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- (81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU,

[Continued on next page]

(54) Title: FUEL BUNDLE FOR A LIQUID METAL COOLED NUCLEAR REACTOR

FIG. 3A

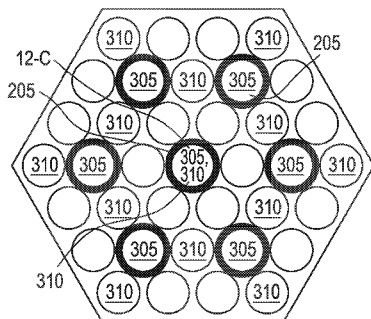
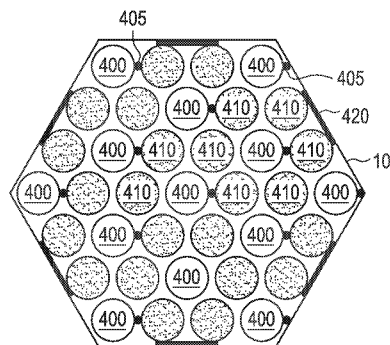


FIG. 4



(57) Abstract: Fuel bundle for a liquid metal cooled reactor, comprising a channel (10), a nose assembly (16) secured to a lower end of the channel, a plurality of fuel rods (12) disposed within the channel, at least one of the fuel rods having at least one guard ring (205) surrounding the fuel rod and spacing the fuel rod from adjacent fuel rods or at least one of the plurality of fuel rods being a wrapped rod, the wrapped rod being helically wrapped with a wire (405), and at least one of the plurality of fuel rods not being a wrapped rod.



RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

Published:

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INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. G21C3/336 G21C3/338
ADD. G21C1/03

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)
G21C

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, COMPENDEX, INSPEC, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 056 441 A (MARMONIER PIERRE ET AL) 1 November 1977 (1977-11-01) abstract; figures 1-6 column 2, line 66 - column 4, line 45 -----	1-5,13
X	JP S55 80800 U (-) 3 June 1980 (1980-06-03) the whole document -----	1
X	US 4 147 591 A (MIKI KAZUYOSHI) 3 April 1979 (1979-04-03) abstract; figures 5,6 column 2, lines 38-59 -----	6
A	----- -/--	7-12,14



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

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"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

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"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

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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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Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2013/036865

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR 2 281 632 A1 (ATOMIC ENERGY AUTHORITY UK [GB]) 5 March 1976 (1976-03-05) figures 1-5 page 1, lines 1-14 page 2, line 21 - page 3, line 23 -----	6-12,14
A	US 4 769 210 A (CAMPBELL CHARLES S [GB]) 6 September 1988 (1988-09-06) abstract; figures 1-3 column 2, lines 36-68 -----	10,12-14
A	US 4 462 958 A (LACKO ROBERT E [US] ET AL) 31 July 1984 (1984-07-31) abstract; figure 1 -----	1-14

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/036865

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.:

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: 1-5, 13

fuel bundle for liquid metal reactor with fuel assemblies in which at least a fuel rod has at least one guard ring surrounding the fuel rod and spacing it from adjacent fuel rods

2. claims: 6-12, 14

fuel bundle for liquid metal reactor with fuel assemblies in which at least one fuel rod is a wrapped rod being helically wrapped with a wire and at least one other fuel rod is not a wrapped rod

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2013/036865

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