Title: PISTON POSITION DRIFT CONTROL FOR FREE-PISTON DEVICE

Abstract: A piston position drift control (110) for a free-piston device (112). The control includes a passage connecting internal volumes of the device, the passage (122) being substantially shorter than an acoustic wavelength of the device; and a check valve (124) in the passage for controlling fluid communication between the internal volumes, the check valve having an opening pressure not less than approximately 20% of a maximum pressure differential of the device at a maximum stroke. The control is passive, requires no active control once in service, provides low susceptibility to damage or fouling, and is amenable to adjustment or repair if needed. In addition, the control is small and inexpensive, and functions across the entire operational range of a free-piston device it supports. A related free-piston device including the piston position drift control is also provided.
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.
INTERNATIONAL SEARCH REPORT

International application No.
PCT/US03/36901

A. CLASSIFICATION OF SUBJECT MATTER
IPC(7) : F 15 B 11/08
US CL : 91/468
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. : 91/468; 60/517, 520, 494, 522; 92/82; 123/46R

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)

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>
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<tr>
<td>Y</td>
<td>US 5 461 859 A (BEALE) 31 October 1995, see entire document.</td>
<td>1-17</td>
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<tr>
<td>Y, P</td>
<td>US 6 564 552 B1 (WARD et al.) 20 May 2003, see entire document.</td>
<td>1-17</td>
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<tr>
<td>A</td>
<td>US 5 873 246 A (BEALE) 23 February 1999.</td>
<td>1-17</td>
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<td>A</td>
<td>JP 09 242 903 A (OSHIRO) 16 September 1997.</td>
<td>1-17</td>
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Further documents are listed in the continuation of Box C.

See patent family annex.

Date of the actual completion of the international search 07 June 2004 (07.06.2004)

Date of mailing of the international search report 02 SEP 2004

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