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- (71) Applicant: **LEVANT POWER CORPORATION**  
[US/US]; 475 Wildwood Avenue, Woburn, MA 01801 (US).
- (72) Inventors: **GIOVANARDI, Marco**; 132 Forest Street, Melrose, MA 02176 (US). **NEIL, Patrick, W.**; 49 High Street, Randolph, MA 02368 (US). **O'SHEA, Colin, Patrick**; 49 Jay Street, Cambridge, MA 02139 (US). **SCHNED3ER, Johannes**; 188 Brookline Street, Cambridge, MA 02446 (US). **TUCKER, Clive**; 6 Lawnwood Place, Unit 3, Charlestown, MA 02129 (US). **ZUCKERMAN, Richard, Anthony**; 225 Cedar St., Apt. If, Somerville, MA 02145 (US).

- (74) Agent: **FERRARO, Neil, P.**; Wolf, Greenfield & Sacks, P.C., 600 Atlantic Avenue, Boston, MA 02210-2206 (US).
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— with international search report (Art. 21(3))

[Continued on nextpage]

(54) Title: MULTI-PATH FLUID DIVERTER VALVE

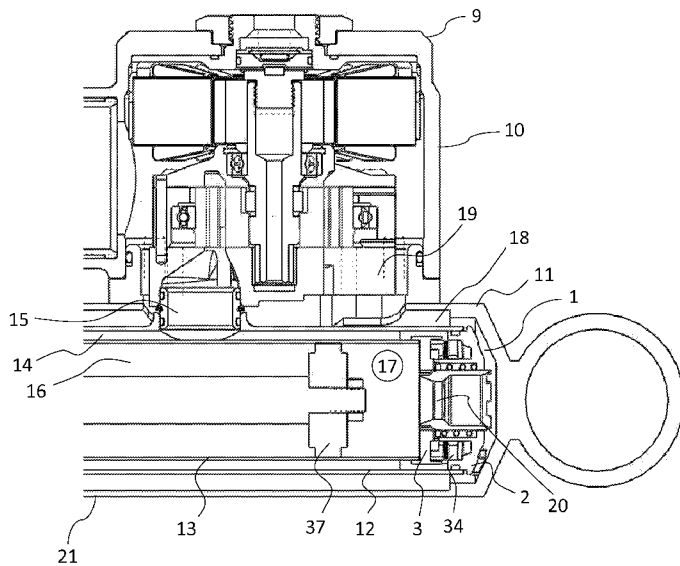


FIG. 2

(57) Abstract: A multi-path fluid flow control valve for a shock absorber that restricts fluid into a first path while opening fluid flow to a second path when a given fluid flow velocity is reached. Exemplary configurations of this diverter valve are disclosed such as a spring loaded disc valve with face sealing lands, and a spool valve with diametric sealing lands. Applications include active suspension dampers in order to limit maximum RPM into a hydraulic motor. For such a system, in one mode the diverter valve allows fluid to move unrestricted into the hydraulic motor. When fluid velocity reaches a tunable set point, in a second mode the diverter valve restricts flow into the hydraulic motor and bypasses it shuttling fluid into the opposite side of the damper. In some cases progressive damping valves are utilized in series or parallel to smooth damping characteristics during, before, and after transitions.

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— 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  
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**INTERNATIONAL SEARCH REPORT**

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| International application No.<br>PCT/US2014/027389 |
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**A. CLASSIFICATION OF SUBJECT MATTER**  
**IPC (8) - B60G 17/015; F16F 9/34 (2014.01)**  
**CPC - B60G 17/0152; F16F 9/3405 (2014.07)**  
 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(8) - B60G 17/015; F16F 9/34, 9/50 (2014.01)  
 CPC - B60G 17/0152, 2600/18, 2600/184; F16F 9/3405 (2014.07)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
 USPC - 137/493.8; 180/165, 902; 290/43

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
 PatBase, Google Patents, Google, YouTube, ProQuest Dialog

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|-----------------------|
| X         | WO 201 11/59874 A2 (TUCKER et al) 22 December 201 1 (22.12.201 1) entire document  | 70-76, 80-82          |
| A         | US 2004/021 1631 A1 (HSU) 28 October 2004 (28.10.2004) entire document             | 1-1 1, 70-82          |
| A         | US 4,936,423 A (KARNOPP) 26 June 1990 (26.06.1990) entire document                 | 1-1 1, 70-82          |
| A         | US 2005/0121268 A1 (GROVES et al) 09 June 2005 (09.06.2005) entire document        | 1-1 1, 70-82          |

Further documents are listed in the continuation of Box C.

\* Special categories of cited documents:

|   |  |
|---|--|
| "A" document defining the general state of the art which is not considered to be of particular relevance  | "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  |
| "E" earlier application or patent but published on or after the international filing date   | "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   |
| "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) | "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 |
| "O" document referring to an oral disclosure, use, exhibition or other means  | "&" document member of the same patent family  |
| "P" document published prior to the international filing date but later than the priority date claimed  |  |

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| Date of the actual completion of the international search<br>04 September 2014 | Date of mailing of the international search report<br><b>07 OCT 2014</b> |
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| Name and mailing address of the ISA/US<br>Mail Stop PCT, Attn: ISA/US, Commissioner for Patents<br>P.O. Box 1450, Alexandria, Virginia 22313-1450<br>Facsimile No. 571-273-3201 | Authorized officer:<br>Blaine R. Copenheaver<br>PCT Helpdesk: 571-272-4300<br>PCT OSP: 571-272-7774 |
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INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2014/027389

**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 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 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.:  
1-11, 70-82

**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.

## Box III

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees need to be paid.

Group I, claims 1-11, 70-82 are drawn to a diverter valve comprising at least one of a compression or rebound chamber and a hydraulic pump/motor.

Group II, claims 12-69 are drawn to a diverter valve comprising a first inlet port, a moveable element, and a force element.

The inventions listed in Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1, because under PCT Rule 13.2 they lack the same or corresponding special technical features for the following reasons:

The special technical features of Group I, a diverter valve controlling the free flow between a compression or rebound chamber and a hydraulic pump/motor, are not present in Group II; and the special technical features of Group II, a diverter valve comprising a first port comprising an inlet, a moveable sealing element that moves through two modes, and a force element that biases the movable sealing element, are not present in Group I.

Groups I and II share the technical features of a diverter valve comprising a first mode of fluid flow through a first outlet port and a second mode of at least partially closing the first outlet port and opening a second outlet port. However, these shared technical features do not represent a contribution over the prior art. Specifically, US 3,805,833 A to Teed teaches of a diverter valve (Abstract; 10, Fig. 2) comprising a first mode of fluid flow through a first outlet port (outlet port 24; Fig. 1; Col. 2, Ln. 67 - Col. 3, Ln. 6) and a second mode of at least partially closing the first outlet port and opening a second outlet port (outlet port 26; Fig. 6; Col. 3, Lns. 9-11).

Since none of the special technical features of the Group I and II inventions are found in more than one of the inventions, unity is lacking.