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(74) Agents: APPLE, Randolph T. et al.; Kilpatrick Townsend & Stockton LLP, Two Embarcadero Center, Eighth Floor, San Francisco, California 94111 (US).

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(71) Applicant: BIOCISION, LLC [US/US]; 12 East Sir Francis Drake Blvd., Suite B, Larkspur, California 94939 (US).

(72) Inventor: SCHRYVER, Brian; 12 East Sir Francis Drake Blvd., Suite B, Larkspur, California 94939 (US).

[Continued on next page]

(54) Title: CRYOGENIC SYSTEMS

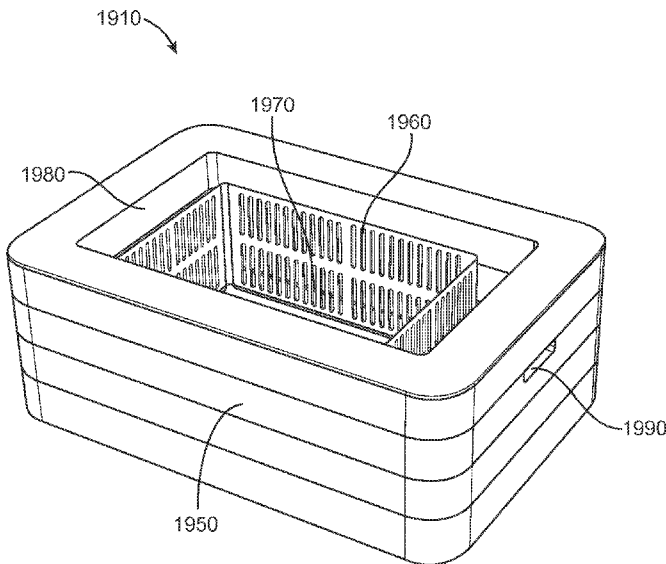


FIG. 2A

(57) Abstract: Cryogenic devices are provided in which solid carbon dioxide (dry ice) is used to maintain a temperature zone in which samples can be manipulated under conditions in which the sample is maintained at a temperature below -50C.





Published:

(88) Date of publication of the international search report:

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

12 February 2015

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US14/40756

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A01N 1/00, 1/02; F25D 3/12 (2014.01)

CPC - F25D 11/02, 23/003, 23/061

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)

IPC(8): A01N 1/00, 1/02; F25D 3/12, 3/14, 31/00 (2014.01)

CPC: F25D 11/02, 23/003, 23/061; USPC: 62/440, 441; 220/592.2

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)

MicroPatent (US Granted, US Applications, EP-A, EP-B, WO, JP, DE-G, DE-A, DE-T, DE-U, GB-A, FR-A);

Google.com, scholar.google.com; DialogPro (Derwent, INSPEC, NTIS, PASCAL, Current Contents Search, Dissertation Abstracts Online, Inside Conferences); KEYWORDS: cryogenic, cryo, freezer, cooler, container, chamber, dry ice, sensor, temperature, thermocouple, laser

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X — Y	US 2005/0188715 A1 (ARAGON D. M.) September 1, 2005; figures 1, 9; paragraph [0020]	1-3, 5/1-5/3, 6/1-6/3, 7/1-7/3, 8/1-8/3, 9/1-9/3, 10/1-10/3, 11/1-11/3, 12/11/1-12/11/3, 13/1-13/3, 14/1-14/3, 15/14/1-15/14/3, 16/15/14/1-16/15/14/3, 17/16/15/14/1-17/16/15/14/3, 18/1-18/3, 19/1-19/3, 20/1-20/3, 21/1-21/3, 22/1-22/3, 23/1-23/3, 24/23/1-24/22/3, 29/1-29/3, 34/1-34/3, 35/1-35/3 — 25/22/1-25/22/3 and 26/25/22/1-26/25/22/3
Y	WO 2012/112035 A1 (LANDMAN B. C. J.) August 23, 2012; figure 4; page 2, lines 1-10	25/22/1-25/22/3 and 26/25/22/1-26/25/22/3

Further documents are listed in the continuation of Box C.

* 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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Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US14/40756

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3,971,231 A (DERRY J.) July 27, 1976; entire document	1-3, 5/1-5/3, 6/1-6/3, 7/1-7/3, 8/1-8/3, 9/1-9/3, 10/1-10/3, 11/1-11/3, 12/11/1-12/11/3, 13/1-13/3, 14/1-14/3, 15/14/1-15/14/3, 16/15/14/1-16/15/14/3, 17/16/15/14/1-17/16/15/14/3, 18/1-18/3, 19/1-19/3, 20/1-20-3, 21/1-21/3, 22/1-22/3, 23/1-23/3, 24/23/1-24/22/3, 25/22/1-25/22/3, 26/25/22/1-26/25/22/3, 27/26/25/22/1-27/26/25/22/3, 28/27/26/25/22/1-28/27/26/25/22/3, 29/1-29/3, 34/1-34/3, 35/1-35/3
A	US 5,709,104 A (HOWCROFT K.) January 20, 1998; entire document	1-3, 5/1-5/3, 6/1-6/3, 7/1-7/3, 8/1-8/3, 9/1-9/3, 10/1-10/3, 11/1-11/3, 12/11/1-12/11/3, 13/1-13/3, 14/1-14/3, 15/14/1-15/14/3, 16/15/14/1-16/15/14/3, 17/16/15/14/1-17/16/15/14/3, 18/1-18/3, 19/1-19/3, 20/1-20-3, 21/1-21/3, 22/1-22/3, 23/1-23/3, 24/23/1-24/22/3, 25/22/1-25/22/3, 26/25/22/1-26/25/22/3, 27/26/25/22/1-27/26/25/22/3, 28/27/26/25/22/1-28/27/26/25/22/3, 29/1-29/3, 34/1-34/3, 35/1-35/3
A	US 6,212,901 B1 (PINT K. R. et al.) April 10, 2001; entire document	1-3, 5/1-5/3, 6/1-6/3, 7/1-7/3, 8/1-8/3, 9/1-9/3, 10/1-10/3, 11/1-11/3, 12/11/1-12/11/3, 13/1-13/3, 14/1-14/3, 15/14/1-15/14/3, 16/15/14/1-16/15/14/3, 17/16/15/14/1-17/16/15/14/3, 18/1-18/3, 19/1-19/3, 20/1-20-3, 21/1-21/3, 22/1-22/3, 23/1-23/3, 24/23/1-24/22/3, 25/22/1-25/22/3, 26/25/22/1-26/25/22/3, 27/26/25/22/1-27/26/25/22/3, 28/27/26/25/22/1-28/27/26/25/22/3, 29/1-29/3, 34/1-34/3, 35/1-35/3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US14/40756

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.: 30-33
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:
-***-Please See Supplemental Page-***-

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 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.:
1-3, 5/1-5/3, 6/1-6/3, 7/1-7/3, 8/1-8/3, 9/1-9/3, 10/1-10/3, 11/1-11/3, 12/11/1-12/11/3, 13/1-13/3, 14/1-14/3, 15/14/1-15/14/3, 16/15/14/1-16/15/14/3, 17/16/15/14/1-17/16/15/14/3, 18/1-18/3, 19/1-19/3, 20/1-20-3, 21/1-21/3, 22/1-22/3, 23/1-23/3, 24/23/1-24/22/3, 25/22/1-25/22/3, 26/25/22/1-26/25/22/3, 27/26/25/22/1-27/26/25/22/3, 28/27/26/25/22/1-28/27/26/25/22/3, 29/1-29/3, 34/1-34/3, 35/1-35/3

- 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.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US14/40756

-Continued from Box No. III: Observations where unity of invention is lacking-

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: claims 1-3, 5/1-5/3, 6/1-6/3, 7/1-7/3, 8/1-8/3, 9/1-9/3, 10/1-10/3, 11/1-11/3, 12/11/1-12/11/3, 13/1-13/3, 14/1-14/3, 15/14/1-15/14/3, 16/15/14/1-16/15/14/3, 17/16/15/14/1-17/16/15/14/3, 18/1-18/3, 19/1-19/3, 20/1-20-3, 21/1-21/3, 22/1-22/3, 23/1-23/3, 24/23/1-24/22/3, 25/22/1-25/22/3, 26/25/22/1-26/25/22/3, 27/26/25/22/1-27/26/25/22/3, 28/27/26/25/22/1-28/27/26/25/22/3, 29/1-29/3, 34/1-34/3, 35/1-35/3 are directed toward a retainer vertically disposed within the chamber.

Group II: claims 4, 5/4, 6/4, 7/4, 8/4, 9/4, 10/4, 11/4, 12/11/4, 14/4, 15/14/4, 16/15/14/4, 17/16/15/14/4, 18/4, 19/4, 20/4, 21/4, 22/4, 23/4, 24/23/4, 25/22/4, 26/25/22/4, 27/26/25/22/4, 28/27/26/25/22/4, 29/4, 34/4 are directed toward a retainer positioned in close proximity to an interior side wall.

Group III: claims 36-38 are directed toward rectangular and planer barrier elements.

Group IV: claims 39-43, 44/39-44/43, 45/39-45-43, 46/39-46/43, 47/39-47/43, 48/39-48/43 are directed toward a laser mounting system.

The inventions listed as Groups I-IV do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons.

The special technical features of Group I include a system for cryogenic processing comprising: a container comprising an insulated chamber, said chamber comprising a chamber floor, at least one chamber wall, a chamber opening above the chamber floor (which is not present in Group IV), said opening suitable for introduction of samples into the chamber (which is not present in Groups II-IV); and at least one gas permeable (which is not present in Groups II, IV) dry-ice retainer (which is not present in Group IV) vertically disposed within the chamber and positioned to permit direct access to the chamber floor through the chamber opening, wherein the retainer(s) divides the chamber into a sample-holding portion comprising at least part of the chamber floor (which is not present in Groups II-IV), and at least one dry ice retention space (which is not present in Groups II, IV).

The special technical features of Group II include a system for cryogenic processing comprising a container comprising one or more sides and a floor forming an interior chamber with an open top, and a retainer (which is not present in Group IV) positioned in close proximity to an interior side wall (which is not present in Groups I, II, IV), wherein said retainer is capable of holding dry ice pieces (which is not present in Group IV) and exhausting CO₂ gas directly into the interior chamber (which is not present in Groups I, II, IV).

The special technical features of Group III include a gas-permeable (which is not present in Groups II, IV) dry ice retainer for use in an insulated open-top rectangular parallelepiped chamber of a cryogenic processing system (which is not present in Group IV), comprising one or more substantially rectangular and planer barrier elements through which CO₂ gas passes and through which solid dry ice pieces do not pass, wherein said planer element is adapted for placement within said chamber such that it is separated from and faces an interior wall of the chamber (which is not present in Groups I, II, IV), forming a retention space (which is not present in Groups II, IV) between the interior wall and the barrier element (which is not present in Groups I, II, IV) into which dry ice may be introduced (which is not present in Groups II, IV).

The special technical features of Group IV include a laser mounting system, comprising: a laser carriage comprising a laser diode electrically connected to a first electrical terminal, and further comprising a first magnet; a mounting plate comprising a second electrical terminal and a second magnet, the second electrical terminal and second magnet being positioned to align with the first electrical terminal and the first magnet when laser carriage is coupled to the mounting plate; a harness adapter having a first surface for receiving an outer surface of a sensor harness and an opposing surface for receiving the mounting plate, the harness adapter being interposed between the harness and the mounting plate; and a lead wire coupled to the second electrical terminal (which is not present in Groups I-III).

The common technical features of Groups I-IV include a container comprising an insulated chamber, said chamber comprising a chamber floor, at least one chamber wall, a chamber opening above the chamber floor, and at least one gas permeable dry-ice retainer and at least one dry ice retention space.

These common technical features are disclosed by US 2006/0218963 A1 (ELIAS): a container (10) comprising an insulated chamber (12), said chamber comprising a chamber floor, at least one chamber wall, a chamber opening above the chamber floor, and at least one gas permeable dry-ice retainer (14) and at least one dry ice retention space (dry ice is held within (i.e., the retention space) box 14 (dry-ice retainer); figure 3; paragraph [0019]).

Because the common technical features are disclosed by Elias, the inventions are not so linked as to form a single general inventive concept. Therefore, Groups I-IV lack unity.