

(12) **United States Patent**  
**Rochas**

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- (54) **PRESSURE CONTROL VALVE**
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- (\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 74 days.

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

- 2,930,404 A \* 3/1960 Kowalski ..... F16K 27/0263  
137/454.5  
4,502,031 A \* 2/1985 Ito ..... H01F 7/081  
335/257

(Continued)

FOREIGN PATENT DOCUMENTS

- EP 1 106 816 A2 6/2001  
EP 1 748 240 A1 1/2007

(Continued)

OTHER PUBLICATIONS

International Search Report corresponding to PCT Application No. PCT/EP2013/059518, mailed Jun. 7, 2013 (German and English language document) (5 pages).

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(57) **ABSTRACT**

A pressure control valve for a high-pressure accumulator of an injection device of an internal combustion engine, includes a magnetic actuator. The magnetic actuator has a magnetic core with contacting pins and a magnetic armature with an armature plate. The contacting pins pass through feedthroughs formed in the armature plate. The armature plate is hydraulically connected by a pressure equalization channel to a valve chamber connected to low pressure. The pressure equalization channel has an opening on the magnetic core end face which opens into the armature space. At least one of the feedthroughs forms a passage for the fuel through the armature plate for the pressure equalization. A residual air gap disk is arranged between the magnetic core and the armature plate. The residual air gap disk forms an additional feedthrough with a radial extension that extends in the direction of the opening.

**8 Claims, 2 Drawing Sheets**

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