US009410948B2

(12) **United States Patent**
Dittmer

(10) **Patent No.: US 9,410,948 B2**
(45) **Date of Patent: Aug. 9, 2016**

(54) **MANIPULATION OF MAGNETIC PARTICLES IN A BIOLOGICAL SAMPLE**

(75) Inventor: **Wendy U. Dittmer**, Eindhoven (NL)

(73) Assignee: **KONINKLIJKE PHILIPS N.V.**, Eindhoven (NL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 168 days.

(21) Appl. No.: **13/258,200**

(22) PCT Filed: **Mar. 19, 2010**

(86) PCT No.: **PCT/IB2010/051206**
§ 371 (c)(1),
(2), (4) Date: **Sep. 22, 2011**

(87) PCT Pub. No.: **WO2010/109392**
PCT Pub. Date: **Sep. 30, 2010**

(65) **Prior Publication Data**

US 2012/0014836 A1 Jan. 19, 2012

(30) **Foreign Application Priority Data**

Mar. 23, 2009 (EP) 09305253

(51) **Int. Cl.**

G01N 33/00	(2006.01)
B01D 21/00	(2006.01)
B03C 1/02	(2006.01)
B03C 1/30	(2006.01)
B01D 35/06	(2006.01)
G01R 33/12	(2006.01)
G01N 33/543	(2006.01)

(Continued)

(52) **U.S. Cl.**
CPC ***G01N 33/54326*** (2013.01); *B01L 2200/16* (2013.01); *B01L 2400/043* (2013.01); *G01N 27/72* (2013.01); *G01N 27/745* (2013.01); *G01N 33/54333* (2013.01); *G01R 33/12* (2013.01)

(58) **Field of Classification Search**
CPC G01N 33/54326; G01N 33/54333; G01N 27/72; G01N 27/745; B01L 2200/16; B01L 2400/043; G01R 33/12
USPC 422/68.1, 69, 502, 504, 507; 210/222, 210/695
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,863,708	A	1/1999	Zanzucchi
6,667,725	B1	12/2003	Simons

(Continued)

FOREIGN PATENT DOCUMENTS

CN	1624447	A	6/2005
CN	101158697	A	4/2008

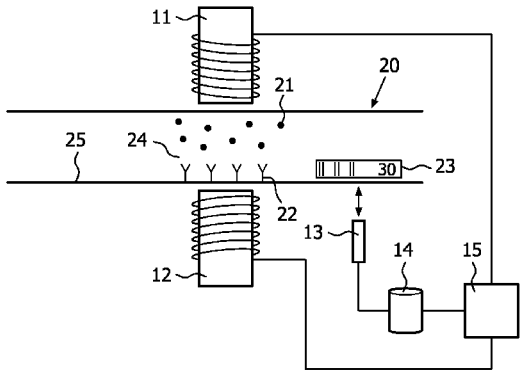
(Continued)

OTHER PUBLICATIONS

Bruls, D.M. et al "Rapid Integrated Biosensor for Multiplexed Immunoassays based on Actuated Magnetic Nanoparticles" Lab on a Chip, vol. 9. No. 24. pp. 3504-3510. 2009.

Primary Examiner — Jennifer Wecker

(57) **ABSTRACT**

A microfluidic device, used with a processing device having a magnetic supplier, including a chamber arranged to receive a biological sample and at least one magnetic particle, and a storage for storing information comprising a magnetic protocol in a form readable by the processing device. The magnetic supplier is configured to generate magnetic forces on the magnetic particle(s) according to this magnetic protocol read from the storage.

20 Claims, 1 Drawing Sheet