

(19)



**Europäisches Patentamt**  
**European Patent Office**  
**Office européen des brevets**

(11) Publication number:

**0 115 907**  
**A3**

(12)

## EUROPEAN PATENT APPLICATION

(21) Application number: 84300065.4

(51) Int. Cl.<sup>4</sup>: **F 02 D 35/02**  
**F 02 D 21/08, F 02 D 41/14**

(22) Date of filing: 05.01.84

(30) Priority: 10.01.83 US 456696

(43) Date of publication of application:  
 15.08.84 Bulletin 84/33

(88) Date of deferred publication of search report: 19.03.86

(84) Designated Contracting States:  
 DE FR GB IT SE

(71) Applicant: **AUTOMOTIVE ENGINE ASSOCIATES**  
**301 South Blount Street**  
**Madison Wisconsin 53703(US)**

(72) Inventor: **Showalter, Merle Robert**  
**301 South Blount Street**  
**Madison Wisconsin 53703(US)**

(74) Representative: **Brooke-Smith, Fred et al,**  
**STEVENS, HEWLETT & PERKINS 5 Quality Court**  
**Chancery Lane**  
**London WC2A 1HZ(GB)**

(54) **Combustion roughness servo control to control fuel/air metering or EGR metering to an internal combustion engine.**

(57) A servo control which adjusts the supply of combustion diluent (either excess air or EGR) upwards until the statistical variation of flame speed achieves a set limit. The system is intended as a control coefficient input to an automatic control system capable of more rapid dynamic response than the roughness controller itself. For engines characterized by exceptional homogeneity and in-cylinder flow control, control of flame speed variability up to set limit nearly minimizes NO<sub>x</sub> emissions and very nearly optimizes fuel efficiency at all engine speeds and loads. Two "measures" of flame speed are disclosed, first peak blowdown pressure in the exhaust, and second, the ionization breakdown voltage of an additional spark fired a specified number of crank angles after the ignition spark.

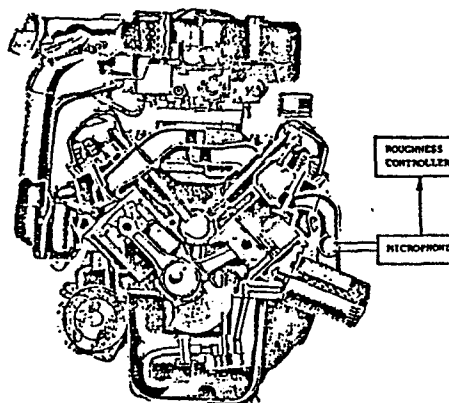


FIG. 8

**EP 0 115 907 A3**



European Patent  
Office

# EUROPEAN SEARCH REPORT

0115907  
Application number

EP 84 30 0065

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. <sup>3</sup> )
P, X	DE-A-3 210 810 (MARARO) * Page 11, line 1 - page 13, line 12; page 13, line 26 - page 14, line 25, page 16, line 10 - page 18, line 35; figures 1-3 *	1-9	F 02 D 35/02 F 02 D 21/08 F 02 D 41/14
X	--- GB-A-1 512 213 (BOSCH) * Page 1, lines 1-18, 53-74; page 2, lines 21 -66; page 2, line 89 - page 3, line 17; page 3, line 78 - page 4, line 24; figures 1-11 *	1-9	
X	--- GB-A-2 060 062 (BOSCH) * Figures 1-8; page 1, lines 16-37; page 1, line 98 - page 2, line 28; page 2, lines 53-110; page 3, lines 13-39 *	1-3, 5-8	TECHNICAL FIELDS SEARCHED (Int. Cl. <sup>3</sup> )
X	--- FR-A-2 466 623 (BOSCH) * Page 1, line 37 - page 2, line 13; page 3, line 7 - page 4, line 30; figure 1-3 *	1, 2, 4-7, 9	F 02 D
-----			
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 28-11-1985	Examiner LAPEYRONNIE P. J. F.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

