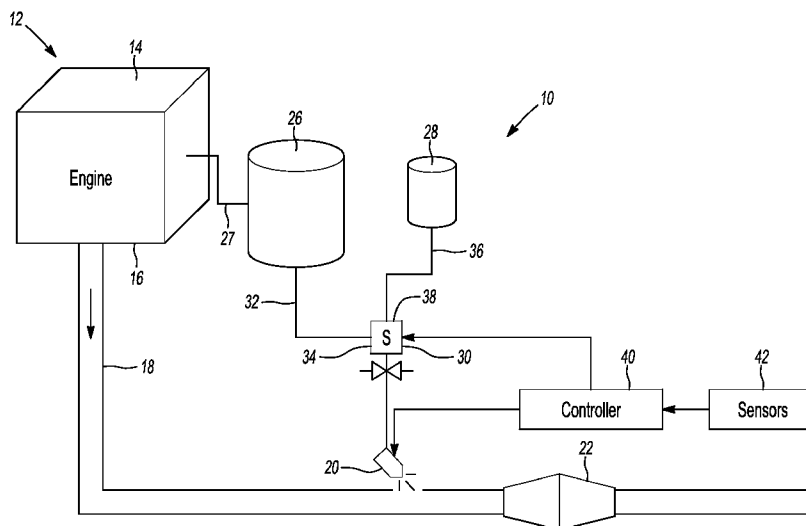




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*F01N 3/20* (2006.01)      *F01N 3/36* (2006.01)
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- (81) **Designated States (unless otherwise indicated, for every kind of national protection available):** AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, 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, PE, PG, PH, PL, PT, RO, RS, RU, 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.
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- Declarations under Rule 4.17:**  
— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

[Continued on next page]

(54) **Title:** ON-VEHICLE NITROGEN OXIDE AFTERTREATMENT SYSTEM



**Fig-1**

(57) **Abstract:** An emissions system for reducing nitrogen oxides in engine exhaust includes an emissions catalyst having an inlet adapted to receive an exhaust from the engine. A fuel tank is adapted to provide fuel for combustion within the engine. A first injector is operable to inject fuel into the exhaust upstream of the catalyst. A second injector is operable to inject supplemental reductant from a supplemental reductant tank into the exhaust upstream of the catalyst. A controller is operable to control the first and second injectors and vary the supply of fuel and supplemental reductant into the exhaust to reduce nitrogen oxides within the exhaust.

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— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))* — *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))*

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**A. CLASSIFICATION OF SUBJECT MATTER***F01N 3/10(2006.01)i, F01N 3/20(2006.01)i, F01N 3/28(2006.01)i, F01N 3/36(2006.01)i*

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)

F01N 3/10; F01N 3/00; B01D 47/00; F01N 3/20

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) &amp; Keywords: exhaust, emission catalyst, reductant, injector, fuel tank, nitrogen oxide

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2010-0000202 A1 (GALEN B. FISHER et al.) 07 January 2010 See paragraphs 28 and 29, claims 1 and 16, fig. 1.	1-19
A	US 05976475A A (JEREMY D. PETER-HOBLYN et al.) 02 November 1999 See column 4, line 65 - column 6, line 7, fig. 1.	1-19
A	US 7065958 B2 (WERNER FUNK et al.) 27 June 2006 See column 8, lines 32 - 60, fig. 4.	1-19
A	US 2008-0053075 A1 (TAKANORI UEDA et al.) 06 March 2008 See paragraph 29, fig. 1.	1-19

 Further documents are listed in the continuation of Box C. See patent family annex.

\* Special categories of cited documents:

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"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

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"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

"&amp;" document member of the same patent family

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Information on patent family members

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**PCT/US2011/025043**

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010-0000202 A1	07.01.2010	EP 2313621 A1 WO 2010-005941 A1	27.04.2011 14.01.2010
US 05976475A A	02.11.1999	AU 2000-11150 A1 CA 2285545 A1 CA 2572493 A1 CN 1124176 C0 CN 1257435 A0 EP 0975417 A1 EP 0975417 B1 EP 1137592 A1 JP 04-021145 B2 JP 04-204647 B2 JP 2001-518830 A JP 2002-527660 A KR 10-0535784 B1 US 06063350A A WO 00-21881 A1 WO 98-43732 A1	01.05.2000 08.10.1998 08.10.1998 15.10.2003 21.06.2000 02.02.2000 21.09.2005 04.10.2001 12.12.2007 07.01.2009 16.10.2001 27.08.2002 12.12.2005 16.05.2000 20.04.2000 08.10.1998
US 7065958 B2	27.06.2006	US 2003-0213234 A1 US 2006-0037309 A1 US 2006-0207243 A1 US 7497076 B2 US 7644579 B2 WO 2007-035354 A2	20.11.2003 23.02.2006 21.09.2006 03.03.2009 12.01.2010 29.03.2007
US 2008-0053075 A1	06.03.2008	CN 100591897 C CN 101052793 A DE 602006019054 D1 EP 1844219 A1 JP 04-254721 B2 JP 2006-214388 A US 7703277 B2 WO 2006-083026 A1	24.02.2010 10.10.2007 03.02.2011 17.10.2007 15.04.2009 17.08.2006 27.04.2010 10.08.2006