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F41A 3/30 (2006.01) *F41A 5/24* (2006.01)

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English

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English

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Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

[Continued on next page]

(54) Title: FIREARM SYSTEMS AND METHODS

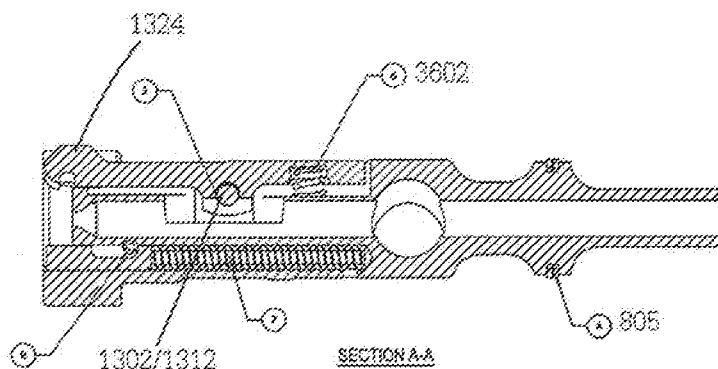


Fig. 36P

(57) **Abstract:** A firearm can have a bolt having a plurality of locking lugs that are configured to have a shear area that is larger than that of a standard M16/M4. A bolt carrier can have a bolt that has a double cut cam having an unlocking cam surface that has sufficient dwell increase to delay a start of unlocking when the bolt carrier is used in an M4 carbine. A stepped extractor pin may be provided that prevents disengagement of the extractor pin. A tube can be configured to provide gas from a barrel of the firearm to the piston via the carrier key. The tube can have a heat radiator formed from triangular shaped threads on at least a portion of the tube. A piston on the bolt and can have a plurality of rings including pairs of mating rings that are formed and maintained as a matched pair.



(88) Date of publication of the international search report:

27 April 2017

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER

INV. F41A15/14 F41A3/26 F41A3/30 F41A3/62 F41A3/70
F41A5/24

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)

F41A F16J

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.
X	US 2012/180648 A1 (SULLIVAN LEROY JAMES [US] ET AL) 19 July 2012 (2012-07-19)	14,25-30
Y	paragraphs [0086], [0113], [0117],	18,19
A	[0155], [0191]	1,9,15,20
A	----- US 2014/090283 A1 (GOMEZ JESUS S [US]) 3 April 2014 (2014-04-03) paragraph [0094]	1,9,14
A	----- CA 2 360 090 A1 (HECKER & KOCH GMBH [DE]) 3 August 2000 (2000-08-03) page 9, line 2; figures 1a,1b	1,9,14
Y	----- GB 107 180 A (MARCH WILLIAM [GB]; MANN ALLEN [GB]; ROBERTSON DONALD WILLIAM [GB]) 21 June 1917 (1917-06-21) page 1, line 17 - line 18; figures 1,2	18,19



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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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2016/033362

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.:

1-16, 18-30
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.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2016/033362

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GB 107180	A	21-06-1917	NONE

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-16

Improved extractor pin

2. claim: 17

Improved feed ramp

3. claims: 18-24

Improved gas leakage mitigation

4. claims: 25-30

Improving the cooling of the gas system
