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(54) **Electro-hydraulic actuator and method for controlling actuator position**

(57) A fluid actuator (10) achieves precise placement without external feedback by employing a spool (44) slidable within a piston (20). The relative positions of the piston (20) and the spool (44) determine whether pressurized fluid is applied to extend the piston, to retract the piston, or to maintain the position of the piston. The spool (44) is positioned by balancing a spring (46) force on one end with a variable pressure force on the other end, the variable pressure fluid for providing the variable pressure force being supplied by a pulse width modulation valve (28) which is mounted in the actuator (10). The pressure of the fluid supplied by the modulation valve (28) is a function of an input such as an electrical signal received by the valve. The position of the piston (20) is determined by the position of the spool (44). In an exemplary embodiment, an actuator positions the vanes of a turbocharger of a motor vehicle engine. The pressurized fluid used is the crankcase oil of the engine.

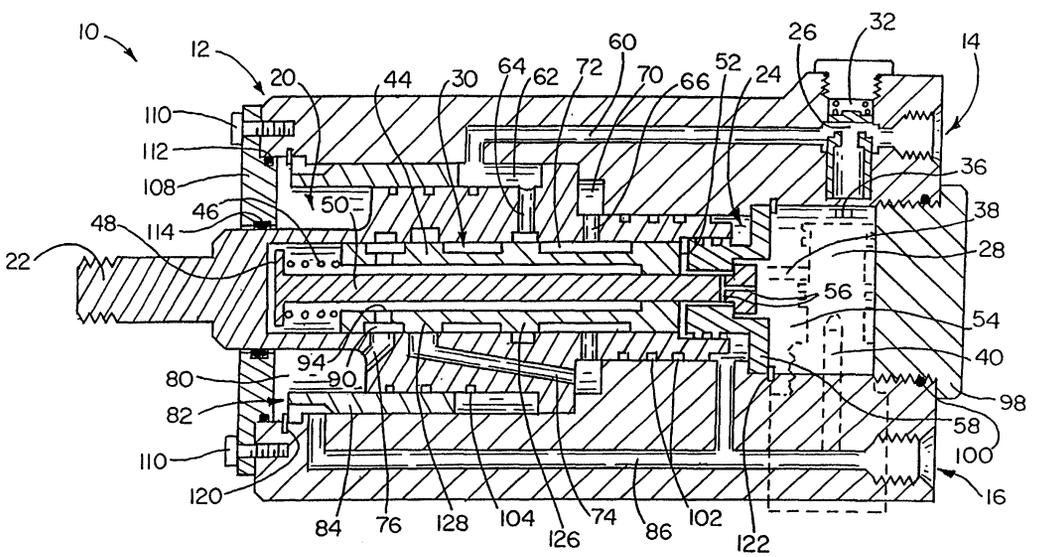


FIG. 1

EP 1 067 293 A3

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EUROPEAN SEARCH REPORT

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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 3 017 750 A (CARL KEMPSON BERTRAM) 23 January 1962 (1962-01-23) * column 2, line 60 - column 3, line 49 *	1-8, 10-18	F15B9/12 F15B15/20
X	DE 31 04 478 A (WABCO STEUERUNGSTECH) 19 August 1982 (1982-08-19) * page 9, line 14 - page 11, line 25 *	1-5, 10-20	
X	GB 1 252 666 A (DEERE & COMPANY) 10 November 1971 (1971-11-10) * column 3, line 1 - column 3, line 126 *	1,2,5-20	
X	US 3 646 849 A (SMITH TREVOR STANLEY) 7 March 1972 (1972-03-07) * column 1, line 59 - column 2, line 26 *	1,12,17	
X	US 4 426 912 A (JARNIAC ROGER) 24 January 1984 (1984-01-24) * column 2, line 67 - column 3, line 41 *	1,12,17	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7) F15B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	25 September 2003	Toffolo, O

CATEGORY OF CITED DOCUMENTS

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25-09-2003

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3017750 A	23-01-1962	NONE	
DE 3104478 A	19-08-1982	DE 3104478 A1	19-08-1982
		GB 2095429 A ,B	29-09-1982
		HU 188772 B	28-05-1986
GB 1252666 A	10-11-1971	DE 1901359 A1	04-09-1969
		FR 1603598 A	03-05-1971
		US 3511134 A	12-05-1970
US 3646849 A	07-03-1972	NONE	
US 4426912 A	24-01-1984	FR 2492909 A1	30-04-1982
		AU 543842 B2	02-05-1985
		AU 7650881 A	29-04-1982
		DE 3173730 D1	20-03-1986
		EP 0051014 A1	05-05-1982
		JP 57098498 A	18-06-1982
		YU 252181 A1	29-02-1984

EPO FORM P0459

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