

(43) International Publication Date
19 September 2013 (19.09.2013)

(51) International Patent Classification:

C23C 16/40 (2006.01) C23C 16/455 (2006.01)
C03C 17/245 (2006.01) C23C 16/54 (2006.01)

(21) International Application Number:

PCT/GB2013/050585

(22) International Filing Date:

8 March 2013 (08.03.2013)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/611,715 16 March 2012 (16.03.2012) US

(71) Applicant: **PILKINGTON GROUP LIMITED**
[GB/GB]; European Technical Centre, Hall Lane, Lathom,
Nr. Ormskirk, Lancashire L40 5UF (GB).

(72) Inventors; and

(71) Applicants : **WANG, Yu** [CN/US]; 8 Graybark Court,
Greensboro, North Carolina 27407 (US). **VARANASI,**
Srikanth [US/US]; 2119 Evergreen Road, No. 4, Ottawa
Hills, Ohio 43606 (US). **STRICKLER, David Alan**
[US/US]; 2647 Barrington Drive, Toledo, Ohio 43606
(US).

(74) Agent: **HAZZARD, Alan David**; Intellectual Property,
Pilkington European Technical Centre, Hall Lane, Lathom,
Ormskirk, Lancashire L40 5UF (GB).

(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,
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.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, 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,
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:

5 December 2013

(54) Title: CHEMICAL VAPOR DEPOSITION PROCESS FOR DEPOSITING ZINC OXIDE COATINGS, METHOD FOR
FORMING A CONDUCTIVE GLASS ARTICLE AND THE COATED GLASS ARTICLES PRODUCED THEREBY

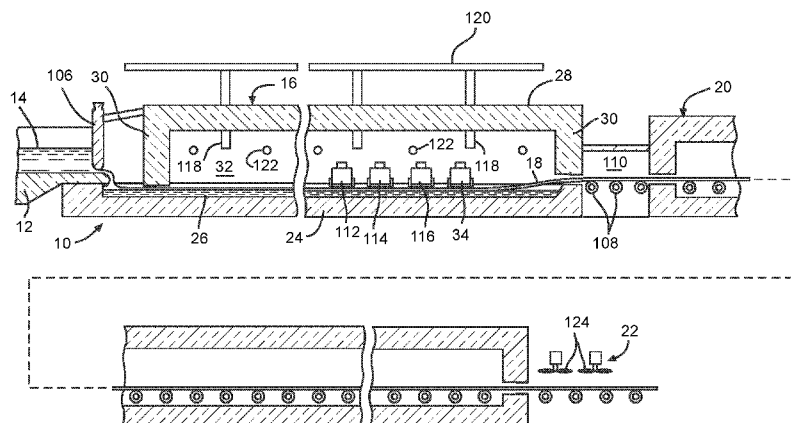


FIG. 1

(57) Abstract: A CVD process for depositing a zinc oxide coating is provided. The CVD process includes providing a moving glass substrate. The CVD process also includes forming a gaseous mixture of an alkyl zinc compound and an inert gas as a first stream, providing a first gaseous inorganic oxygen-containing compound in a second stream and providing a second gaseous inorganic oxygen-containing compound in the second stream, a third stream or in both the second and third streams. Additionally, the CVD process includes mixing the streams at or near a surface of the moving glass substrate and a zinc oxide coating is formed thereon. A method for forming a coated glass article is also provided. Additionally, a coated glass article is provided.

INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2013/050585

A. CLASSIFICATION OF SUBJECT MATTER

INV. C23C16/40 C03C17/245 C23C16/455 C23C16/54
ADD.

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)

C23C C03C

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, 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 6 071 561 A (GORDON ROY G [US] ET AL) 6 June 2000 (2000-06-06) column 4, line 52 - column 5, line 26 -----	1-12
A	US 2008/063793 A1 (ABRAMS MICHAEL B [US] ET AL) 13 March 2008 (2008-03-13) claims 1,8 page 3, paragraph 35 page 2, paragraph 16 -----	1,3,7, 10-12
X	US 2011/244140 A1 (TAKANO NOBUHIKO [JP]) 6 October 2011 (2011-10-06) paragraphs [0091], [0102] - paragraph [0110] -----	1-12
A	US 2011/088774 A1 (GROMBALL FRANCK [DE] ET AL) 21 April 2011 (2011-04-21) paragraph [0030]; figure 2 ----- -/-	7,12



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 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

11 July 2013

Date of mailing of the international search report

11/10/2013

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

Schuhmacher, Jörg

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2013/050585

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.:

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 chemical vapor deposition process for depositing a zinc oxide coating as defined in claim 1.

2. claims: 13-29

A method for forming a coated glass article as defined in claim 13 and a coated glass article as defined in claim 21.

INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2013/050585

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	WO 2012/129358 A1 (PILKINGTON GROUP LTD [GB]; SANDERSON KEVIN D [GB]; SOUBEYRAND MICHEL J) 27 September 2012 (2012-09-27) page 22 -----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2013/050585

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6071561	A	06-06-2000	NONE
US 2008063793	A1	13-03-2008	AT 528420 T 15-10-2011
		AU 2007293468 A1	13-03-2008
		BR PI0716189 A2	01-01-2013
		CN 101512043 A	19-08-2009
		EP 2074239 A1	01-07-2009
		ES 2374744 T3	21-02-2012
		JP 2010502558 A	28-01-2010
		KR 20090061650 A	16-06-2009
		PL 2074239 T3	31-07-2012
		PT 2074239 E	02-11-2011
		RU 2009112714 A	20-10-2010
		US 2008063793 A1	13-03-2008
		WO 2008030276 A1	13-03-2008
US 2011244140	A1	06-10-2011	JP 2011214062 A 27-10-2011
			US 2011244140 A1 06-10-2011
US 2011088774	A1	21-04-2011	FR 2919110 A1 23-01-2009
			US 2011088774 A1 21-04-2011
			WO 2009019373 A2 12-02-2009
WO 2012129358	A1	27-09-2012	US 2012240634 A1 27-09-2012
			WO 2012129358 A1 27-09-2012