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[Continued on next page]

(54) Title: SPRING RETAINING PIN FOR VALVE STEM RETENTION

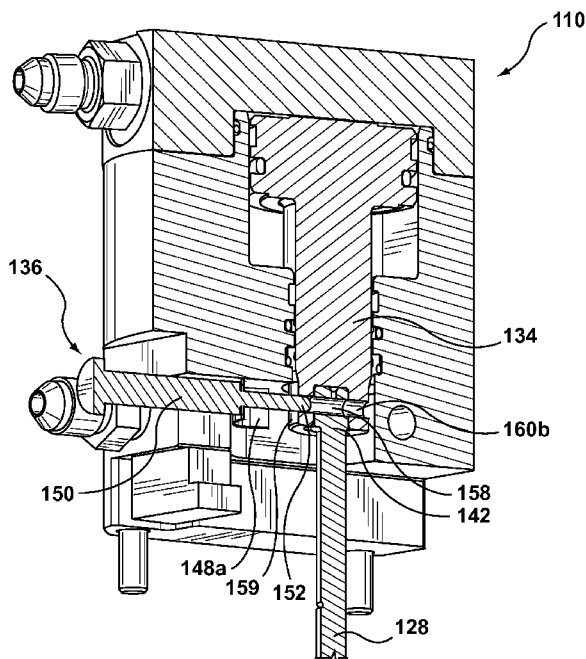


FIG. 4

(57) Abstract: An apparatus and method of coupling and decoupling a valve stem to an actuator are disclosed. In one embodiment, the actuator includes a moveable member that is coupled to the valve stem. One of the valve stem and the moveable member is a male coupling portion and the other of the valve stem and moveable member is the female coupling portion. The male coupling portion is nested within the female coupling portion. A retaining pin retains the male coupling portion with respect to the female coupling portion.





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— *of inventorship (Rule 4.17(iv))*

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— *with international search report (Art. 21(3))*

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 15/37963

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B29C 45/03 (2015.01)

CPC - B29C 45/03

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) - B29C 45/03 (2015.01)

CPC - B29C 45/03

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

IPC(8) - B29C 45/03, 45/00, 45/18, 45/20 (2015.01)

CPC - B29C 45/03, 45/00, 45/281, 45/1775, 45/84, 45/18, 45/20, 45/74 (Search Terms Limited, See Below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatBase, Google Patents, Google Scholar. Search Terms Included: valve gate hot runner; ball lock pin; locking pin C-shape; ball-lock spade; retention block for actuator; hot runner OR injection mold OR molding material distributor; actuat*; nozzle% OR stem%; pin*; valve stem%; spade OR c-shape OR u-shape; clamp* OR grip* OR clip* OR lock*; spade;

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y -- A	US 2011/0018172 A1 (Bouti et al.) 27 January 2011 (27.01.2011), entire document, especially Fig 1-2, 8A-8B; para [0032]	1-3, 31, 37, 38, 41-43, 48 ----- 50 ----- 4-9, 20-21, 24-26, 28-29, 32-36, 39-40, 44-47, 49
Y -- A	US 2009/0315236 A1 (McIntosh) 24 December 2009 (24.12.2009), entire document, especially Fig 1a, 1b, 2	50 ----- 35-36, 40
A	US 5,845,898 A (Halder et al.) 08 December 1998 (08.12.1998), entire document, especially Fig 1	4, 6-9, 20-21, 25-26, 28-29, 32-33, 40, 44-47
A	US 2002/0179780 A1 (Benoit et al.) 05 December 2002 (05.12.2002), entire document, especially Fig 1-2, 5	5, 24, 34, 39-40
A	Applicant's Own Admitted Prior Art, especially Fig 1	35-36, 49-50
A	US 2010/0044896 A1 (Tabassi et al.) 25 February 2010 (25.02.2010), entire document	1, 31, 41
A	WO 2014/009024 A2 (Olaru) 16 January 2014 (16.01.2014), entire document	1, 31, 41
A	US 2013/0316036 A1 (Metz et al.) 28 November 2013 (28.11.2013), entire document	1, 31, 41
A	US 2,098,185 A (Hannaford) 02 November 1937 (02.11.1937), entire document	1, 31, 41

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

"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

25 August 2015 (25.08.2015)

Date of mailing of the international search report

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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 4,952,093 A (Murakami) 28 August 1990 (28.08.1990), entire document	1, 31, 41
A	US 5,669,590 A (Przewodek) 23 September 1997 (23.09.1997), entire document	1, 31, 41
A	US 2003/0151165 A1 (Colonico) 14 August 2003 (14.08.2003), entire document	1, 31, 41

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 15/37963

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.: 10-19, 22-23, 27, 30
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:

- 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.:

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.