

1) Family number: 53031087 (US2013340512A)

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Title: METHODS AND APPARATUS FOR ENGINE ANALYSIS USING INTERNAL ELECTRICAL SIGNALS

Priority: US20110521934P 20110810 US20120641493P 20120502 US20120235575 20120809
WO2012US50127 20120809 US20130835067 20130315

Family:	Publication number	Publication date	Application number	Application date
	CA2844659 AA	20140206	CA20122844659	20120809
	CA2844926 AA	20140915	CA20142844926	20140306
	US2013340512 AA	20131226	US20130835067	20130315
	US2014297157 AA	20141002	US20120235575	20120809
	US9200981 BB	20151201	US20130835067	20130315
	US10436676 BB	20191008	US20120235575	20120809
	WO13023046 A1	20130214	WO2012US50127	20120809

Probable Assignee: THOMPSON AUTOMOTIVE LABS LLC

Assignee(s):(std): GRUBBS WILLIAM A ; THOMPSON AUTOMOTIVE LABS LLC ; HORLBECK ERIC ; THOMPSON JOHN ; MCDONALD DANIEL ; CARR EMERY ; CHATHAM GREGORY KEITH ; HORLBECK ERIC G

Assignee(s): EBERHARDT ALLEN C ; THOMPSON AUTOMOTIVE LABS LLC1835 LAKE GLEN DRIVEFUQUAY
VARINANC27526US

Inventor(s):(std): EBERHARDT ALLEN C ; CHATHAM GREGORY KEITH ; GRUBBS WILLIAM A ; HORLBECK ERIC ; THOMPSON JOHN ; HORLBECK ERIC G ; MCDONALD DANIEL ; CARR EMERY

Inventor(s): CARR EMERYUS ; HORLBECK ERIC GUS ; THOMPSON JOHNUS ; EBERHARDT ALLEN CUS

Agent(s): SMART AND BIGGAR; MYERS BIGEL SIBLEY AND SAJOVEC PA; SAGE PATENT GROUP; HALL DAVID C

Designated states: AE AG AL AM AO AT AU AZ BA BB BE BF BG BH BJ BN BR BW BY BZ CA CF CG CH CI CL CM CN CO CR CU CY CZ DE DK DM DO DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GT GW HN HR HU ID IE IL IN IS IT JP KE KG KM KN KP KR KZ LA LC LK LR LS LT LU LV LY MA MC MD ME MG MK ML MN MR MT MW MX MY MZ NA NE NG NI NL NO NZ OM PE PG PH PL PT QA RO RS RU RW SC SD SE SG SI SK SL SM SN ST SV SY SZ TD TG TH TJ TM TN TR TT TZ UA UG US UZ VC VN ZA ZM ZW

International class (IPC 8-9): F02D41/14 G01L1/00 G01L1/10 G01L5/00 G01M15/00 G01M15/04 G01M15/11 G01M15/12 G1L1/00
G1L5/00 (Advanced/Invention);
F02D41/28 G01R23/16 (Advanced/Non-invention)

CPC: F02D41/1497 F02D2041/286 F02D2041/288 F02D2200/1015 G01M15/11 G01L1/10 G01L5/00 G01M15/12

US class: 1/1 701/102 73/114.02

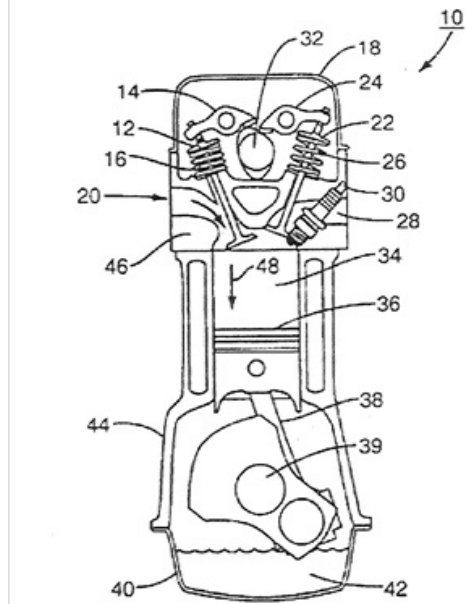
[Classification Explorer](#)

Cited documents: US8471742 BB, US8392096 BB, US8256278 BB, US8091410 BB, US7801671 BA, US7788020 BB, US7694554 BA, US7614290 BB, US7591170 BB, US7571640 BB, US7540185 BB, US7536902 BB, US7530261 BB, US7334552 BB, US7324888 BA, US7292933 BB, US7171302 BB, US7162397 BB, US7155965 BB, US7142972 BA, US7031828 BA, US6892691 BA, US6883497 BB, US6810320 BB, US6651490 BA, US6338326 BA, US6223120 BA, US6222445 BA, US6067847 A, US5758307 A, US5687082 A, US5668725 A, US5503007 A, US5495774 A, US5425269 A, US5400592 A, US4424709 A, US4083234 A, US2014182548 AA, US2011253101 AA, US2011072893 AA, US2010042311 AA, US2008190184 AA, US2008098806 AA, US2007157713 AA, US2007079785 AA, US2007050126 AA, US2005251321 AA, US2005193804 AA, GB2442797 A1,

Forward Citations: WO16160374, WO14196873, US9689329, US9620129, US9590740, US9452726, US9309859, US2016273463, US2016222893, US2016201585, US2015211425, US2014156106, US2014048039, US10221825, US10174692, US10047690, US10012205, RU2667826, EP3112839, CN107667212,

Abstract:

A method of analyzing an engine for misfire activity includes receiving an electrical signal associated with a plurality of cycles of the engine, identifying energy spikes in the electrical signal associated with cylinder firings in the engine, generating engine speed estimates based on spacing between the energy spikes, and analyzing anomalies in the engine speed estimates to identify misfire activity in the engine. Also described is a method of analyzing an engine for misfire activity including receiving an electrical signal associated with the engine, detecting AC ripple in the electrical signal, generating engine speed estimates in response to the detected AC ripple, and analyzing anomalies in the engine speed estimates to identify misfire activity in the engine.

**2) Family number: 8774247** (US5687082A)

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Title: Methods and apparatus for performing combustion analysis in an internal combustion engine utilizing ignition voltage analysis

Priority: US19950517544 19950822 WO1996US13608 19960822

Family:

Publication number	Publication date	Application number	Application date
AU199669004 A1	19970319	AU19960069004	19960822
US5687082 A	19971111	US19950517544	19950822
WO9708642 A1	19970306	WO1996US13608	19960822

Probable Assignee: OHIO STATE UNIV

Assignee(s):(std): UNIV OHIO STATE ; UNIV OHIO STATE RES FOUND

Assignee(s): OHIO STATE UNIV ; THE OHIO STATE UNIVERSITY ; THE OHIO STATE UNIVERSITY RESEARCH FOUNDATION

Inventor(s):(std): RIZZONI GIORGIO

Inventor(s): GIORGIO RIZZONI

Designated states: AL AM AT AU AZ BB BE BF BG BJ BR BY CA CF CG CH CI CM CN CU CZ DE DK EE ES FI FR GA GB GE GN GR HU IE IL IS IT JP KE KG KP KR KZ LK LR LS LT LU LV MC MD MG MK ML MN MR MW MX NE NL NO NZ PL PT RO RU SD SE SG SI SK SN SZ TD TG TJ TM TR TT UA UG UZ VN

International class (IPC 8-9): F02P17/12 G06F19/00 (Advanced/Invention); F02P17/12 (Core/Invention)

International class (IPC 1-7): F02P17/12 G01M15/00 G06F19/00 H01T15/00

CPC: F02D41/1405 F02P17/12

European class: F02P17/12 R02D41/14B8

US class: 324/379 364/431.08 701/102 701/106 701/111 702/33 702/66 73/114.08

[Classification Explorer](#)

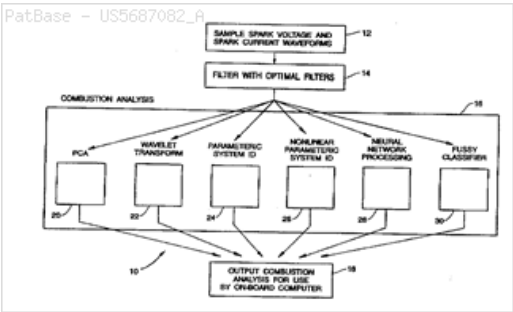
Cited documents: US5400760 A, US5387870 A, US5383350 A, US5376886 A, US5363046 A, US5355056 A, US5349930 A, US5349299 A, US5347855 A, US5327090 A, US5317267 A, US5294888 A, US5271265 A, US5237279 A, US5226322 A, US5220821 A, US5174267 A, US5111790 A, US5041976 A, US4918389 A, US4886029 A, US4812979 A, US4608855 A, US4543936 A, US4468956 A, US4308519 A, US4233943 A, US4004213 A,

Forward Citations: WO0179803, WO0159468, WO0159468, US9200981, US7927095, US7844352, US7843354, US7747380, US7571640, US7457732, US7428478, US7403877, US7383165, US7286927, US7243048, US7174251, US7171302, US7113861, US7113861, US6907412, US6814055, US6805099, US6766787, US6550312, US6522991, US6453733, US6426626, US6314802, US6212509, US6208981, US6204770, US6185500, US6134537, US6112149, US6092017, US6021369, US6020742, US6009371, US6006155, US5875411, US5862507, US2014310211, US2013340512, US2009030593, US2008238698, US2008236262, US2008186841, US2008097625, US2007124113, US2007037581, US2005251321, US2005187700, US2005051136, US2004244468, US2004172229, US2004172228, US2004172227, US2003036891, US10436676, US10215112, EP1139086, EP1139086, DE102004024375,

Abstract:

An ignition voltage analysis is performed to provide a combustion diagnosis. A first set of characteristic parameters are provided relating a plurality of spark plug voltage, current or gap impedance waveform signals to a plurality of combustion quality measures. A spark plug voltage, current or gap impedance waveform signal is sampled in real time during a first combustion process. A second set of characteristic parameters are then generated based upon the sampled first spark plug voltage waveform signal. The combustion process is classified as a one of a knocking combustion event, a normal combustion event, a slow burn event, a partial burn event,

and a misfire event. The spark plug voltage, current or gap impedance waveform signals are classified according to a statistical closeness to parameters generated by a testing engine operated in each of the above operating modes. The sampled ignition voltage signals are correlated with combustion performance indices for use in practical in-vehicle implementation for feedback control, engine monitoring, or the like.



3) Family number: 33002364 (US2006101902A)

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Title:	ENGINE MISFIRE DETECTION			
Priority:	US20040628334P 20041115	US20050264246 20051101		
Family:	Publication number	Publication date	Application number	Application date
	US2006101902 AA	20060518	US20050264246	20051101
	US7292933 BB	20071106	US20050264246	20051101

Probable Assignee: LOTUS ENGINEERING INC

Assignee(s):(std): CHRISTENSEN JAMES R ; LOTUS ENGINEERING INC

Inventor(s):(std): CHRISTENSEN JAMES R

Inventor(s): CHRISTENSEN JAMES

Agent(s): GIFFORD KRASS GROH SPRINKLE AND CITKOWSKI PC; GIFFORD KRASS SPRINKLE ANDERSON AND CITKOWSKI PC

International class (IPC 8-9): F02D41/00 G01M15/00 G21C17/00 (Advanced/Invention); F02D41/00 G01M15/00 G21C17/00 (Core/Invention)

CPC: G01M15/11

European class: G01M15/11

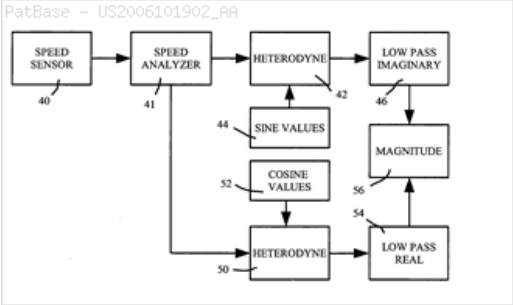
US class: 701/111 702/183 73/114.04 73/116 73/117.3

[Classification Explorer](#)

Cited documents: US6357287 BA, US6021758 A, US5996337 A, US5893042 A, US5862506 A, US5841025 A, US5821411 A, US5804711 A, US5752213 A, US5747681 A, US5717133 A, US5678520 A, US5576963 A, US5515281 A, US5495415 A, US5487008 A, US5415028 A, US5394330 A, US5200899 A, US4520449 A, US2003089338 AA,

Forward Citations: WO14144440, WO08024663, US9951703, US9523627, US9200981, US8371157, US8091410, US8060275, US7849733, US7571640, US7540185, US7536902, US7415347, US2016169141, US2014311230, US2014277997, US2012232774, US2011160983, US2010263439, US2010218598, US2008236262, US2008189023, US2008177437, US2008051981, US2007277780, US2007240591, US2007157713, US10436676, US10378468, US10316772, US10288526, EP2972177, EP2972177, DE102010041444, DE102008057508, CN105209878, CN104110317, CN104110317, AU2017218944,

Abstract:
A method of detecting an engine malfunction such as a misfire includes determining engine speed values at each of a plurality of measurement angular positions, heterodyning the engine speed values with sine and cosine functions indexed in the angular domain, passing the heterodyned results through a low pass filter, and computing the resulting magnitude from the resulting two vectors. An apparatus for detecting an engine malfunction, such as a misfire, includes an engine speed analyzer, a multiplier, and a low pass filter.



4) Family number: 15036592 (US6223120B)

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Title:	CYLINDER TORQUE ESTIMATION USING CRANKSHAFT ANGULAR RESPONSE MEASUREMENTS			
Priority:	US19980109260P 19981119	US19990426873 19991026		
Family:	Publication number	Publication date	Application number	Application date

Probable Assignee: WILLIAMS JEREMY
Assignee(s):(std): WILLIAMS JEREMY
Assignee(s): WILLIAMS JILL ; WILLIAMS LAWRENCE
Inventor(s):(std): WILLIAMS JEREMY
International class (IPC 8-9): G01M15/11 (Advanced/Invention);
G01M15/04 (Core/Invention)
International class (IPC 1-7): G06F17/10 G06G7/70
CPC: F02D35/024 F02D2041/288 F02D2200/1004 G01M15/11
European class: G01M15/11
US class: 701/102 701/111 701/115

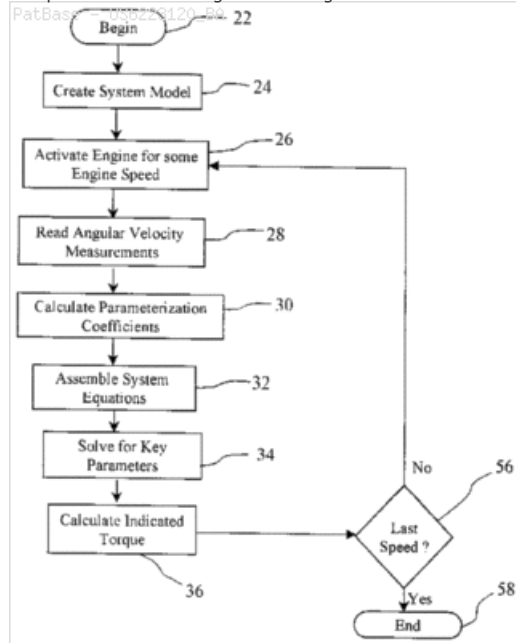
[Classification Explorer](#)

Cited documents: US5921221 A, US5794171 A, US5774823 A, US5771482 A, US5646340 A, US5592386 A, US5528931 A, US5377537 A, US5278760 A, US5269271 A, US5249558 A, US5239473 A, US5200899 A, US4843870 A, US4697561 A, US4532592 A, JPS608429, JP60008429 A2,

Forward Citations: US9334799, US9200981, US7926329, US7915842, US7809489, US7747380, US7623955, US7290523, US7194398, US7099769, US7099769, US7047125, US6876919, US6866024, US6714852, US6357287, US2018087459, US2012310513, US2009276143, US2009030593, US2008276697, US2008105233, US2006048744, US2006039095, US2005197834, US2005090968, US2004215379, US2003236611, US2003176991, US2003167118, US10436676, US10215111, JP4934049, JP2008520970, ITNA20130018, EP1559898, EP1462638,

Abstract:

A method and apparatus for identifying misfiring cylinders using crankshaft angular velocity measurements. The measured angular velocity is used in conjunction with a system model to estimate the indicated torque developed by each cylinder. The method and apparatus provides accurate results for engines with overlapping firing pulses, and also under conditions in which there is large torsional deflection in the crankshaft. The method and apparatus is suitable for implementation with on-board misfire diagnostics. Experimental validation is provided using a nineteen liter, six cylinder diesel engine. The experimental data demonstrates that accurate detection and identification of misfiring cylinders is possible over the full speed and load range of the engine.



5) Family number: 53197881 (US5269178A)

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Title: ENGINE MISFIRE, KNOCK OF ROUGHNESS DETECTION METHOD AND APPARATUS
Priority: US19900625222 19901210 US19910720240 19910624 EP19920902896 19911210
WO1991US09280 19911210 US19930074861 19930610 US19940223522 19940405
US19950509733 19950801 US19950575739 19951218 US19960585431 19960111
US19970895158 19970716

Family:	Publication number	Publication date	Application number	Application date
	AT137017 E	19960515	AT19910902896T	19911210
	AU199191525 A1	19920708	AU19910091525	19911210
	CA2099613 AA	19930604	CA19912099613	19911210
	DE69118914 D1	19960523	DE19916018914	19911210
	DE69118914 T2	19960919	DE19916018914T	19911210
	DE69132016 D1	20000406	DE19916032016	19911210
	DK0562012 T3	19960513	DK19910902896T	19911210
	EP0562012 A1	19930929	EP19920902896	19911210
	EP0562012 B1	19960417	EP19920902896	19911210
	EP0675342 A2	19951004	EP19950200188	19911210

EP0675342 A3	19951018	EP19950200188	19911210
EP0675342 B1	20000301	EP19950200188	19911210
EP0757236 A2	19970205	EP19960401696	19960730
EP0757236 A3	19980304	EP19960401696	19960730
EP0892262 A2	19990120	EP19980401766	19980713
EP0892262 A3	19990818	EP19980401766	19980713
ES2085620 T3	19960601	ES19920902896T	19911210
GR3020272 T3	19960930	GR19960401651T	19960619
JP6505075 T2	19940609	JP19920503699T	19911210
JP9119873 A2	19970506	JP19960203745	19960801
US5269178 A	19931214	US19910720240	19910624
US5287735 A	19940222	US19900625222	19901210
US5313826 A	19940524	US19930074861	19930610
US5495774 A	19960305	US19940223522	19940405
US5675094 A	19971007	US19960585431	19960111
US5686672 A	19971111	US19950575739	19951218
US5869752 A	19990209	US19970895158	19970716
US5902934 A	19990511	US19950509733	19950801
WO9210733 A2	19920625	WO1991US09280	19911210
WO9210733 A3	19921015	WO1991US09280	19911210
WO9724590 A1	19970710	WO1996US19955	19961216

Probable Assignee: SENSORTECH LLC

Assignee(s):(std): SENSORTECH LP ; SENSORTECH LLC

Assignee(s): SPRAGUE FREDERICK P ; VIGMOSTAD ERICK B ; SENSORTECH L P FAIRFIELD IOWA US ; VIGMOSTAD ERIK B ; KLAUBER ROBERT D ; MANDARINO JOSEPH V ; SENSOR TEC LP ; SENSORTECH L L C ; SENSORTECH L P

Inventor(s):(std): SPRAGUE FRED D ; SPRAGUE FREDERICK ; MANDARINO JOSEPH ; KLAUBER ROBERT ; VIGMOSTAD ERIK ; VIGMOSTAD ERICK B ; SPRAGUE FRED P ; SPRAGUE FREDERICK P ; MANDARINO JOSEPH V ; VIGMOSTAD ERIK B ; KLAUBER ROBERT D

Inventor(s): ROBAATO DEII KURAUBAA ; FURETSUDO PII SUPURAGUE ; ERIKU BII BUIGUMOSUTATSUDO ; FREDERICK P SPRAGUE ; ROBERT D KLAUBER ; JOSEPH V MANDARINO ; ERIK B VIGMOSTAD

Agent(s): SIM AND MCBURNEY; SUGIMURA KOSAKU

Designated states: AT AU BB BE BF BG BJ BR CA CF CG CH CI CM CS CY DE DK ES FI FR GA GB GN GR HU IE IT JP KP KR LI LK LU MC MG ML MN MR MW NL NO PL PT RO SD SE SN SU TD TG US

International class (IPC 8-9): B60G17/019 F02D45/00 F02P17/12 G01D3/028 G01L1/12 G01L23/22 G01L3/10 G01L5/22 G01M15/00 G01M15/04 G01M15/11 (Advanced/Invention); F02D45/00 F02P17/12 (Advanced/Non-invention); B60G17/015 F02D45/00 F02P17/12 G01D3/028 G01L23/00 G01L3/10 G01M15/04 (Core/Invention)

International class (IPC 1-7): F02D45/00 F02P17/00 G01D3/028 G01D5/14 G01L1/12 G01L23/22 G01L3/00 G01L3/02 G01L3/10 G01L5/13 G01M15/00 G01N3/00

CPC: Y10S73/02 F02D41/0087 F02D41/1498 F02D2041/1432 F02D2200/1002 F02D2200/1015 G01L3/102 G01M15/042 G01M15/11 G01D3/028 G01L23/223 B60G17/019 B60G2202/11 B60G2202/24 B60G2202/312 B60G2204/11 B60G2400/30 B60G2400/60 B60G2400/91 B60G2401/12 B60G2401/172 B60G2600/02 B60G2600/08 B60G2600/602 B60G2600/604 B60G2800/80 B60G2800/802 F16F2230/08 G01L1/125 G01L5/225 G01L1/127 G01L3/105

European class: B60G17/019 G01D3/028 G01L1/12 G01L23/22B4 G01L3/10A2 G01L5/22D G01M15/04D G01M15/11 L60G202/11 L60G202/24 L60G202/312 L60G204/11 L60G400/30 L60G400/60 L60G400/91 L60G401/12 L60G401/172 L60G600/02 L60G600/08 L60G600/602 L60G600/604 L60G800/80 L60G800/802 R02D200/1002 R02D200/1015 R02D41/00H6 R02D41/14B20M R02D41/14F2 R16F230/08

US class: 701/101 73/114.02 73/114.11 73/114.15 73/116 73/117.03 73/118.1 73/35 73/35.04 73/660 73/779 73/862.191 73/862.333 73/DIG.2

JP class F-Term: 2G087 2G087/AA01 2G087/BB12 2G087/BB14 2G087/BB35 2G087/BB37 2G087/CC01 2G087/CC06 2G087/CC38 2G087/CC40 2G087/EE14 2G087/EE24 2G087/FF04 2G087/FF07 2G087/FF08 2G087/FF09 2G087/FF12 2G087/FF13 2G087/FF14 2G087/FF18 2G087/FF28 2G087/FF37 3G019 3G019/CD09 3G019/DB02 3G019/DB07 3G019/DB08 3G019/FA31 3G019/GA00 3G019/GA05 3G019/LA07 3G084 3G084/BA16 3G084/BA33 3G084/DA16 3G084/DA17 3G084/DA27 3G084/DA38 3G084/EA01 3G084/FA19 3G084/FA21 3G084/FA24 3G084/FA25 3G084/FA32 3G084/FA33 3G084/FA38 3G384 3G384/AA01 3G384/AA03 3G384/AA07 3G384/BA02 3G384/BA43 3G384/BA47 3G384/CA01 3G384/CA12 3G384/CA25 3G384/DA01 3G384/DA02 3G384/DA07 3G384/DA12 3G384/DA15 3G384/DA18 3G384/DA19 3G384/DA20 3G384/DA24 3G384/DA27 3G384/EB14 3G384/EB17 3G384/EB18 3G384/EC01 3G384/EC06 3G384/EC11 3G384/EC12 3G384/ED01 3G384/ED04 3G384/ED05 3G384/ED06 3G384/ED07 3G384/ED08 3G384/ED12 3G384/EE25 3G384/EE35 3G384/EG01 3G384/FA32 3G384/FA33 3G384/FA55 3G384/FA56 3G384/FA64 3G384/FA76 2F049 2F050 2G087/AA04 2G087/AA12 2G087/AA13 2G087/AA14 2G087/AA15 2G087/AA27 2G087/BB08 2G087/DD01 2G087/DD17 2G087/DD20 2G087/EE30 2G087/FF23 2G087/FF24

JP class F-Index: F02D45/00/364/A F02D45/00/364/B F02D45/00/368/A F02D45/00/368/Z F02P17/00/F G01M15/00/Z G01M15/04 G01M15/11 G01L1/12 G01L3/10/A G01L3/10/301/Z G01M15/00 G01M15/05

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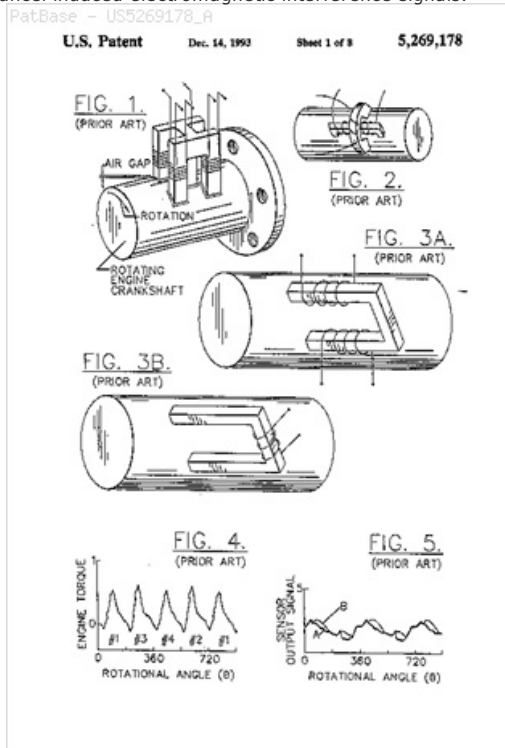
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Forward Citations: WO9964870, WO9748894, WO9724590, WO9630737, WO18140180, WO16120616, WO15001097, WO14105364, WO14105364, WO14090970, WO10056429, WO09049610, WO09049610, WO08140404, WO08086248, WO08069423, WO08033386, WO08024663, WO08000012, WO08000012, WO07148200,

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Abstract:

Disclosed are a method and apparatus for comparing torsional stress/strain states of a power transmitting member of an internal combustion engine to detect an abnormal combustion condition, including misfire, knock or roughness. Statistical processing steps may be used to detect an abnormal combustion event including: calculating a mean and standard deviation for a set of signals related to the torsional stress induced in the power transmitting member, calculating a difference between a later signal and the mean, calculating a ratio of the difference to the standard deviation, and comparing the ratio to a threshold. The ratio so obtained from a given cylinder may further be compared with one or more other such ratios from other cylinders. A magnetostrictive sensor may preferably be used to obtain the signals relating to the torsional stress in the power transmitting member, such as the engine crankshaft. In addition, the magnetostrictive sensor may include windings to cancel induced electromagnetic interference signals.



6) Family number: 32216929 (US2005193804A)

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Title: ENGINE COMBUSTION STATE DETECTION DEVICE

Priority: JP20040063328 20040308

Family:

Publication number	Publication date	Application number	Application date
DE102005010386 A1	20051208	DE200510010386	20050307
JP2005248909 A2	20050915	JP20040063328	20040308
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US2005193804 AA	20050908	US20050072397	20050307
US7133766 BB	20061107	US20050072397	20050307

Probable Assignee: DENSO CORP

Assignee(s):(std): DENSO CORP

Assignee(s): DENSO CORP KARIYA

Inventor(s):(std): KOKUBO NAOKI

Agent(s): YAMADA TSUYOSHI; NIXON AND VANDERHYE PC

International class (IPC 8-9): F02D41/00 F02D45/00 F02P5/152 G01M15/00 (Advanced/Invention); F02D41/00 F02D45/00 F02P5/152 G01M15/00 (Core/Invention)

International class (IPC 1-7): F02D41/00 F02D45/00 G01M15/00

CPC: F02D35/024 F02D35/028 F02D41/1498 F02D2041/288 F02D2200/101 F02D2200/1012 G01M15/046

European class: F02D35/02D2 F02D35/02T G01M15/04D8 R02D200/1010 R02D200/1012 R02D41/14F2 R02D41/28B2

US class: 123/406.2 701/114 73/114.04 73/114.07 73/114.070S 73/116 73/117.3 73/35.12 73/35.120P

JP class F-Term: 3G084 3G084/AA03 3G084/BA13 3G084/BA17 3G084/BA23 3G084/BA24 3G084/CA09 3G084/DA23 3G084/DA25 3G084/DA27 3G084/EA01 3G084/EA04 3G084/EB17 3G084/FA07 3G084/FA10 3G084/FA20 3G084/FA21 3G084/FA26 3G084/FA32 3G084/FA33 3G084/FA34 3G084/FA38 3G384 3G384/AA07 3G384/BA05 3G384/BA24 3G384/BA26 3G384/BA31 3G384/CA17 3G384/CA18 3G384/DA04 3G384/DA33 3G384/DA36 3G384/DA38 3G384/EA11 3G384/EA17 3G384/EA18 3G384/EB08 3G384/EB17 3G384/EC01 3G384/EC05 3G384/EC11 3G384/EC12 3G384/ED01 3G384/ED05 3G384/ED07 3G384/EE02 3G384/EE04 3G384/EE32 3G384/EE38 3G384/EG01 3G384/EG08 3G384/FA01 3G384/FA04 3G384/FA27 3G384/FA28 3G384/FA29 3G384/FA32 3G384/FA33 3G384/FA38 3G384/FA42 3G384/FA54 3G384/FA56 3G384/FA57 3G384/FA58 3G384/FA62 3G384/FA63

JP class F-Index: F02D45/00/362/J F02D45/00/364/A F02D45/00/368/A F02D45/00/368/S F02D45/00/368/T

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Abstract:

A rotation angle sensor detects the rotation speed of a crankshaft of an engine. An ECU extracts a first frequency component synchronized with combustion cycles of the engine that is contained in a rotation speed signal obtained by the detection of the rotation angle sensor, and a second frequency component having a higher frequency than the first frequency component. It detects a combustion state by using the rotation variation amount of the first frequency component in a lower rotation range than a specified engine speed, and by using the rotation variation amount of the second frequency component in a higher rotation range.

