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(71) Applicant (for all designated States except US): **ABBOTT LABORATORIES** [US/US]; 100 Abbott Park Road, Abbott Park, IL 60064 (US).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **FRITCHIE, Patrick, P.** [US/US]; 218 Westwood Drive, Southlake, TX 76092 (US).(74) Agent: **HANLEY, Mark, G.**; Hanley, Flight & Zimmerman, LLC, 150 S. Wacker Drive, Suite 2100, Chicago, IL 60606 (US).

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(54) Title: SYSTEM, APPARATUS, AND METHOD FOR CLOSED TUBE SAMPLING AND OPEN TUBE SAMPLING FOR AUTOMATED CLINICAL ANALYZERS

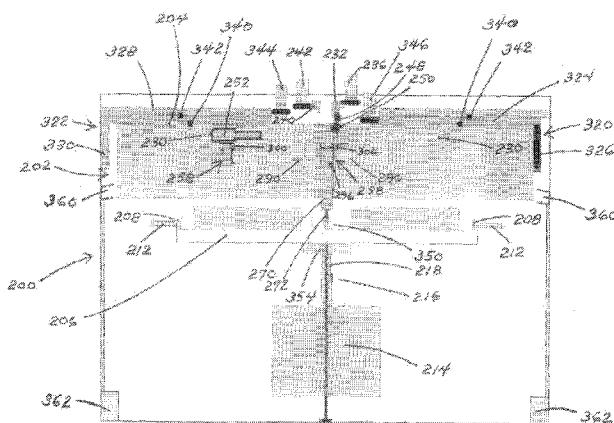


FIG. 11

(57) **Abstract:** A centrifuge to which sample tubes can be introduced while the centrifuge is in motion. The centrifuge comprises a carousel (202) having an upper portion (204) and a lower portion (206). The upper portion of the carousel has a plurality of positions for sample tubes for a centrifugation operation, a plurality of drive mechanisms (230) attached to the upper portion of the carousel, a movable element (352) mounted upon each drive mechanism, the movable element capable of traversing the length of the drive mechanism when the drive mechanism is actuated, a sample tube-holding assembly (258) comprising a sample tube holder (260) and a bearing (262) attached to each movable element, and at least one balancing element (320, 322) capable of contributing to a force vector that cancels an imbalance vector generated by rotation of the centrifuge.



INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/040840

A. CLASSIFICATION OF SUBJECT MATTER

INV. B04B5/04 B04B9/14 B04B11/04
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B04B G01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 224 955 A1 (ULTRA CENTRIFUGE NEDERLAND NV [NL]) 10 June 1987 (1987-06-10) page 3, right-hand column, line 6 - line 15; figure 2	1-7, 49-54
Y	US 5 584 790 A (BELL MICHAEL L [US] ET AL) 17 December 1996 (1996-12-17) abstract; figures	1-7, 49-54
Y	US 2010/009833 A1 (RYU HEUIGEUN [KR] ET AL) 14 January 2010 (2010-01-14) the whole document	1-7, 49-54
Y	JP 2010 064012 A (OLYMPUS CORP) 25 March 2010 (2010-03-25) abstract; figures	1-7, 49-54
	----- -/-	

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

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Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Leitner, Josef

INTERNATIONAL SEARCH REPORT

International application No

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	IT T020 110 009 A1 (GIACALONE ANDREA; GIACALONE STEFANIA; SPARANO LUIGI) 14 April 2011 (2011-04-14) figures -----	1,49
Y	JP 52 087760 A (HITACHI KOKI KK) 22 July 1977 (1977-07-22) figures 5,6 -----	1,49

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2012/040840

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0224955	A1	10-06-1987	DE 3666147 D1 16-11-1989
			EP 0224955 A1 10-06-1987
			JP 62183866 A 12-08-1987
			NL 8503149 A 01-06-1987
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US 5584790	A	17-12-1996	NONE

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			US 2010009833 A1 14-01-2010
			US 2012302419 A1 29-11-2012

JP 2010064012	A	25-03-2010	NONE

IT T020110009	A1	14-04-2011	-----
JP 52087760	A	22-07-1977	NONE

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/040840

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of Item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

see additional sheet(s)

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-65

A centrifuge comprising a carousel having an upper portion and a lower portion, the upper portion of the carousel having a plurality of positions for sample tubes for a centrifugation operation, a plurality of drive mechanisms attached to the upper portion of the carousel, a movable element mounted upon each drive mechanism, the movable element capable of traversing the length of the drive mechanism when the drive mechanism is actuated, a sample tube-holding assembly comprising a sample tube holder and a bearing attached to each movable element, and at least one balancing element capable of contributing to a force vector that cancels a vector generated by rotation of the carousel of the centrifuge, as well as a method for carrying out a centrifugation process, comprising the steps of inserting sample tubes into such a centrifuge by means of sample tube holders, and after centrifugation has begun, if the sample tubes are not properly balanced, detecting an imbalance vector by a vibration sensor, which transmits information to a central processing unit.

2. claims: 66, 67

A blade for cutting slits in stoppers of sample tubes, wherein the blade has a tip angle to control stretching of a stopper and promote efficient cutting of the material from which the stopper is formed.
