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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, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, 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, RW, SA, 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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[Continued on next page]

(54) Title: METHOD AND APPARATUS OF CONFINING HIGH ENERGY CHARGED PARTICLES IN MAGNETIC CUSP CONFIGURATION

(57) Abstract: An apparatus and method for generating nuclear fusion reactions using a plasma initiator, and electron injector and a magnetic coil cusp confinement arrangement. The plasma initiator produces the high beta plasma inside the reaction chamber for electron confinement in the magnetic cusp arrangement. The electron injector produces a plasma potential well within the reaction chamber to confine ions and accelerates ions to fusion relevant energies within the reaction chamber.

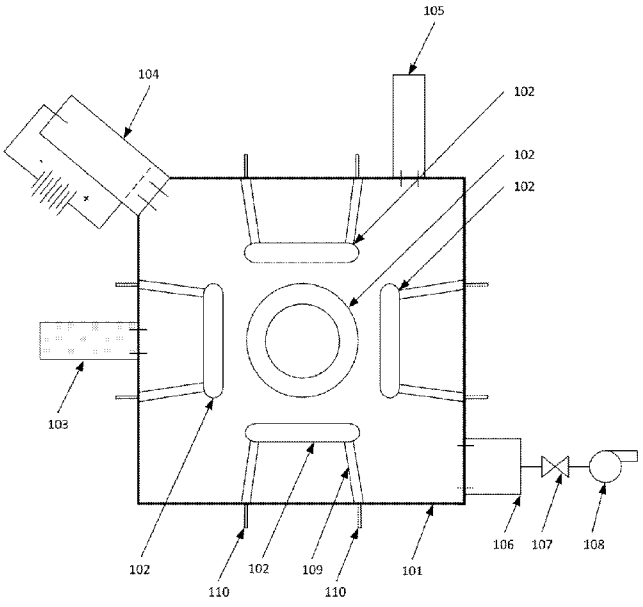

Figure 4

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TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *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))*

(88) Date of publication of the international search report:
25 February 2016

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 15/20040

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - G21B 1/00, G21B 1/03, G21B 1/05, H05H 1/02, H05H 1/03, H05H 1/11 (2015.01)

CPC - G21B 1/00, G21 B1/03, G21B 1/05, H05H 1/02, H05H 1/11, H05H 1/22, H05H 1/14

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)- G21B1/00, G21B1/03, G21B1/05, H05H1/02, H05H1/03, H05H1/11 (2015.01)
CPC-G21B1/00, G21B1/03, G21B1/05, H05H1/02, H05H1/11, H05H1/22, H05H1/14

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
IPC(8)- G21B1/00, G21B1/03, G21B1/05, H05H1/02, H05H1/03, H05H1/11 (2015.01)
CPC-G21B 1/00, G21 B1/03, G21B 1/05, H05H 1/02, H05H 1/11, H05H 1/22, H05H 1/14; USPC - 376/129, 376/107, 376/127

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Patbase; Google, Google Patent, Freepatentsonline
Search terms used: fusion plasma initiate ignition inject electrons ions positive high beta pressure heating cusp magnetic confinement containment time mirror ratio field strength formula equation

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y --- A	US 4,826,646 A (BUSSARD) 02 May 1989 (02.05.1989), Fig 9; col 8, ln 47-52; col 15, ln 32-41; col 8, ln 67-col 9, ln 2; col 12, ln 25-36; claim 17, 22, 26, 31	1, 4, 15, 16, 21 --- 2, 3, 17, 18
Y --- A	US 5,160,694 A (STEUDTNER) 03 November 1992 (03.11.1992), abstract; col 12, ln 33-62; col 19, ln 19-65	1, 4, 15, 16, 21 --- 2, 3, 17, 18
Y	US 2013/0089171 A1 (SYKES et al.) 11 April 2013 (11.04.2013), para [0077], [0078]	16, 21
A	US 2003/0230240 A1 (ROSTOKER et al.) 18 December 2003 (18.12.2003), entire document	1-4, 15-18, 21
A	US 2008/0187086 A1 (BUSSARD et al.) 07 August 2008 (07.08.2008), entire document	1-4, 15-18, 21

☐ 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	Date of mailing of the international search report
12 November 2015 (12.11.2015)	22 DEC 2015
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 15/20040

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.: 5-14, 19, 20
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:

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.:

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.