APPARATUS FOR MAKING A GLASS ARTICLE AND METHODS

Methods of making a glass article comprise the step of flowing molten glass into an inlet of a conduit (132, 136), wherein the molten glass entering the inlet includes a flow profile with a first quantity (182) traveling in the conduit at a lower elevation than a second quantity (184) traveling in the conduit. The method further includes the step of twisting the flow profile within the conduit such that the first quantity travels in the conduit at a higher elevation than the second quantity. In further examples, apparatus for making a glass article comprise a helical vane (170) non-rotatably fixed in a conduit (132, 136) and configured to twist a flow profile (180) of a molten glass flowing within the conduit.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

*C03B 17/00(2006.01)i, C03B 5/235(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)

C03B 17/00; B01F 15/00; C03B 11/08; C03B 9/48; C03B 15/02; F16L 5/00; B01F 5/06; B01F 5/00

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

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: glass article, melter, fining chamber, stir chamber, conduit, flow profile, twist, forming vessel

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
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<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<td>A</td>
<td>US 2006/0120214 A1 (SPOROS G. RAFTIS) 08 June 2006. See paragraphs [0016]-[0019],[0039],[0042]; claims 1-3.5 and figures 1,2,4.</td>
<td>1-3, 6-8, 11-13 15-18</td>
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<td>A</td>
<td>US 2010/0085704 A1 (PAUL RICHARD GEZESIK et al.) 08 April 2010. See paragraphs [0027],[0028]; claims 1,8,10; figure 1.</td>
<td>1-3, 6-8, 11-13 15-18</td>
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<td>A</td>
<td>US 04408883 A (WILLIAM T. RICE, III) 11 October 1983. See column 2, lines 44-column 3, lines 11,12; claims 1,3,4 and figure 1.</td>
<td>1-3, 6-8, 11-13 15-18</td>
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☐ 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: 10 DECEMBER 2012 (10.12.2012)

Date of mailing of the international search report: 12 DECEMBER 2012 (12.12.2012)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office

189 Cheongna-ro, Seo-gu, Daegu Metropolitan City, 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

CHANG, BONG HO

Telephone No. 82-42-481-3353

Form PCT/ISA/210 (second sheet) (July 2009)
INTERNATIONAL SEARCH REPORT

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.: 5, 10, 20 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:

   Claims 5, 10 and 20 are unclear because they refer to multiple dependent claims 4, 9 and 19 which do not comply with PCT Rule 6.4(a)

3. ☒ Claims Nos.: 4, 9, 14, 19 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 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 application No.
PCT/US2012/032238

Form PCT/ISA/210 (continuation of first sheet (2)) (July 2009)
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