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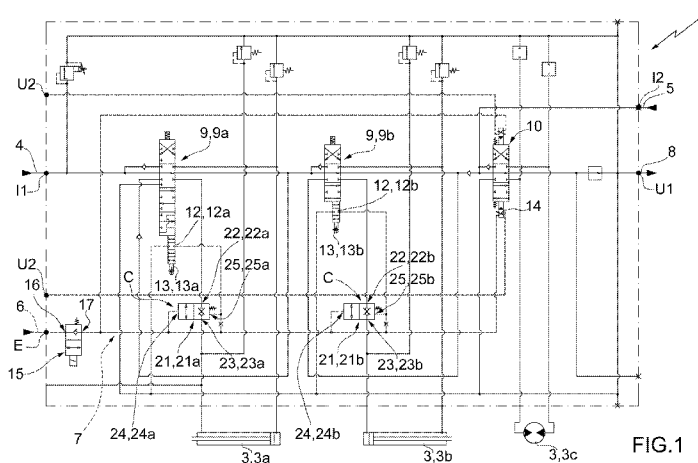
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Published:

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(54) Title: CONTROL DEVICE FOR ZERO-LEAK DIRECTIONAL CONTROL VALVES



(57) Abstract: Hydraulic system, distributor and bidirectional valve to activate the hydraulic actuators (3; 3a, 3b) of an operating machine; the hydraulic system (1) having: a first high-pressure oil delivery (4); an oil drain (8); a slide valve with a spool, which is axially sliding and is suited to control a hydraulic actuator (3); a second low-pressure oil delivery (6); an activation valve (15); and a bidirectional valve (21) with a first passage opening (22) that can be hydraulically connected, by means of the slide valve (9) to the first delivery (4) and a second passage opening (23) hydraulically connected to the actuator (3); wherein, the bidirectional valve has an inlet opening (24) that can be connected, by means of the activation valve (15) to the second delivery (6) and an outlet opening (25) that can be connected, by means of the spool (12) to the drain (8).

WO 2016/009369 A3

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2015/055358

A. CLASSIFICATION OF SUBJECT MATTER
INV. F15B11
ADD.
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)
F15B

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)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 2 189 666 A1 (BOSCH REXROTH OIL CONTROL S P [IT]) 26 May 2010 (2010-05-26) paragraph [0021] - paragraph [0027]; figure 1	1-4
A	WO 2011/154810 A1 (HYDROCONTROL S P A CON UNICO SOCIO [IT]; BULGARELLI CLAUDIO [IT]; RIVA) 15 December 2011 (2011-12-15) cited in the application page 3, line 10 - page 4, line 10; figure 1	1-4
A	US 4 766 728 A (GLOMEAU J ROBERT [US]) 30 August 1988 (1988-08-30) column 2, line 3 - column 4, line 52; figures 1,2	1-4
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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 another 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

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Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 286 502 A (BIANCHETTA DONALD L ET AL) 1 September 1981 (1981-09-01) column 2, line 3 - column 4, line 52 -----	1-4

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2015/055358

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2189666	A1	26-05-2010	NONE
WO 2011154810	A1	15-12-2011	NONE
US 4766728	A	30-08-1988	NONE
US 4286502	A	01-09-1981	NONE

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2015/055358

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 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 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.:

1-4

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-4

a hydraulic system to activate hydraulic actuators.

2. claims: 5-9

a distributor for a hydraulic system

3. claims: 10-12

a bidirectional valve for a hydraulic system
