



- (51) International Patent Classification:  
F02M 59/26 (2006.01)
- (21) International Application Number:  
PCT/EP2013/001500
- (22) International Filing Date:  
21 May 2013 (21.05.2013)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
12170081.9 30 May 2012 (30.05.2012) EP
- (71) Applicant: CATERPILLAR MOTOREN GMBH & CO. KG [DE/DE]; Falckensteiner Straße 2, 24159 Kiel (DE).
- (72) Inventors: VON DER OSTEN-SACK, Andreas; Vörstkoppel 3, 24145 Kiel (DE). OHRT, Ole; Steinbergstraße 1a, 25575 Beringstedt (DE).
- (74) Agent: KRAMER - BARSKE - SCHMIDTCHEN; Landsberger Strasse 300, 80687 Munich (DE).
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,

DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

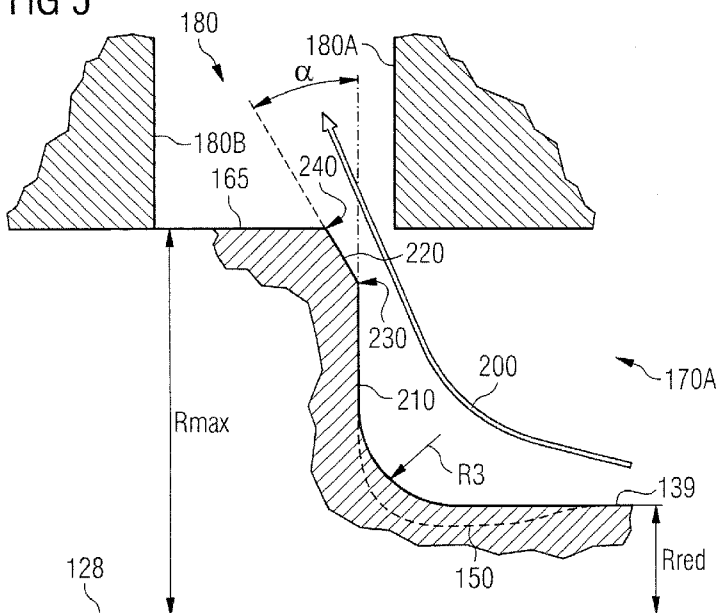
**Published:**

- 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))

(88) Date of publication of the international search report:  
23 January 2014

(54) Title: PLUNGER FOR AN INTERNAL COMBUSTION ENGINE FUEL PUMP

FIG 5



(57) Abstract: A plunger (115) of a fuel pump (10) may have an essentially cylindrical base shape for axial movement and rotation within a pump barrel (110) of the fuel pump (10). The plunger (115) may comprise, at a fuel amount controlling end of the plunger (115), an outer surface that comprises a recessed surface region (139), a sealing surface section (165), and a control interface (170, 170A, 170B) connecting in radial direction the recessed surface region (139) with the sealing surface section (165). At the radial inner section of the control interface (170, 170A, 170B), the transition from the recessed surface region (139) to the control interface (170, 170A, 170B) may be curved with a curvature radius that has a radius equal or larger than 1mm to thereby reduce or avoid cavitation effects, for example, when used with high water content alternative fuels.

**INTERNATIONAL SEARCH REPORT**

International application No  
PCT/EP2013/001500

**A. CLASSIFICATION OF SUBJECT MATTER**  
INV. F02M59/26  
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)  
F02M

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

<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	FR 1 567 479 A (SULZER) 16 May 1969 (1969-05-16) figures 1,2	1-4,8, 11,14,15 5,6 12,13
X	----- JP 57 030375 U (UNKNOWN) 17 February 1982 (1982-02-17)  figures	1,2,7, 9-11,14, 15
X	----- DE 763 005 C (BOSCH GMBH ROBERT) 29 March 1954 (1954-03-29)  figures	1,2,7, 9-11,14, 15
X Y	----- DE 39 02 764 A1 (BOSCH GMBH ROBERT [DE]) 2 August 1990 (1990-08-02) claim 8; figures 1,2	1,2,14, 15 5,6

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents :

<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"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</p> <p>"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</p> <p>"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</p> <p>"&amp;" document member of the same patent family</p>
---	---

Date of the actual completion of the international search  <b>14 November 2013</b>	Date of mailing of the international search report  <b>29/11/2013</b>
--	---

Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer  <b>Torle, Erik</b>
--	--

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2013/001500

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 1567479	A	16-05-1969	CH 476917 A 15-08-1969
			FR 1567479 A 16-05-1969
			NL 6709497 A 20-12-1968
-----			
JP 57030375	U	17-02-1982	
DE 763005	C	29-03-1954	NONE
-----			
DE 3902764	A1	02-08-1990	DE 3902764 A1 02-08-1990
			GB 2231369 A 14-11-1990
			JP 2974710 B2 10-11-1999
			JP H02238167 A 20-09-1990
-----			