A pump system has a rotatory shaft and a rotatory drive arrangement coupled to the rotatory shaft for applying rotatory energy thereto. First through fourth pump arrangements are coupled to the rotatory shaft, each pump arrangement pumping a pulse of air during each rotation of the rotatory shaft, the first, second, third, and fourth pump arrangements pumping a corresponding pulse of air sequentially during each rotation of the rotatory shaft. The rotatory shaft has a first and second ends, and a central region therebetween where an electric motor is coaxially arranged. The first and third pump arrangements are coupled to the first end of the rotatory shaft, and the second and fourth pump arrangements are coupled to the second end of the rotatory shaft. Angularly displaced eccentric couplers couple the pump arrangement to the respective ends of the rotatory shaft.
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, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG). — before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

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### INTERNATIONAL SEARCH REPORT

**International application No**

PCT/US07/18270

#### A CLASSIFICATION OF SUBJECT MATTER

**IPC**

- K04B 23/04 (2006 01), 1/00 (2006 01), 17/00 (2006 01), 4/0/0 (2006 01), 35/01 (2006 01), 27/00 (2006 01)

**USPC**

- 417/62.4 15,271 2,666,350 352,4 15,4 19,52 1,524

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 417/62.4 15 271 2,666,350,352,4 15 4 19,52 1,324

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

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

#### C DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>US 5,588,811 (PRICE) 31 December 1996 (31 12 1996), whole document</td>
<td>1-6, 8-20</td>
</tr>
<tr>
<td>A</td>
<td>US 3,239,132 (FRANK et al.) 8 March 1966 (08 03 1966) column 4 lines 23-34</td>
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<td>A</td>
<td>US 1,508,805 (SHAVV et al.) 16 September 1924 (16 09 1924) whole document</td>
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<tr>
<td>A</td>
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#### D Further documents are listed in the continuation of Bo. C

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- **A** document member of the same patent family

#### Date of the actual completion of the international search

25 June 2008 (25 06 2008)

#### Date of mailing of the international search report

20 AUG 2008

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