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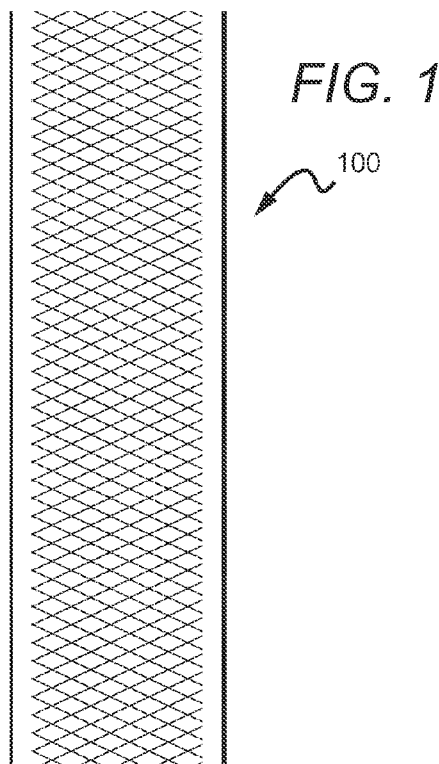
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[Continued on next page]

(54) Title: MODIFIED SPUTTERING TARGET AND DEPOSITION COMPONENTS, METHODS OF PRODUCTION AND USES THEREOF



(57) Abstract: Deposition apparatus are described herein that include at least one coil, at least one coil set, at least one coil-related apparatus, at least one target-related apparatus or a combination thereof, wherein the at least one coil, at least one coil set, at least one coil-related apparatus, at least one target-related apparatus or a combination thereof comprises a surface, and wherein at least part of the surface comprises a regular depth pattern. Methods of producing a coil, coil set or a coil-related apparatus, at least one target-related apparatus are also disclosed herein that comprise: providing at least one coil, at least one coil set, at least one coil-related apparatus, at least one target-related apparatus or a combination thereof, wherein the at least one coil, at least one coil set, at least one coil-related apparatus, at least one target-related apparatus or a combination thereof comprises a surface, providing a patterning tool; and utilizing the patterning tool to create a regular depth pattern in at least part of the surface.



(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (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, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, 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))

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22 October 2009

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/031777**A. CLASSIFICATION OF SUBJECT MATTER***C23C 14/34(2006.01)i, H01L 21/203(2006.01)i, C23C 14/56(2006.01)i*

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: C23C 14/34, H01L 21/203, C23C 14/56

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean Utility models and applications for Utility models since 1975

Japanese Utility models and applications for Utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & keywords: deposition, coil, target, surface, pattern

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98-31845 A1 (BOTTOMFIELD LAYNE F.) 23 July 1998 See the abstract; figures 1-21; and claims 1-21	1-13
X	US 6812471 B2 (POPIOLKOWSKI ALAN R et al.) 02 November 2004 See the abstract; figures 1-8; and claims 1-46	1-13
X	US 5614071 A (MAHVAN NADER et al.) 25 March 1997 See the abstract; figures 1-8B; and claims 1-8	1-13
X	US 5474649 A (KAVA JOSEPH et al.) 12 December 1995 See the abstract; figures 1-6; and claims 1-12	1-13
A	JP 10-330971 A (JAPAN ENERGY CORP.) 15 December 1998 See the abstract; figures 1-2; and claims 1-6	1-13



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

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of 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

26 AUGUST 2009 (26.08.2009)

Date of mailing of the international search report

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Name and mailing address of the ISA/KR

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2009/031777**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:

- I. Claims 1-7 directed to a deposition apparatus.
- II. Claims 8-13 directed to a method of producing a coil, coil set or a coil-related apparatus.

(Continued on extra 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.:
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.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2009/031777

Continuation of Box III.

Independent claim 1 is directed to a deposition apparatus comprising at least one coil, at least one coil set, at least one coil-related apparatus, at least one target-related apparatus or a combination thereof, wherein the at least one coil, at least one coil set, at least one coil-related apparatus, at least one target-related apparatus or a combination thereof comprises a surface, and wherein at least part of the surface comprises a regular depth pattern.

Independent claim 8 is directed to a method of producing a coil, coil set or a coil-related apparatus, comprising providing at least one coil, at least one coil set, at least one coil-related apparatus, or a combination thereof, wherein the at least one coil, at least one coil set, at least one coil-related apparatus or a combination thereof comprises a surface, providing a patterning tool, and utilizing the patterning tool to create a regular depth pattern in at least part of the surface.

The common technical feature between claims 1 and 8 is the deposition apparatus defined in claim 1. However, this feature lacks novelty and inventive step with respect to the documents cited in the ISR: (a) WO 98-31845 A1, (b) US 6812471 B2, (c) US 5614071 A, (d) US 5474649 A. Thus, there is no technical relationship left over the prior art among the claimed inventions, leaving the claims without a single general inventive concept.

Hence, there is a lack of unity of invention "a posteriori" (PCT Rules 13.1 and 13.2).

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2009/031777

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 98-31845 A1	23.07.1998	JP 2001-509214 A KR 10-2000-0069523 A US 06506312 B1	10.07.2001 25.11.2000 14.01.2003
US 6812471 B2	02.11.2004	CN 1577732 A CN 100351998 C JP 2005-039279 A KR 10-0887218 B1 US 06933508 B2 US 2003-0173526 A1 US 2004-0056211 A1 WO 2003-078680 A1	09.02.2005 28.11.2007 10.02.2005 06.03.2009 23.08.2005 18.09.2003 25.03.2004 25.09.2003
US 5614071 A	25.03.1997	WO 1997-001653 A2	16.01.1997
US 5474649 A	12.12.1995	EP 0671756 A1 EP 0671756 B1 JP 08-088219 A KR 10-0322416 B1	13.09.1995 22.10.1997 02.04.1996 02.07.2002
JP 10-330971 A	15.12.1998	EP 0882812 A1 EP 0882812 B1 JP 3449459 B2 JP 03-449459 B2 KR 10-0300522 B1 TW 438897 A US 06045665 A US 06319419 B1	09.12.1998 05.09.2001 22.09.2003 11.07.2003 22.11.2001 07.06.2001 04.04.2000 20.11.2001