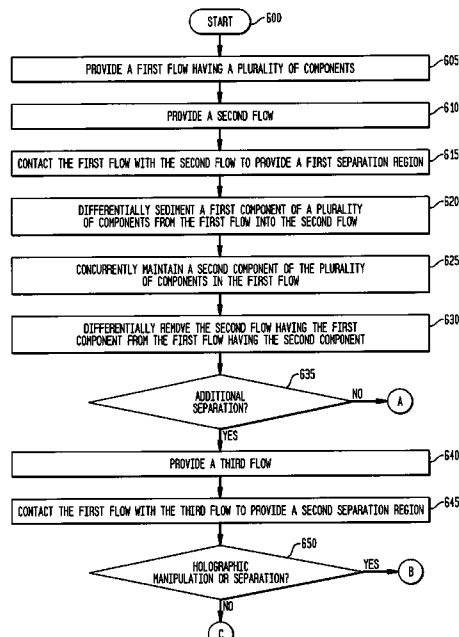


FIG. 1

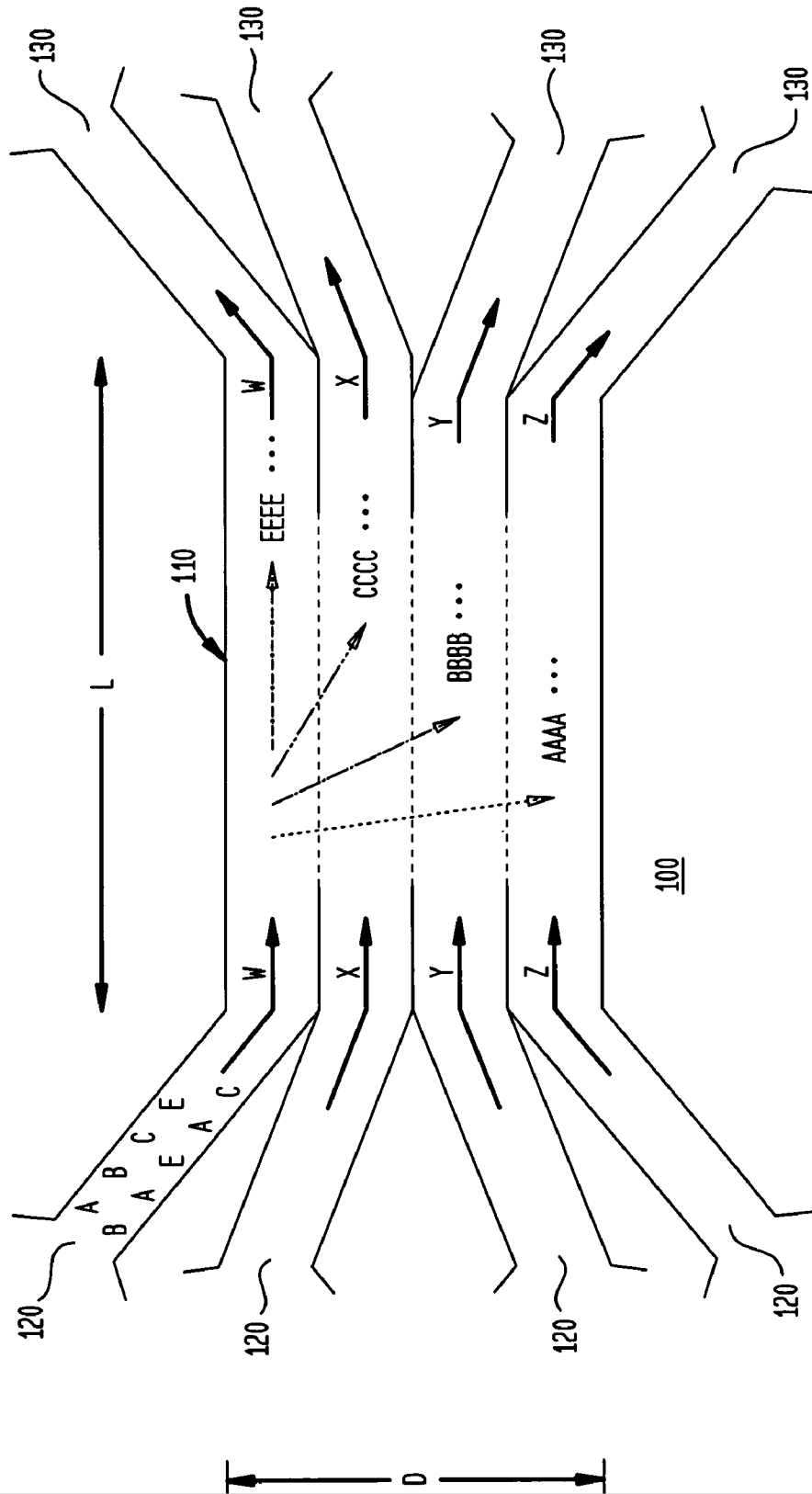


FIG. 2

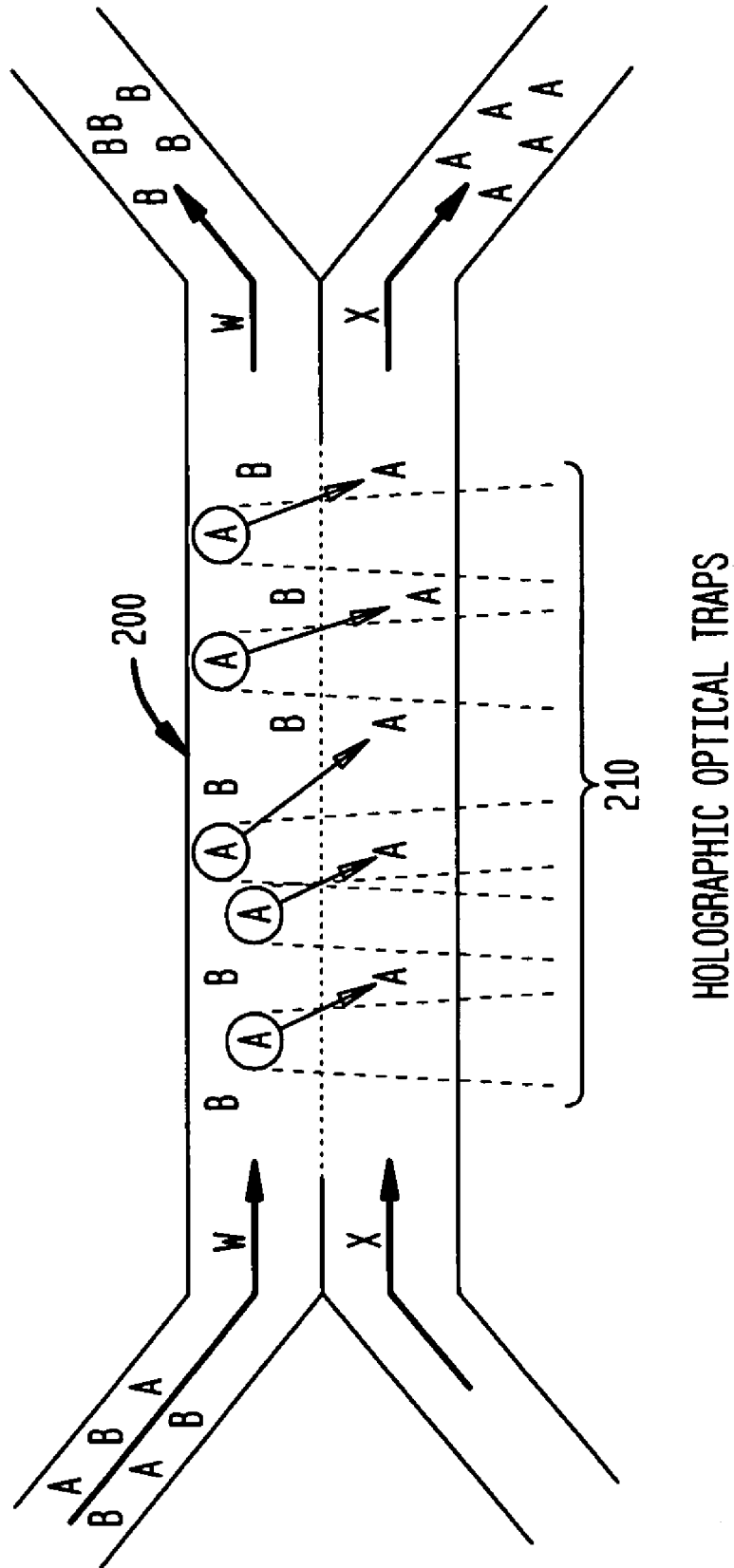


FIG. 3

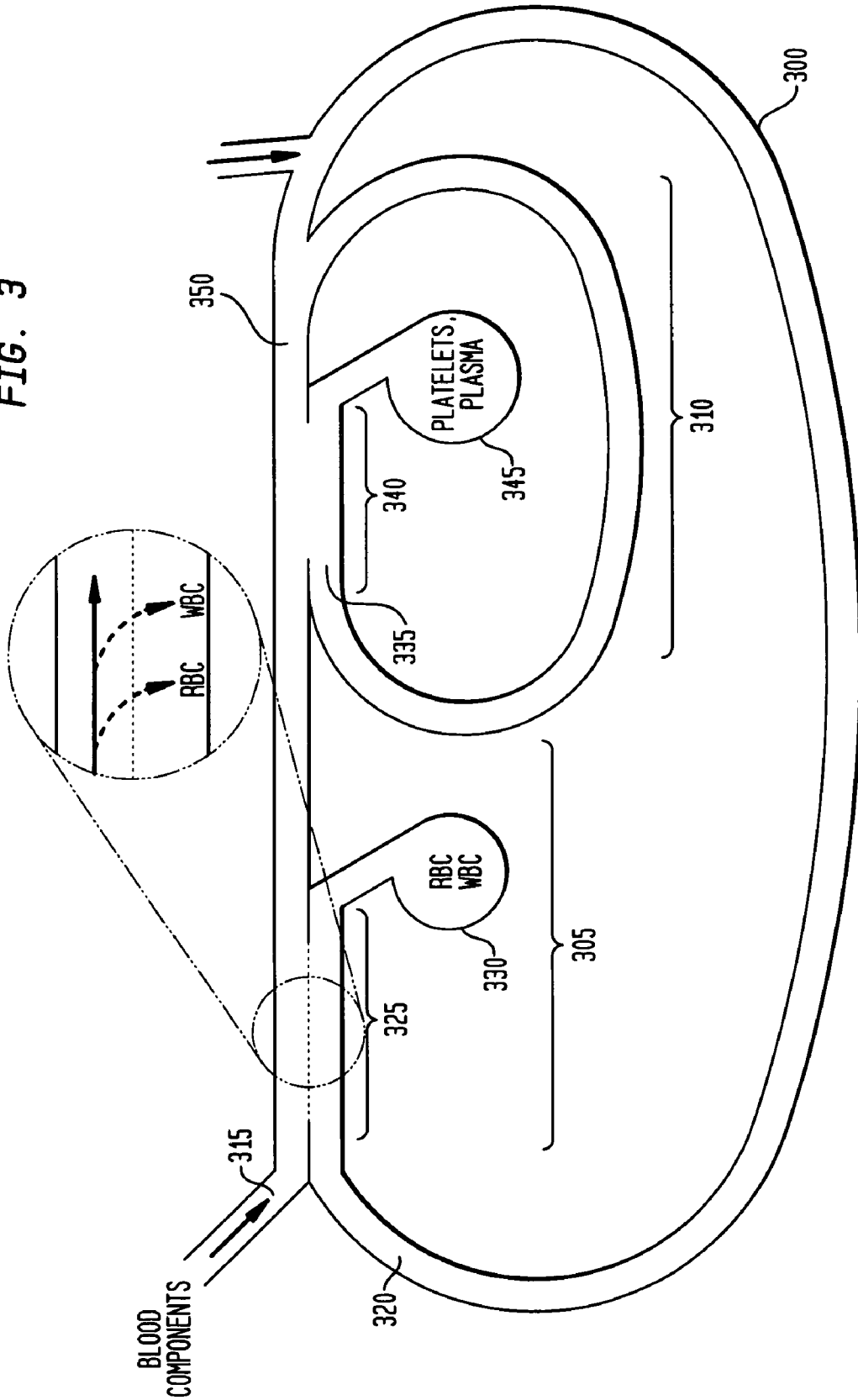
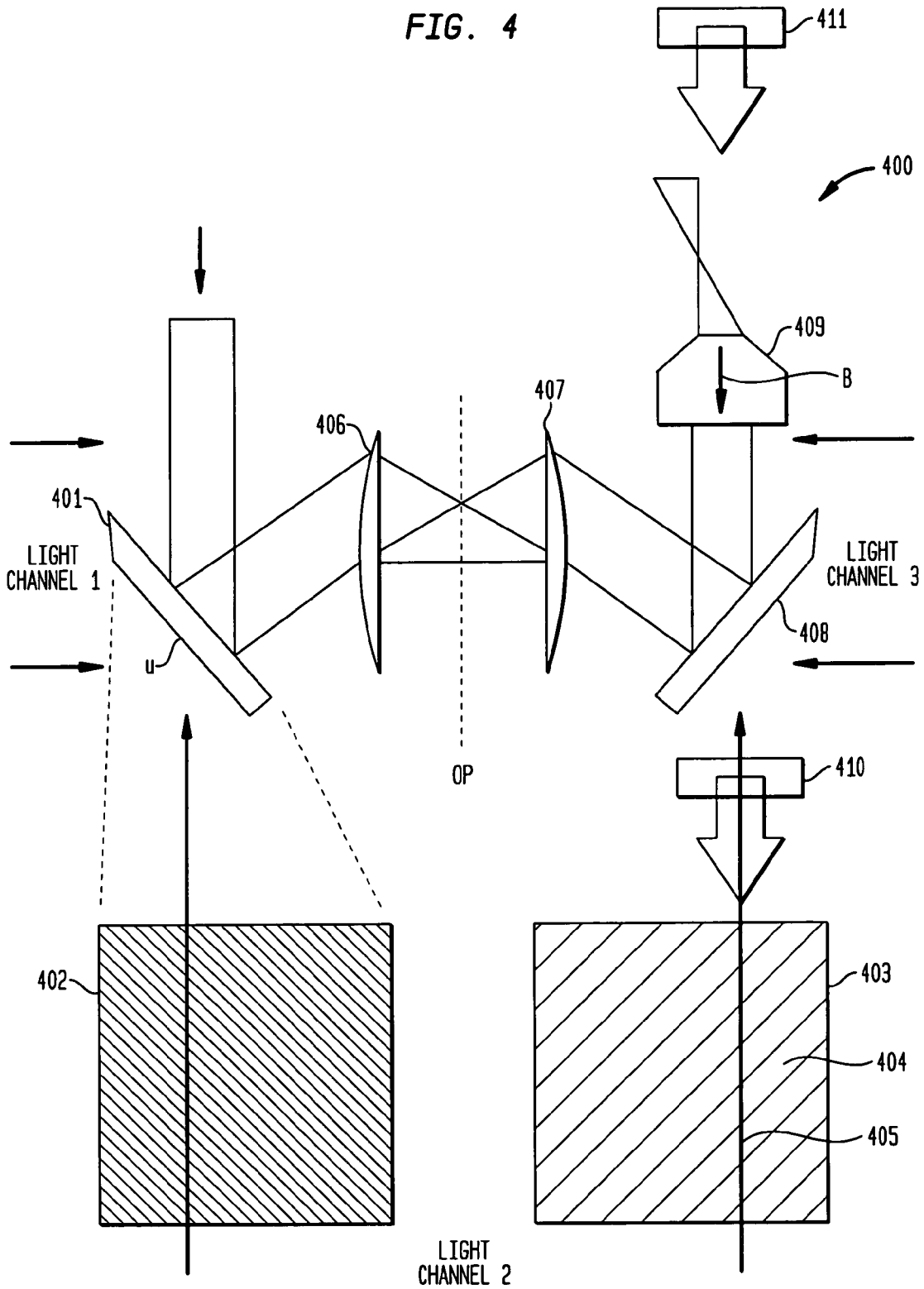


FIG. 4



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