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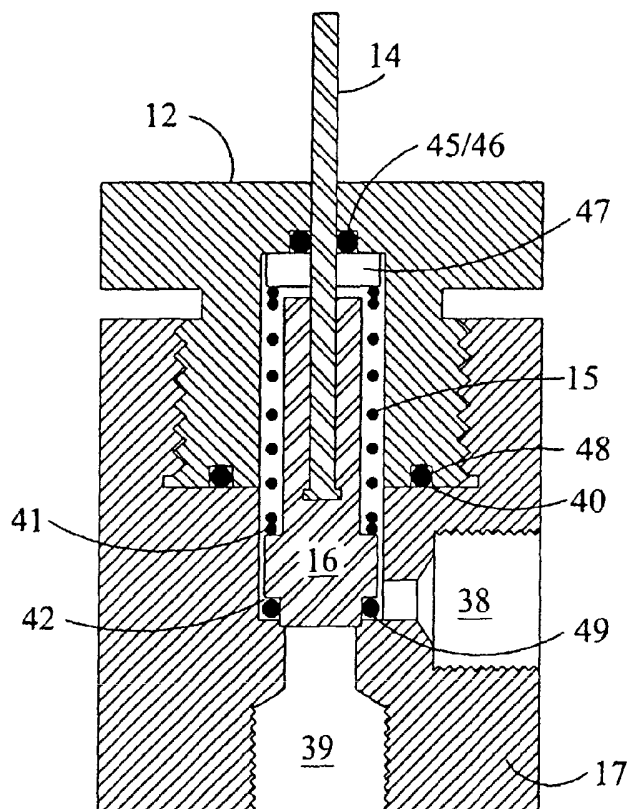
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(54) Title: FLOW MEASUREMENT AND CONTROL SYSTEM FOR POSITIVE DISPLACEMENT PUMPS



(57) Abstract: A pump monitoring and flow control system that provides direct indication of discharge flow on a positive displacement or diaphragm injection-type pumps. The device (1) uses a "tell-tale" check valve that drives a proximity switch (20) each time the valve, installed as the output check valve on a standard injection pump, opens with discharge flow. The proximity switch (20) in turn signals the monitoring system while flow control is accomplished through an adjustable volume chamber in series with the output check valve.



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

national Application No
PCT/US 03/16574

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 F16K15/02 F16K17/04 F16K37/00

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 7 F16K F04B

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 practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 144 102 A (BUSE WERNER) 1 September 1992 (1992-09-01) column 2, line 12 - column 3, line 27; figure 1	1-3, 6-9, 13, 14
X	WO 85/00868 A (ROSAEN NILS O) 28 February 1985 (1985-02-28) page 2, line 27 - page 5, line 3; figures 1-4	1, 7, 13, 14
X	US 3 667 495 A (SCHULER HANSJORG ET AL) 6 June 1972 (1972-06-06) column 10, line 73 - column 16, line 51; figures 1-5	1-4, 7-10, 13, 14
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in 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 document but published on or after the international filing date

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"P" document published prior to the international filing date but later than the priority date claimed

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"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

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"&" document member of the same patent family

Date of the actual completion of the international search

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03.01.04

Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 03/16574

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 694 117 A (SUGAREK C ALAN) 2 December 1997 (1997-12-02) column 3, line 8 - column 5, line 56; figures 1-5 -----	1-3,6-9, 12-14
X	US 3 587 632 A (CLAY HAILE S) 28 June 1971 (1971-06-28) column 1, line 71 - column 2, line 61; figure 1 -----	1-4, 7-10,13, 14
X	US 3 995 658 A (HAGER DANIEL) 7 December 1976 (1976-12-07) column 2, line 43 - column 4, line 5; figures 1-7 -----	1,7,13, 14
X	DE 201 05 191 U (HONEYWELL AG) 2 May 2002 (2002-05-02) the whole document -----	13,14
A	IT 1 218 663 B (MAGNETI MARELLI SPA) 19 April 1990 (1990-04-19) figures 1,2 -----	1,7,13, 14

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 03/16574

Box I Observations where certain claims were found unsearchable (Continuation of item 1 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 II Observations where unity of invention is lacking (Continuation of item 2 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 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.:

1, 7, 13, 14

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ 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: 1,7,13,14

Check valve construction.

2. claims: 15,16,18

Monitoring system that can be used with a check valve.

3. claim: 17

Variable volume cylinder.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 03/16574

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