Eminet Global Research Solutions

Sample Report - Invalidity

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Objective and Scope: Subject Matter

The objective of the search is to find and report prior art from Patents and Non Patent literature against the **independent claim 1 of the target patent US 9623414 B2 .**

1. Apparatus for performing polymerase chain reactions in a plurality of samples, said apparatus comprising:

a plurality of thermally conductive sample blocks for polymerase chain reactions, arranged in a fixed horizontal array, wherein each sample block comprises a plurality of sample wells and is configured to retain a plurality of samples;

a plurality of independently controlled thermoelectric modules, a thermoelectric module positioned underneath each said sample block, wherein the thermoelectric modules are configured to cycle the temperatures of the sample blocks for polymerase chain reactions;

a layer of thermally conductive material between each sample block and each thermoelectric module; and

a solid barrier of thermally insulating material positioned between each pair of adjacent sample blocks to thermally isolate the sample blocks of the pair from each other.

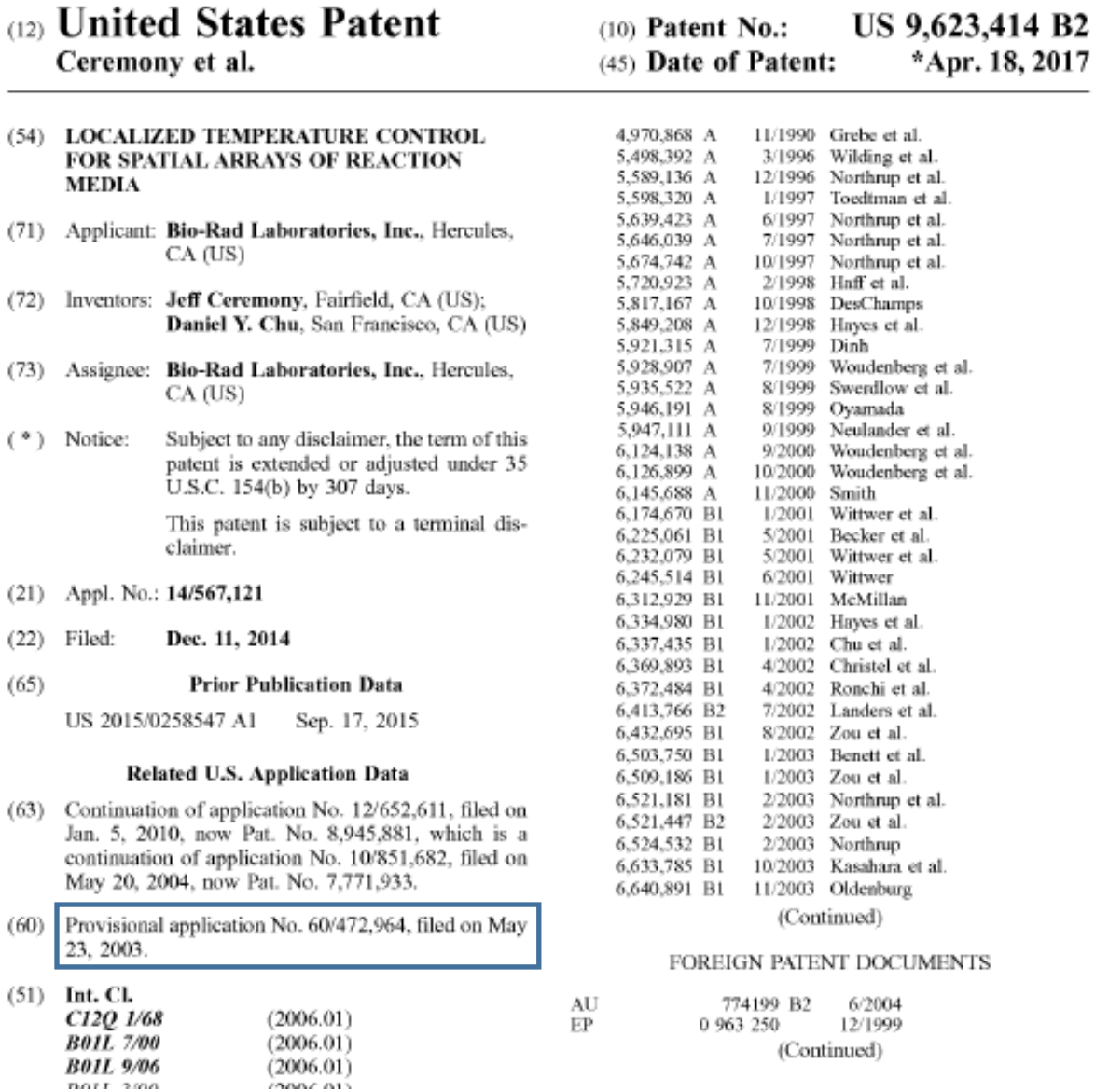
Objective and Scope: Prior Art Considerations

Jurisdiction: Global

Types of documents: Patents and Other literature

Date restriction: Documents published before 23rd May, 2003 (claimed priority date);

Or US patent documents filed before 23rd May, 2003



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

(10) **Patent No.: US 9,623,414 B2**
(45) **Date of Patent: *Apr. 18, 2017**

(54) **LOCALIZED TEMPERATURE CONTROL FOR SPATIAL ARRAYS OF REACTION MEDIA**

(71) Applicant: **Bio-Rad Laboratories, Inc.**, Hercules, CA (US)

(72) Inventors: **Jeff Ceremony**, Fairfield, CA (US); **Daniel Y. Chu**, San Francisco, CA (US)

(73) Assignee: **Bio-Rad Laboratories, Inc.**, Hercules, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 307 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **14/567,121**

(22) Filed: **Dec. 11, 2014**

(65) **Prior Publication Data**

US 2015/0258547 A1 Sep. 17, 2015

Related U.S. Application Data

(63) Continuation of application No. 12/652,611, filed on Jan. 5, 2010, now Pat. No. 8,945,881, which is a continuation of application No. 10/851,682, filed on May 20, 2004, now Pat. No. 7,771,933.

(60) Provisional application No. 60/472,964, filed on May 23, 2003.

(51) **Int. Cl.**

C12Q 1/68	(2006.01)
B01L 7/00	(2006.01)
B01L 9/06	(2006.01)

4,970,868	A	11/1990	Grebe et al.
5,498,392	A	3/1996	Wilding et al.
5,589,136	A	12/1996	Northrup et al.
5,598,320	A	1/1997	Toedtman et al.
5,639,423	A	6/1997	Northrup et al.
5,646,039	A	7/1997	Northrup et al.
5,674,742	A	10/1997	Northrup et al.
5,720,923	A	2/1998	Haff et al.
5,817,167	A	10/1998	DesChamps
5,849,208	A	12/1998	Hayes et al.
5,921,315	A	7/1999	Dinh
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5,935,522	A	8/1999	Swerdlow et al.
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5,947,111	A	9/1999	Neulander et al.
6,124,138	A	9/2000	Woudenberg et al.
6,126,899	A	10/2000	Woudenberg et al.
6,145,688	A	11/2000	Smith
6,174,670	B1	1/2001	Wittwer et al.
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6,245,514	B1	6/2001	Wittwer
6,312,929	B1	11/2001	McMillan
6,334,980	B1	1/2002	Hayes et al.
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6,521,181	B1	2/2003	Northrup et al.
6,521,447	B2	2/2003	Zou et al.
6,524,532	B1	2/2003	Northrup
6,633,785	B1	10/2003	Kasahara et al.
6,640,891	B1	11/2003	Oldenburg

(Continued)

FOREIGN PATENT DOCUMENTS

AU	774199 B2	6/2004
EP	0 963 250	12/1999

(Continued)

Objective and Scope: Prosecution and rejection Analysis

Type of rejection: Double Patenting

Comment: Initial claims of the subject patent were rejected based on a condition of double patenting. After that, the claims were amended and granted.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

Results

Results: Summary

WO2001024930A1: This patent reference from *MWG-BIOTECH AG* relates to a device for performing chemical or biological reactions. The device consists of a plurality of individual reaction vessel receiving segments. The individual segments are thermally insulated from one another. Every segment is provided with an independently controlled heating element.

WO2001049416A1: This patent reference from *The Regents Of The University Of California* discloses about a polymerase chain reaction system. One embodiment of the invention has four chamber modules that can be thermocycled simultaneously or independently.

Results: Relevancy Table

Independent Claim 1 of US 9623414 B2	WO2001024930A1	WO2001049416A1
Apparatus for performing polymerase chain reactions in a plurality of samples, said apparatus comprising:	✓	✓
a plurality of thermally conductive sample blocks for polymerase chain reactions, arranged in a fixed horizontal array, wherein each sample block comprises a plurality of sample wells and is configured to retain a plurality of samples;	✓	✓
a plurality of independently controlled thermoelectric modules,	✓	✓
a thermoelectric module positioned underneath each said sample block, wherein the thermoelectric modules are configured to cycle the temperatures of the sample blocks for polymerase chain reactions;	✓	✓
a layer of thermally conductive material between each sample block and each thermoelectric module; and	✓	✗
a solid barrier of thermally insulating material positioned between each pair of adjacent sample blocks to thermally isolate the sample blocks of the pair from each other.	✓	✗

Result Categorization	
Category X	Documents disclosing all the features of the subject matter and considered a prior art under section 102 of U.S.C 35
Category Y	Documents disclosing some of the features of the subject matter and considered a prior art under section 103 of U.S.C 35

✓ : Mapped
✗ : No Excerpts found

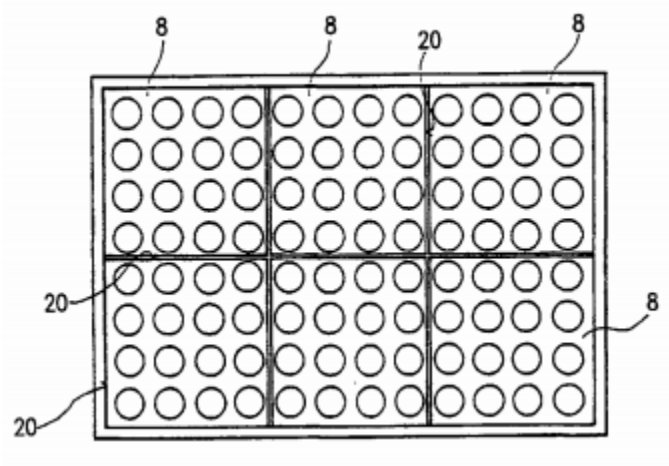
Results: #1 WO 2001024930 A1(Bibliographic)

Title	Publication Date	Filing Date	Priority Date	Assignee	Inventor(s)
DEVICE FOR CARRYING OUT CHEMICAL OR BIOLOGICAL REACTIONS	April 12, 2001	September 29, 2000	October 01, 1999	MWG-BIOTECH AG	Wolfgang Heimberg et al.

Abstract

The invention relates to a device for carrying out chemical or biological reactions. Said device comprises a reaction vessel-receiving element for receiving a microtiter plate with a plurality of reaction vessels. The reaction vessel-receiving element is provided with a plurality of recesses that are arranged in a regular pattern and that receive the corresponding reaction vessels. The inventive device further comprises a heating element for heating the reaction vessel-receiving unit and a cooling element for cooling the reaction vessel-receiving unit. The inventive device is characterized in that the reaction vessel-receiving element is subdivided into several segments. The individual segments are thermally decoupled from one another. Every segment is provided with a heating element that is controlled independent of the other heating elements.

Relevant Image



Results: #1 WO 2001024930 A1(Mapping 1.1)

Independent Claim 1 of US 9623414 B2

Apparatus for performing polymerase chain reactions in a plurality of samples, said apparatus comprising:

a plurality of thermally conductive sample blocks for polymerase chain reactions, arranged in a fixed horizontal array, wherein each sample block comprises a plurality of sample wells and is configured to retain a plurality of samples;

a plurality of independently controlled thermoelectric modules,

a thermoelectric module positioned underneath each said sample block, wherein the thermoelectric modules are configured to cycle the temperatures of the sample blocks for polymerase chain reactions;

a layer of thermally conductive material between each sample block and each thermoelectric module; and

a solid barrier of thermally insulating material positioned between each pair of adjacent sample blocks to thermally isolate the sample blocks of the pair from each other.

Excerpts from WO2001024930A1

[Description]

The present invention relates to an **apparatus for carrying out chemical or biological reactions with a reaction vessel receiving element for the recordings of reaction vessels, wherein the reaction vessel receiving element having a plurality of arranged in a regular grid recesses for receiving reaction vessels,** a heating device for heating the reaction vessel receiving element, and a cooling means for cooling the reaction vessel receiving element.

[Description]

A heat exchanger 6, a Peltier element 7 and a segment 8 of a reaction vessel receiving body 9 are each arranged on the bases 5a. The heat exchanger 6 is part of a cooling device and the Peltier element 7 is part of a combined heating and cooling device. The elements arranged on the bases 5a (heat exchanger, Peltier element, segment) are glued with a highly thermally conductive adhesive resin, as a result of which good heat transfer is achieved between these elements, and the elements are also firmly connected to form a segment part 10. The device has a total of six such segment parts 10. Instead of adhesive resin, a heat-conducting film or a heat-conducting paste can also be provided.

Results: #1 WO 2001024930 A1(Mapping 1.2)

Independent Claim 1 of US 9623414 B2

Apparatus for performing polymerase chain reactions in a plurality of samples, said apparatus comprising:

a plurality of thermally conductive sample blocks for polymerase chain reactions, arranged in a fixed horizontal array, wherein each sample block comprises a plurality of sample wells and is configured to retain a plurality of samples;

a plurality of independently controlled thermoelectric modules,

a thermoelectric module positioned underneath each said sample block, wherein the thermoelectric modules are configured to cycle the temperatures of the sample blocks for polymerase chain reactions;

a layer of thermally conductive material between each sample block and each thermoelectric module; and

a solid barrier of thermally insulating material positioned between each pair of adjacent sample blocks to thermally isolate the sample blocks of the pair from each other.

Excerpts from WO2001024930A1

[Claims]

1. Device for carrying out chemical or biological reactions, with a reaction vessel receiving body (9) for receiving a microtiter plate with several reaction vessels, the reaction vessel receiving body (9) having a plurality of recesses arranged in a regular grid for receiving the respective reaction vessels, **a heating device (7) for heating the Reaction vessel receiving body (9), and a cooling device (6) for cooling the reaction vessel receiving body (9), characterized in that the reaction vessel receiving body (9) is divided into several segments (8), and the individual segments (8) are thermally decoupled and each segment (8) a heating device (7) is assigned, which can be controlled independently of one another.**

[Description]

Here, the individual segment parts 10 are spatially fixed, which ensures that, despite the formation of the gaps between the segment parts 10, all reaction vessel holders 12 are arranged in the grid of the reaction vessels of a microtiter plate. The side walls 4 of the housing 2 are formed from a non-heat-conducting material.

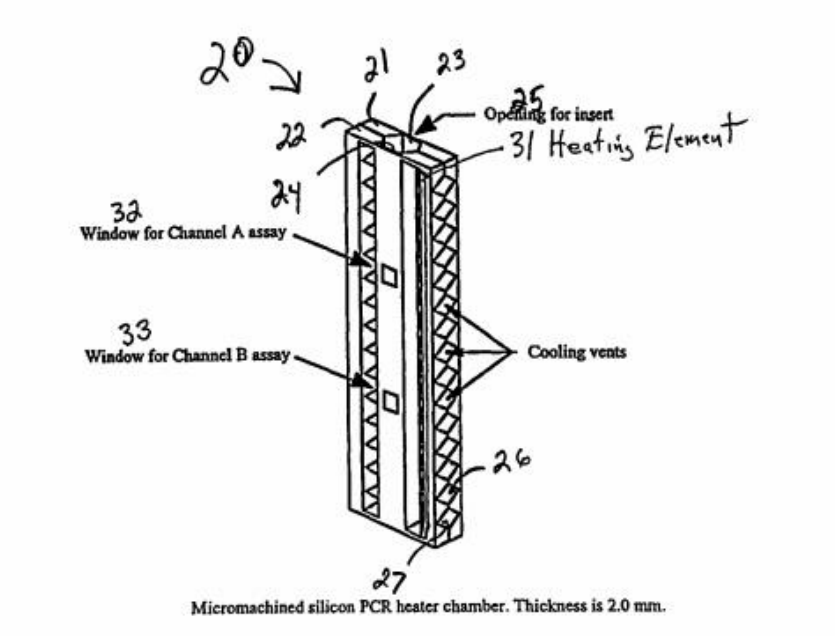
Results: #2 WO 2001049416 A1 (Bibliographic)

Title	Publication Date	Filing Date	Priority Date	Assignee	Inventor(s)
Polymerase chain reaction system	July 12, 2001	January 03, 2001	January 04, 2000	THE REGENTS OF THE UNIVERSITY OF CALIFORNIA	William J. Benett et al.

Abstract

A portable polymerase chain reaction DNA amplification and detection system includes one or more chamber modules. Each module supports a duplex assay of a biological sample. Each module has two parallel interrogation ports with a linear optical system. The system is capable of being handheld.

Relevant Image



Micromachined silicon PCR heater chamber. Thickness is 2.0 mm.

Results: #2 WO 2001049416 A1 (Mapping)

Independent Claim 1 of US 9623414 B2

Apparatus for performing polymerase chain reactions in a plurality of samples, said apparatus comprising:

a plurality of thermally conductive sample blocks for polymerase chain reactions, arranged in a fixed horizontal array, wherein each sample block comprises a plurality of sample wells and is configured to retain a plurality of samples;

a plurality of independently controlled thermoelectric modules,

a thermoelectric module positioned underneath each said sample block, wherein the thermoelectric modules are configured to cycle the temperatures of the sample blocks for polymerase chain reactions;

a layer of thermally conductive material between each sample block and each thermoelectric module; and

a solid barrier of thermally insulating material positioned between each pair of adjacent sample blocks to thermally isolate the sample blocks of the pair from each other.

Excerpts from WO2001049416A1

Lines [18-23]

One embodiment of the invention provides a polymerase chain reaction DNA amplification and detection system having a main body and one or more sample chamber modules adapted to contain biological sample volumes. Each of the sample chamber modules has the ability to support a duplex assay. Parallel interrogation ports are operatively connected to the sample chamber modules.

Lines [11-13]

The HANAA embodiment of **the present invention includes four chamber modules, 14A, 14B, 14C, and 14D which are thermally cycled simultaneously or independently.**

Inferential Mapping: The patent reference mentions chamber modules that can be thermo-cycled independently. However, the patent reference does not specifically mention each chamber module having a thermoelectric module.

Search Approach

Methodology

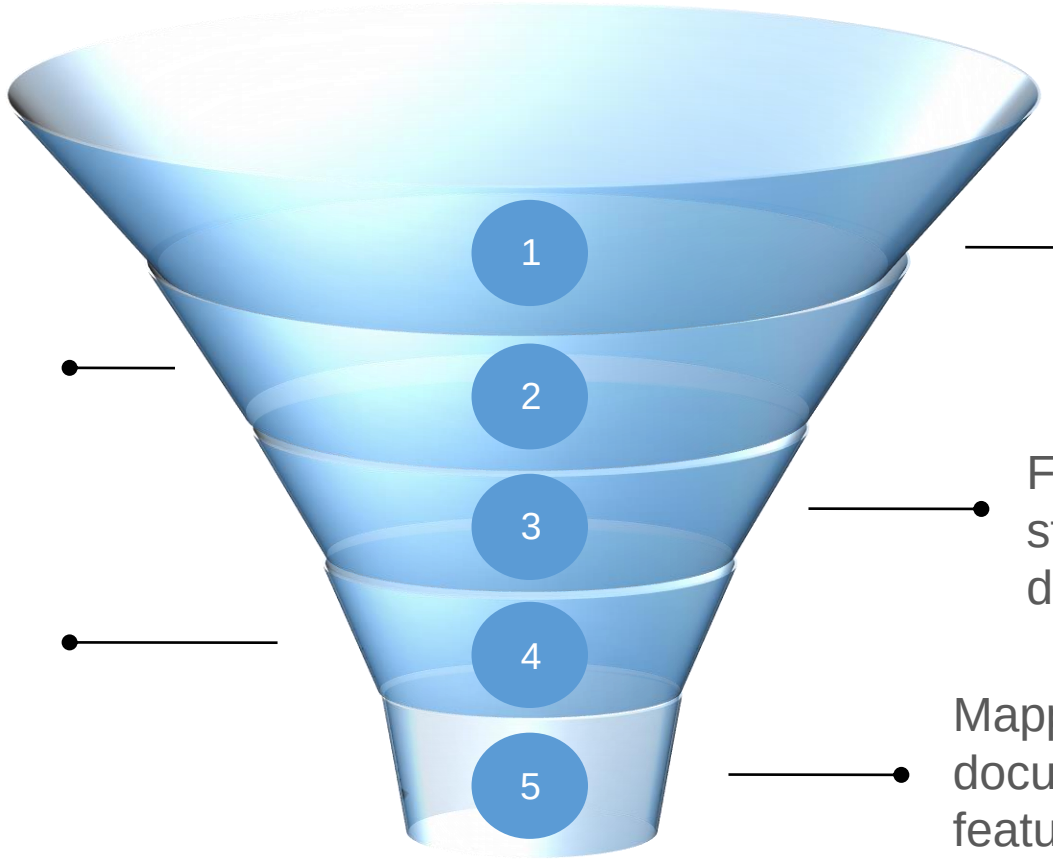
Keywords

Classifications

Strings

Search Approach: Methodology

Following search approach was implemented during the execution of the search:



1. Analyzing the subject matter of target patent.
2. Identifying relevant keywords and classifications pertaining to the subject matter.
3. Framing indicative search strategies for searching in the databases
4. Analysis of retrieved patent/non-patent documents
5. Mapping excerpts from relevant documents against the claim features of target patent.

Search Approach: Keywords

Terms	Keywords
APPARATUS	APPARATUS?? OR DEVICE? OR SYSTEM? OR ARRANGEMENT? OR EQUIPEMNT? OR INSTRUMENT? OR THERMO_CYCL???
POLYMERASE CHAIN REACTION	POLYMERASE_CHAIN_REACTION? OR “PCR” OR MULTIPLEX_AMPLIFICATION? OR AMPLIF+_REACTION?
PLURALITY	PLURAL??? OR MULTI???? OR LARGE_NUMBER OR ARRAY? OR STACK?
INDEPENDENT	INDEPENDENT?? OR INDIVIDUAL?? OR SEPARATE?? OR DISCRETE?? OR EACH
Control	CONTROL???? OR MAINTAIN??? OR MANAG??? OR GOVERN???
SAMPLE BLOCK	(SAMPLE? OR INSPECT??? OR TEST??? OR REACT???) 3D (BLOCK? OR CHAMBER? OR TUBE? OR CELL? OR VESSEL? OR WELL? OR
THERMOELECTRIC MODULE	(THERM???? OR HEAT??? OR TEMPERATURE?) 3D (ELECTRIC???? OR ELEMENT? OR UNIT? OR MODULE? OR DEVICE?) OR HEATER?
THERMAL CONDUCTION/INSULATION	(THERM???? OR HEAT???) 3D (CONDUCT+ OR INSULAT+ OR ISOLAT+ OR PROTECT+)
LAYER/BARRIER	LAYER??? OR BARRI+ OR LAMINA? OR COVER???

Search Approach: Classifications (1.1)

IPC/CPC	Definitions
B01L7/54	HEATING OR COOLING APPARATUS; HEAT INSULATING DEVICES USING SPATIAL TEMPERATURE GRADIENTS
B01L3/50851	CONTAINERS FOR THE PURPOSE OF RETAINING A MATERIAL TO BE ANALYSED, E.G. TEST TUBES RIGID CONTAINERS NOT PROVIDED FOR ABOVE FOR MULTIPLE SAMPLES, E.G. MICROTITRATION PLATES SPECIALLY ADAPTED FOR HEATING OR COOLING SAMPLES
B01L7/52	HEATING OR COOLING APPARATUS; HEAT INSULATING DEVICES WITH PROVISION FOR SUBMITTING SAMPLES TO A PREDETERMINED SEQUENCE OF DIFFERENT TEMPERATURES, E.G. FOR TREATING NUCLEIC ACID SAMPLES
B01L9/06	TEST-TUBE STANDS; TEST-TUBE HOLDERS
B01L2300/044	CONNECTING CLOSURES TO DEVICE OR CONTAINER PIERCEABLE, E.G. FILMS, MEMBRANES
B01L2300/0829	MULTI-WELL PLATES; MICROTITRATION PLATES
B01L2300/12	SPECIFIC DETAILS ABOUT MATERIALS

Search Approach: Classifications (1.2)

IPC/CPC	Definitions
B01L2300/1805	CONDUCTIVE HEATING, HEAT FROM THERMOSTATTED SOLIDS IS CONDUCTED TO RECEPTACLES, E.G. HEATING PLATES, BLOCKS
B01L2300/1822	CONDUCTIVE HEATING, HEAT FROM THERMOSTATTED SOLIDS IS CONDUCTED TO RECEPTACLES, E.G. HEATING PLATES, BLOCKS USING PELTIER ELEMENTS
B01L2300/1838	MEANS FOR TEMPERATURE CONTROL USING FLUID HEAT TRANSFER MEDIUM
B01L2300/1883	MEANS FOR TEMPERATURE CONTROL USING THERMAL INSULATION
B01L2400/0475	MOVING FLUIDS WITH SPECIFIC FORCES OR MECHANICAL MEANS SPECIFIC MECHANICAL MEANS AND FLUID PRESSURE
B01L2400/0487	MOVING FLUIDS WITH SPECIFIC FORCES OR MECHANICAL MEANS SPECIFIC MECHANICAL MEANS AND FLUID PRESSURE FLUID PRESSURE, PNEUMATICS
B01L2400/049	MOVING FLUIDS WITH SPECIFIC FORCES OR MECHANICAL MEANS SPECIFIC MECHANICAL MEANS AND FLUID PRESSURE FLUID PRESSURE, PNEUMATICS VACUUM

Search Approach: Strings

S.No	String
1	**Full Text:** (APPARATUS **5D** POLYMERASE CHAIN REACTION) ***AND*** (PLURALITY **3D** SAMPLE BLOCKS) ***AND*** ((INDEPENDENT **3D** CONTROL) **5D** THERMOELECTRIC MODULE)
2	**Full Text:** (APPARATUS **5D** POLYMERASE CHAIN REACTION) ***AND*** (PLURALITY **3D** SAMPLE BLOCKS) ***AND*** (THERMAL CONDUCTION/INSULATION **3D** LAYER/BARRIER)
3	**Full Text:** (PLURALITY **3D** SAMPLE BLOCKS) ***AND*** ((INDEPENDENT **3D** CONTROL) **5D** THERMOELECTRIC MODULE) ***AND*** **RELEVANT IPC/CPC Classifications**
4	**Full Text:** (POLYMERASE CHAIN REACTION) ***AND*** (INDEPENDENT **3D** CONTROL) ***AND*** **RELEVANT IPC/CPC Classifications**

Search Approach: Databases used

Patent databases

- Thomson innovation
- Questel orbit
- LexisNexis
- PatBase
- Free Patents Online
- USTO
- Espacenet
- InPass
- J-PlatPat
- KIPRIS
- CNIPA
- CIPO
- CAS REGISTRY/DGENE/PCTGEN/USGENE hosted by STN
- GENSEQ
- Patome
- Patentscope

Non-Patent database

- Google Scholar
- Science Direct
- CiteseerX
- Scopus
- Web of Science, Thomson Innovation
- LexisNexis
- Springer link
- JournalSeek
- Embase
- Ei Compendex
- INSPEC
- Non-Patent Conference proceedings
- ACM digital library
- IOP
- 99 Resources
- Open Thesis
- Dissertation Abstract Online

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