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(54) Title: RAPID CHILLING DEVICE FOR VITRIFICATION

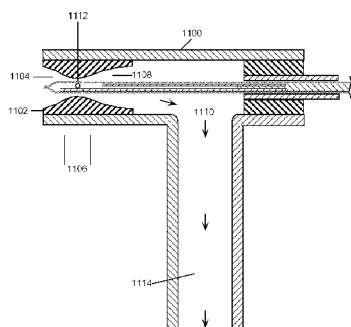


Fig. 11

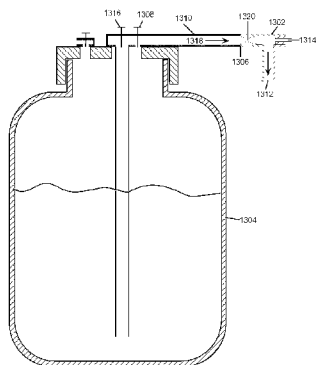


Fig. 13

(57) Abstract: Successful cryopreservation by the vitrification method depends on high chilling speed. Practitioners of vitrification prefer to use liquid nitrogen as the chilling cryogen due to its inherent safety and low cost. Plunging vitrification cryocontainers in to a quiescent pool of liquid nitrogen invariably results in a chilling rate less than the theoretical potential. The shortfall is attributed to the well-known Leidenfrost effect. The purpose of this invention it to provide improve chilling rates during vitrification using liquid nitrogen. One feature of this invention is a contacting device that invokes convective heat transfer principles to increase chilling speed. In another feature of this invention, cryogen velocity is derived from a self-pressurized dewar containing a saturated cryogen. The self-pressurization is achieved by ambient heating of the dewar's contents. In another embodiment, a sub-cooled cryogen, such as propane, is used in tandem with a saturated cryogen, such as LN2, in a self-pressurized dewar.

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INTERNATIONAL SEARCH REPORT

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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G01N A01N

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EPO-Internal, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 637 741 A (WOHLWEND MARTIN [CH]) 8 February 1995 (1995-02-08)	1,3,8,12
Y		2,7,10, 11
A	page 2, line 20 - page 2, line 32 page 4, line 31 - page 5, line 10 figure 1	4
A	EP 0 853 238 A (STUDER DANIEL DR [CH]) 15 July 1998 (1998-07-15)	1,8
Y	column 1, line 3 - column 1, line 17 column 5, line 30 - column 6, line 43 column 8, line 34 - column 10, line 4 figures 1-4	2,7,10, 11
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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	*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
E earlier document but published on or after the international filing date	*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
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O document referring to an oral disclosure, use, exhibition or other means	*&* document member of the same patent family
P document published prior to the international filing date but later than the priority date claimed	

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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 Koch, Anette
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INTERNATIONAL SEARCH REPORT

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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	US 5 024 830 A (LINNEN JOHN G [US]) 18 June 1991 (1991-06-18) column 4, line 25 - column 4, line 63 column 7, line 4 - column 7, line 21 column 7, line 59 - column 8, line 13 column 12, line 9 - column 12, line 24 figures 1-5 column 14, line 29 - column 15, line 50	1
A	DE 100 15 773 A1 (LEICA MIKROSYSTEME GMBH WIEN [AT]) 4 October 2001 (2001-10-04) paragraph [0001] paragraph [0011] - paragraph [0018] paragraph [0022] - paragraph [0025] figures 1-4	1
A	WO 94/05995 A (LEICA AG [AT]; SITTE HELLMUTH [AT]; NEUMANN KLAUS [DE]; EDELMANN LUDWI) 17 March 1994 (1994-03-17) page 1, paragraph 1 page 2, paragraph 4 - page 3, paragraph 1 page 6, line 1 - page 7, paragraph 2 figure 1	3
A	WO 2007/123720 A (CORNELL RES FOUNDATION INC [US]; WARKENTIN MATTHEW [US]; THORNE ROBERT) 1 November 2007 (2007-11-01) paragraph [0005] paragraph [0018]	1
A	paragraph [0026] - paragraph [0030] paragraph [0032] paragraph [0034]	3
A	FR 2 891 165 A (CRYO BIO SYSTEM SA [FR]) 30 March 2007 (2007-03-30) page 6, line 13 - page 7, line 22 figures 1-5	2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/031242

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 allsearchable 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.:

1-12

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: 1-12

A contactor for the rapid chilling of a biological specimen

2. claims: 13-14

A closed contactor apparatus for the rapid chilling of a biological specimen

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2009/031242

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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