(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
31 May 2001 (31.05.2001)

PCT

(10) International Publication Number
WO 01/039197 A3

(51) International Patent Classification[7]: G21B 1/00, 1/02

(21) International Application Number: PCT/US00/31341

(22) International Filing Date:
15 November 2000 (15.11.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/448,402 24 November 1999 (24.11.1999) US

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(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

(88) Date of publication of the international search report:
20 February 2003

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 01/039197 A3

(54) Title: CAVITATION NUCLEAR REACTOR

(57) Abstract: A method and apparatus for driving nuclear reactions in a controlled manner within a cavitation nuclear reactor or CNR is provided. In general, the CNR is comprised of a solid material and, more particularly, comprised of a fuel material interspersed within a host material. The CNR can utilize any of a variety of different shapes. Energy, typically in the form of acoustic energy, is driven into the CNR with one or more drivers in order to create a pressure intensity pattern within the reactor. As a result of the pressure intensity pattern, at numerous locations within the reactor the energy is large enough to form small cavities or bubbles. Due to the phenomena of cavitation, the applied energy causes the newly formed bubbles to oscillate, undergoing a period of expansion followed by a period of bubble collapse. The velocity of the spherically converging material associated with the cavitation cycle, often times reaching supersonic velocities, is sufficient to achieve a density and temperature in excess of that required to drive a variety of different nuclear reactions including fusion, fission, spallation, and neutron stripping. If desired, an external heat source can be used to heat the material comprising the CNR, thereby promoting the desired nuclear reactions. In a specific embodiment, the CNR is driven at a frequency that either substantially matches a resonant frequency of the CNR or substantially matches an integer multiple of a resonant frequency.

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A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G21B 01/00, 01/02
US CL : 376/100-103, 146, 149

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)
U.S. : 376/100-103, 146, 149

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)
Please See Continuation Sheet

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X, P	US 6,024,935 A (MILLS et al) 15 February 2000 (15.02.2000), see entire document. Particularly note figure 5 and columns 26+.	1-5, 19, 20, 233-236, 240-242 and 249
Y	US 5,982,801 A (DEAK) 09 November 1999 (09.11.1999), see column 10.	1-5, 19, 20, 233-236, 240-242 and 249
Y	US 5,968,323 A (PLESS) 19 October 1999 (19.10.1999), see entire document.	1-5, 19, 20, 233-236, 240-242 and 249
Y	US 5,659,173 A (PUTTERMAN et al) 19 August 1997 (19.08.1997), see entire document.	1-5, 19, 20, 233-236, 240-242 and 249
Y	US 5,525,041 A (DEAK) 11 June 1996 (11.06.1996), see entire document.	1-5, 19, 20, 233-236, 240-242 and 249
X	US 5,411,654 A (AHERN et al) 02 May 1995 (02.05.1995), see entire document.	1-5, 19, 20, 233-236, 240-242 and 249

☒ 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 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

"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
28 August 2002 (28.08.2002)	10 OCT 2002
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703)305-3230	Authorized officer JACK KEITH Telephone No. (703) 308-1113

Form PCT/ISA/210 (second sheet) (July 1998)

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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.
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Y	US 4,448,743 A (BASS) 15 MAY 1984 (15.05.1984), see entire document.	1-5, 19, 20, 233-236, 240-242 and 249
Y	US 4,968,395 A (PAVELLE et al) 06 November 1990 (06.11.1990), see entire document.	1-5, 19, 20, 233-236, 240-242 and 249
Y	US 4,367,130 A (LEMELSON) 04 January 1983 (04.01.1983), see entire document.	1-5, 19, 20, 233-236, 240-242 and 249
Y	US 4,344,911 A (MANISCALCO et al) 17 August 1982 (17.08.1982), see entire document.	1-5, 19, 20, 233-236, 240-242 and 249
X	US 4,333,796 A (FLYNN) 08 June 1982 (08.06.1982), see entire document.	1-5, 19, 20, 233-236, 240-242 and 249
Y	US 3,762,992 A (HEDSTROM) 02 October 1973 (02.10.1973), see entire document.	1-5, 19, 20, 233-236, 240-242 and 249
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X	WO 95/20816 A1 (PAINTELLI) 03 August 1995 (03.08.1995), see entire document.	1-5, 19, 20, 233-236, 240-242 and 249
Y	WO 97/49274 A2 (LO) 31 December 1997 (31.12.1997), see entire document.	1-5, 19, 20, 233-236, 240-242 and 249
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A	MOSS et al. Calculated Pulse Widths and Spectra of a Single Sonoluminescing Bubble Science. 30 May 1997, Vol. 276, pages 1398-1401.	1-5, 19, 20, 233-236, 240-242 and 249
A	CRUM, L.A. Sonoluminescence Physics Today. September 1994, Pages 22-29.	1-5, 19, 20, 233-236, 240-242 and 249
A	FUKUSHIMA. Is Sono-Fusion to be a Possible Mechanism for Cold Fusion?	1-5, 19, 20, 233-236,

C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Frontiers of Cold Fusion. 1993, Pages 609-612.	240-242 and 249
A	BARBER et al. Observation of synchronous picosecond sonoluminescence Nature. 25 July 1991, Vol. 352, No. 6333, pages 318-320.	1-5, 19, 20, 233-236, 240-242 and 249
A	MARGULIS, M.A. Modern Views on the Nature of Acousto-chemical Reactions Russian Journal of Physical Chemistry. January 1976, pages 1-11.	1-5, 19, 20, 233-236, 240-242 and 249
A	MOSS et al. Sonoluminescence and the prospects for table-top micro-thermonuclear fusion Physics Letters A. 16 November 1995, pages 69-74.	1-5, 19, 20, 233-236, 240-242 and 249
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A	DINGEE, D.A. Fusion Power C&EN. 02 April 1979, Vol. 1, No. 2, Pages 32-47.	1-5, 19, 20, 233-236, 240-242 and 249
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Y	US 3,346,458 A (SCHMIDT) 10 October 1967 (10.10.1967), see entire document.	1-5, 19, 20, 233-236, 240-242 and 249
Y	US 3,037,922 A (JOHNSON) 05 June 1962 (05.06.1962), see entire document.	1-5, 19, 20, 233-236, 240-242 and 249

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Continuation of Item 4 of the first sheet:
Title is to long.

New title: Cavitation Nuclear Reactor

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

See paper no. 7 dated 01 March 2002 (PCT/ISA/206) .

Continuation of B. FIELDS SEARCHED Item 3:
East
search terms: Sono (luminescence, fusion, cavitation), bubble

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Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claim Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claim 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. ☐ Claim Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
Please See Continuation 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 fee, this Authority did not invite payment of any additional fee.
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.: 1-5, 19, 20, 233-236, 240-242 and 249.

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.
☐ No protest accompanied the payment of additional search fees.