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**Kim et al.**

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(54) **MICROFLUIDIC APPARATUS AND METHOD OF ENRICHING TARGET MATERIAL IN BIOLOGICAL SAMPLE BY USING THE SAME**

USPC ..... 422/502, 503, 506, 507  
See application file for complete search history.

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(56) **References Cited**

U.S. PATENT DOCUMENTS

6,632,399 B1 \* 10/2003 Kellogg ..... B01F 13/0059 422/505  
7,857,141 B2 12/2010 Park et al.

(Continued)

FOREIGN PATENT DOCUMENTS

EP 0965388 A2 12/1999  
EP 2737948 A1 6/2014

(Continued)

OTHER PUBLICATIONS

EPO Extended Search Report in Application No. 13178795.4 dated Jul. 21, 2014.

(Continued)

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(57) **ABSTRACT**

A micro fluidic apparatus includes a sample chamber that divides a sample into a first fluid layer and a second fluid layer due to a centrifugal force; a first enriching unit that receives the first fluid layer from the sample chamber, forms a first complex of a first fine particle and the first target material, and separates the first complex from the first fluid layer using a density difference; and a second enriching unit that receives the second fluid layer from the sample chamber, forms a second complex of a second fine particle and the second target material, and separates the second complex from the second fluid layer using a density difference.

**14 Claims, 8 Drawing Sheets**

