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# 199-1343

### ELECTRONIC THROTTLE SERVO OVERHEAT PROTECTION SYSTEM

#### TECHNICAL FIELD

[0001] The present invention relates generally to control systems for internal combustion engines, and more particularly, to an electronic throttle servo temperature protection system.

#### BACKGROUND ART

[0002] Many previously known motor vehicle throttle controls have a direct physical linkage between an accelerator pedal and the throttle body so that the throttle plate is pulled open by the accelerator cable as the driver presses the pedal. The direct mechanical linkage includes biasing that defaults the linkage to a reduced operating position, in a manner consistent with regulations. Nevertheless, such mechanisms are often simple and unable to adapt fuel efficiency to changing traveling conditions, and add significant weight and components to the motor vehicle.

[0003] An alternative control for improving throttle control and the precise introduction of fuel air mixtures into the engine cylinders is accomplished by electronic throttle control. The electronic throttle control includes a throttle control unit that positions the throttle plate by an actuator controlled by a microprocessor based on the current operating state

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determined by sensors. The processors are often included as part of a powertrain electronic control that can adjust the fuel air intake and ignition in response to changing conditions of vehicle operation as well as operator control. Protection may be provided so that an electronic system does not misread or misdirect the control and so that unintended operation is avoided when portions of the electronic control suffer a failure.

[0004] Typically, the actuator or servomotor used to position the throttle plate is designed to have the maximum control effort available (motor voltage, current, duty cycle) to enhance throttle plate position Having a large control effort continuously response. available or available for maximum effort could possibly lead to overstressing the system's physical components if a blockage of the throttle plate occurs or the mechanism encounters a mechanical limit. For example, a mechanical limit may be an open stop or a close stop. Specifically, the H-driver and the servomotor could overheat with sustained full control effort under some environmental conditions. In an effort to avoid permanent damage, some electronic systems shut down when they get to a threshold temperature.

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[0005] The disadvantages, associated with these conventional electronic throttle overheat protection techniques have made it apparent that a new technique for electronic throttle overheat protection is needed. The new technique should allow full control effort while

preventing overheat conditions. The present invention is directed to these ends.

# SUMMARY OF THE INVENTION

[0006] It is, therefore, an object of the invention to provide an improved and reliable electronic throttle servo temperature protection system. Another object of the invention is to allow full control effort while preventing overheat conditions.

[0007] In accordance with the above and other objects of the present invention, an electronic throttle servo overheat protection system is provided. In one embodiment of the invention, a method for controlling a positioning device associated with internal combustion engine control is provided. In accordance with the method, an electric motor actuates the positioning device. The positioning device is then commanded to change to a commanded position. The control effort required to change to the commanded position is It is then determined whether the control detected. effort exceeds a threshold for a predetermined time period. When the control effort exceeds the threshold for the predetermined time period, the control effort is reduced.

[0008] The present invention thus achieves an improved electronic throttle servo overheat protection system. The present invention is advantageous in that it will not cause mechanism failure or require

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significant and costly added robustness to the mechanism.

[0009] Additional advantages and features of the present invention will become apparent from the description that follows, and may be realized by means of the instrumentalities and combinations particularly pointed out in the appended claims, taken in conjunction with the accompanying drawings.

# BRIEF DESCRIPTION OF THE DRAWINGS

[0010] In order that the invention may be well understood, there will now be described some embodiments thereof, given by way of example, reference being made to the accompanying drawings, in which:

[0011] FIGURE 1 is a block diagram of an electronic throttle servo overheat protection system in accordance with one embodiment of the present invention; and

[0012] FIGURE 2 is a flow chart depicting a method of providing electronic throttle servo overheat protection in accordance with one embodiment of the present invention.

#### BEST MODES FOR CARRYING OUT THE INVENTION

[0013] The present invention is illustrated herein with respect to an electronic throttle servo overheat protection system, particularly suited for the automotive field. However, the present invention is applicable to various other uses that may require electronic throttle servo overheat protection systems.

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[0014] Referring to FIGURE 1, a motor vehicle powertrain system 10 including electronic throttle control system 12 includes an electronic control unit 14. In the preferred embodiment, the electronic control unit 14 includes a powertrain control module (PCM) 16, including a main processor and an electronic throttle monitor (ETM) 18, including an independent processor. The PCM and ETM each share sensors 19 and actuators that are associated with the powertrain system 17 and control module 16. Preferably, the electronic throttle monitor 18 includes a processor physically located within the powertrain control module housing, although a separate housing, separate locations and other embodiments can also be employed in practicing the invention. Moreover, while the electronic throttle monitor 18 and the module 16 have powertrain control independent processors, they preferably share the inputs and outputs of powertrain sensors 19 and actuators 21 and 34, respectively, for independent processing.

A wide variety of inputs are represented in [0015] the diagram of FIGURE 1 by the diagrammatic representation of redundant pedal position sensors 20. The sensors 20 are coupled through inputs 22 and are representative of many different driver controls that may demonstrate the demand for power. In addition, the electronic control unit 14 includes inputs 26a and 26b for detecting throttle position. A variety of ways for indications providing such are diagrammatically represented in FIGURE 1 by a first throttle position

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sensor 24a and a redundant second throttle position sensor 24b to obtain a power output indication. As a result of the many inputs represented at 19, 22, 26a and 26b, the electronic controller 14 provides outputs for limiting output power so that the output power does not exceed the power demand. A variety of outputs are also diagrammatically represented in FIGURE 1 by the illustrated example of inputs to a throttle control unit 28 that in turn powers an actuator and motor interface 30 for displacing the throttle plate 34. For example, an actuator and interface may comprise redundant drive motors powering a gear interface to change the angle of the throttle plate 34 in the throttle body 36.

[0016] Likewise, the responsive equipment, such as a motor, may also provide feedback. For example, the motor effort sensor 38 or the throttle position sensors 24a and 24b may provide feedback to the throttle control unit 28, as shown at 37, 27a and 27b, respectively, to determine whether alternative responses are required or to maintain information for service or repair.

[0017] Referring to Figure 2, a flow chart depicting a method of providing electronic throttle servo overheat protection in accordance with one embodiment of the present invention is illustrated. In operation, the preferred method of the present invention is initiated at step 40 and immediately proceeds to step 42. In step 42, the controller preferably determines if the control effort has been more positive than a predetermined limit for at least a predetermined time period. Typically, an

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effort limit of approximately +6 volts and a contiguous time interval of about 300 milliseconds are used. Obviously, these values may vary as required. If the predetermined threshold has been exceeded, then the sequence proceeds to step 44.

[0018] A hold open mode is initiated at step 44 and then immediately continued in step 46. In step 46, the controller preferably determines if it has called for the hold open mode for less than a hard open time period. A person skilled in the art understands that the hard open time period may depend upon the voltage applied to the motor. For example, a given servo motor would not overheat under the following conditions:

Positioning Effort (volts)	Duration (seconds)
18	10
16	12
14	18
12	32
10	62
9	82
8	128
7	219
6	445
5	indefinite

These operating conditions may keep a motor at less than a threshold temperature to prevent overheating. For example, a threshold temperature may be 220 degrees Celsius.

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**[0019]** If the throttle plate has been in a hold open mode for less than the hard open time period, then the sequence proceeds to step 48. In step 48, the controller preferably applies a maximum opening control effort to the motor. In the hold open mode, a typical maximum opening control effort has a magnitude of +14.5 volts. Obviously, the magnitude of the effort may vary as required. Then, the sequence returns to step 46. If the throttle plate has been in the hold open mode for longer than the hard open time period, then the sequence proceeds to step 50.

[0020] In step 50, the controller preferably reduces the opening control effort applied to the motor to a moderate opening control effort. The moderate opening control effort can be applied to the motor for an indefinite period of time without permitting the motor to overheat. Typically, the moderate opening effort has a magnitude of approximately +5 volts. Then, the sequence returns to step 42.

[0021] Thus, the following sequence typically occurs when the controller is in the hold open mode. First, the system detects that it should go into the hold open mode. Then, full voltage is applied to clear or crush any small debris obstructing movement of the throttle plate. The voltage is reduced to approximately +5 volts to prevent the motor from overheating.

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[0022] If in step 42 the effort has not been more positive, then the sequence proceeds to step 52. In step 52, the controller preferably determines if the control effort has been more negative than a predetermined limit for at least a predetermined time period. Typically, an effort limit of approximately -6 volts and a contiguous time interval of about 300 milliseconds are used. If the predetermined threshold has been exceeded, then the sequence proceeds to step 54.

[0023] A hold close mode is initiated in step 54 and then immediately continued in step 56. In step 56, the controller preferably determines whether it has called for a hold close mode for less than a hard close time period. A typical time period is approximately 30 milliseconds. If the throttle plate has been in the hold close mode for less than the hard close time period, then the sequence proceeds to step 58.

[0024] In step 58, the controller applies a maximum closing control effort to the motor. In the hold close mode, a typical maximum closing control effort has a magnitude of -14.5 volts. Then, the sequence returns to step 56. If the throttle plate has been in the hold close mode for longer than the hard close time period, then the sequence proceeds to step 60.

[0025] In step 60, the controller reduces the closing control effort applied to the motor to a moderate closing control effort. The moderate closing control effort can be applied to the motor for an indefinite

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period of time without permitting the motor to overheat. Typically, a moderate control effort of approximately -5 volts is applied to the motor. Then, the sequence returns to step 52.

[0026] Thus, the following sequence typically occurs when the controller is in the hold close mode. First, full voltage is applied to clear or crush any small debris obstructing throttle plate movement. Then, approximately -5 volts is applied to hold the plate against the close stop for a period of time determined by the method of the present invention. A voltage approximately equal to -5 volts typically prevents the motor from overheating. Then the sequence returns to step 52.

[0027] If in step 52 the effort has not been more negative than a predetermined limit for a given time period, then the sequence proceeds to step 62. In step 62, the controller initiates a control normal mode. Subsequently, the sequence immediately proceeds to step 64 in which the controller controls the throttle plate normally. The sequence then returns to step 42.

[0028] The present invention thus achieves an improved and reliable electronic throttle servo overheat protection system by monitoring when the closing or opening control effort exceeds a threshold for a given amount of time. In this way, the present invention allows full control effort while preventing overheat conditions. Additionally, the present invention does

not cause mechanism failure or require significant and costly added robustness to the mechanism.

[0029] From the foregoing, it can be seen that there has been brought to the art a new and improved electronic throttle servo overheat protection system. It is to be understood that the preceding description of the preferred embodiment is merely illustrative of some of the many specific embodiments that represent applications of the principles of the present invention. Clearly, numerous and other arrangements would be evident to those skilled in the art without departing from the scope of the invention as defined by the following claims.

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# What is claimed is:

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1 1. A method for controlling a positioning 2 device of an internal combustion engine, the method 3 comprising the steps of:

4 providing an electric motor for actuating the 5 positioning device

commanding the positioning device to change to a commanded position;

detecting a control effort required to change to said commanded position;

10 determining whether said control effort exceeds 11 a threshold for a predetermined time period; and

12 reducing said control effort when said control 13 effort exceeds said threshold for said predetermined 14 time period.

said threshold has an absolute value of 6 volts.

 The method as recited in claim 1, wherein said predetermined time period is 300 milliseconds.

4. The method as recited in claim 1, wherein the step of commanding the positioning device to change to a commanded position, comprises commanding the positioning device to open to a commanded position in a hold open mode.

5. The method as recited in claim 4, further comprising the step of applying a maximum control effort to the positioning device for a hard open time period.

6. The method as recited in claim 5, wherein said maximum control effort is +14.5 volts.

The method as recited in claim 5, wherein 1 7. 2 said hard open time period is 30 milliseconds.

The method as recited in claim 1, wherein 1 8. the step of commanding the positioning device to change to a commanded position, comprises commanding the positioning device to close to a commanded position in a hold close mode.

The method as recited in claim 8, further 9. comprising the step of applying a maximum control effort to the positioning device for a hard close time period.

10. The method as recited in claim 9, wherein said maximum control effort is -14.5 volts.

11. The method as recited in claim 9, wherein said predetermined time period is 30 milliseconds.

12. A system for controlling a positioning device of an internal combustion engine to prevent 3L1 3 overheat conditions, the system comprising:

an electric motor for actuating the positioning device with a control effort;

a control effort detector coupled to said б electric motor and detecting said control effort; and 7 8 a controller coupled to said electric motor and said cont/rol effort detector, said controller 9 including / control logic operative to command the 10 positioning device to change to a commanded position, 11



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12 detect a control effort required to change to said 13 commanded position, determine whether said control 14 effort exceeds a threshold for a predetermined time 15 period, and reduce said control effort when said 16 control effort exceeds said threshold for said 17 predetermined time period.

13. The system as recited in claim 12, wherein said threshold has an absolute value of 6 volts.

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14. The system as recited in claim 12, wherein said predetermined time period is 300 milliseconds.

15. The system as recited in claim 12, wherein said controller further includes control logic operative to command the positioning device to open to a commanded position in a hold open mode.

16. The system as recited in claim 15, wherein said controller further includes control logic operative to apply a maximum control effort to the positioning device for said hard open time period.

1 17. The system as recited in claim 16, wherein 2 said maximum control effort is +14.5 volts.

1 18. The system as recited in claim 16, wherein 2 said hard open time period is 30 milliseconds.

1 19. The system as recited in claim 12, wherein 2 said controller further includes control logic 3 operative to command the positioning device to close 4 to a commanded position in a hold close mode.

1 20. The method as recited in claim 19, further 2 comprising the step of applying a maximum control 3 effort to the positioning device for a hard close 4 time period.

1 July 21. The system as recited in claim 20, wherein 2 said maximum control effort is -14.5 volts.

1 22. The system as recited in claim 20, wherein 2 said predetermined time period is 30 milliseconds.

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#### ABSTRACT

[0030] A method for controlling a positioning device (34) of an internal combustion engine includes the step of providing an electric motor (30) for actuating a positioning device (34). A user employs an actuator (21) to command the throttle plate (34) to change to a commanded position. A motor effort sensor (38) then detects a control effort required by the motor (30) to change to the commanded position. A throttle control unit (28) determines whether the control effort exceeds a threshold for а predetermined time period. If the control effort exceeds the threshold for the predetermined time period, the throttle control unit (28) actuates the motor (30) to reduce the control effort.

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I verily believe I am the claimed and for which a	e original, first and sole a patent is sought on the	inventor or an original, fir invention entitled	st and joint invento	r of the subj	ect matter	that is
	ELECTRONIC THROT	TLE SERVO OVERHEAT	PROTECTION SYS	TEM		
the specification of whi	ch is attached hereto.					
I have reviewed and ur	nderstand the contents of	f the specification identifie	d above, including t	he claims.		
I acknowledge my duty	to disclose information of	of which I am aware that i	s material to the exa	mination of	this applic	ation in
accordance with Section	on I.56(a), Title 37 of the	Code of Federal Regulation	ons; and			
as to application for pa America, prior to this a	atents or inventor's certil pplication by me or my le	ficate on the invention file gal representatives or as	ed in any country fo signs,	reign to the	United St	ates of
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application designating application is not discl paragraph of 35 U.S.C.	g the United States, liste osed in the prior United 2. § 112, I acknowledge t nich became available b	20 of any United States a ad below and, insofar as States or PCT Internation he duty to disclose inform vetween the filing date o	the subject matter al application in the ation which is mater	of each of t manner pro rial to paten	he claims wided by t tability as o	of this he first defined
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this application and tra	ansact all business in the ne competent Internation d registration number)	tor, I hereby appoint the f United States Patent and al Authorities in connection	Trademark Office co	onnected the	erewith and	d to act
John S. Artz - 36,431 John E. Kajander - 47						

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John S. Artz Artz & Artz, PC	250			
28333 Telegraph Road, Suite Southfield, MI 48034	250	Phone: 248-223-	9500	
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FULL NAME AND POST OFFICE ADDRESS OF INVENTOR:	e e en contrato contrato Contrato contrato	CITIZENSHIP	SIGNATURE	DATE
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Attorney Docket No: 199-1343

Please call 313-755-9098 if this paper becomes separated from the file.

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# IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:

Ross Dykstra Pursifull

Serial No. Unassigned

Filed: Herewith

For:

ELECTRONIC THROTTLE SERVO OVERHEAT PROTECTION SYSTEM

Attorney Docket No: 199-1343 (VGT 0118 PUS)

Jo Anne Croskey

I hereby certify that this correspondence is being deposited with the United States Postal Service via "Express Mail" under Label No. EL 856002582 US in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231 on:

 $\frac{10-9-01}{\text{Date of Deposit}}$ 

oske K anne Signature

# DISCLOSURE STATEMENT UNDER 37 C.F.R. § 1.97

Assistant Commissioner for Patents Washington, D.C. 20231

Sir:

In compliance with 37 C.F.R. § 1.97, the art listed and identified on the attached Form PTO-1449 is being submitted herewith for consideration by the Examiner. A copy of each of the listed references is included herewith.

It is Applicant's opinion that the claims presently on file patentably distinguish the present invention from each of these references. The above references are being cited only in the interests of candor and without any admission that they constitute statutory prior art or contain matter which anticipates the invention or which would render the same obvious, either singly or in combination, to a person of ordinary skill in the art.

# 199-1343 (VGT 0118 PUS)

The Commissioner is authorized to charge any additional fees which may be required, or credit any overpayment, to Deposit Account No. 50-0476.

Respectfully submitted,

By:

Sill John 6. Artz

Reg. No. 36,431 28333 Telegraph Road, Suite 250 Southfield, MI 48034 (248) 223-9500

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Attorney for Applicant(s)

Date: October 9, 2001

	Under the	Pap (ed	uction Act of 1995, n	PTO/SB/08A (10-96) [MODIFIED] Pε o persons are required to respond to a collect	Approved for use through 10/31/99. d Trademark Office: U.S. DEPARTMENT ( mformation unless it contains a valid OMB	OF COMMERCE
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	By A	Applicant		Applicant ·	Ross D. Pursifull	-6/
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Sheet 1 of 1		Attorney Docket Number	199-1343 (VGT 0118	B PUS)		

Examiner Initials	Cite No.1	U.S. PATENT DOCUMENT	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Kind Code <sup>2</sup> Number (if known)	- +0		
R	AA	4,656,407	Burney	04/07/87	
le	AB	4,819,597	Gale et al.	04/11/89	
he	AC	5,327,056	Loreck et al.	07/05/94	
H	AD	5,614,798	Zydek et al.	03/25/97	
IE	AE	5,889,376	Takatsuka et al	03/30/99	
AC	AF	5,992,383	Scholten et al.	11/30/99	
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Examiner No.1	Foreign Patent Docu	iment	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered, include copy of this form with next communication to applicant.

<sup>1</sup> Unique ci

<sup>1</sup> Unique ci tation designation number. <sup>2</sup> See attached Kinds of U.S. Patent Documents. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.<sup>6</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.

01 374 IN THE UNITED STATES PATENT AND TRADEMARK OFFICE In re Application of: RECEIVED R. Pursifull OCT 1 5 2002 09/973,030 4 Serial No.: IA X STUN TECHNOLOGY CENTER R3700 rigi 28353 Tel. FOO Filed: October NT S iela, For: ELECTRONIC THROTTLE SERVO OVERHEAT PROTECTION SYSTEM Attorney Docket No: 199-1343 (VGT 0118 PA) I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail to: Assistant Commissioner for Patents, Washington, D.C. 20231 on: - Crockey Signature October 3, 2002 Date of Deposit PRELIMINARY AMENDMENT Assistant Commissioner for Patents Washington, D.C. 20231 Sir: Please amend the application as follows: In the Claims: Kindly substitute claim 11 with the following: (Amended) The method as recited in claim 9, wherein said hard close 11 A ime period is 30 milliseconds.

2 09/973,030 2 Kindly substitute claim 20 with the following: Jubi 20. (Amended) The system as recited in claim 19, wherein said controller further includes control logic operative to command application of a maximum control effort to the positioning device for a hard close time period. Kindly substitute claim 22 with the following: Jul 1 The method as recited in claim 20, wherein said hard 22. (Amended) 2 close time period is 30 milliseconds.

# 1. J-1343 (VGT 0118 PUS)

#### 09/973,030

# REMARKS

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The Applicant wishes to thank the Examiner for considering the present application. The Applicant respectfully submits that the amendments requested above do not introduce new matter into the disclosure of the application and therefore are allowable.

Regarding the amendments to claims 11 and 22, the Applicant submits that these amendments are adequately supported by the originally filed specification. In particular, the originally filed specification, on page 9, paragraph 23, discloses that the hold close time period is approximately 30 milliseconds in duration. Claims 11 and 22 have been amended to properly recite this limitation. Therefore, the Applicant submits that the claims 11 and 22, as amended, are proper and in an allowable condition.

Regarding the amendment to claim 20, the Applicant asserts that this amendment is proper because it is also supported by the application as originally filed. Specifically, claim 20 depends from claim 19, which in turn depends from independent claim 12. Both claims 12 and 19 relate to a system whereas claim 20 recites a method. The Applicant has amended claim 20 such that it correctly recites a system, rather than a method. The Applicant submits that claim 20, as amended, does not add new matter, and therefore is in an allowable condition.

In light of the above remarks, the Applicant respectfully submits that claims 11, 20, and 22 are in an allowable condition and that the amendments are fully supported by the application as originally filed.

Respectfully submitted, ARTZ & ARTZ. P.C.

S. Artz John/

Reg/No. 36,431 28333 Telegraph Road, Ste. 250 Southfield, MI 48034 Attorney for Applicant(s)

Date: October 3, 2002
09/973,030

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#### "VERSION WITH MARKINGS TO SHOW CHANGES MADE"

### In the Claims:

Kindly substitute claim 11 with the following:

11. (Amended) The method as recited in claim 9, wherein said <u>hard close</u> [predetermined] time period is 30 milliseconds.

#### Kindly substitute claim 20 with the following:

20. (Amended) The <u>system</u> [method] as recited in claim 19, <u>wherein</u> <u>said controller further includes control logic operative to command application of</u> [further comprising the step of applying] a maximum control effort to the positioning device for a hard close time period.

Kindly substitute claim 22 with the following:

22. (Amended) The method as recited in claim 20, wherein said <u>hard</u> <u>close</u> [predetermined] time period is 30 milliseconds.

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John S. Artz			EXAM	NER
Artz & Artz, PC Suite 250			CASTRO,	ARNOLD
28333 Telegraph Southfield, MI			ART UNIT	PAPER NUMBER

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Please find below and/or attached an Office communication concerning this application or proceeding.

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PTO-90C (Rev. 07-01)

	·····	Ap	plication No.	Applicant(s)	
		09	9/973,030	PURSIFULL	
Of	fice Action Summary	Ex	aminer	Art Unit	
			nold Castro	3747	
The Period for Rep	MAILING DATE of this comm	nunication appears	s on the cover sheet wi	th the correspondence address	
THE MAILIN - Extensions of after SIX (6) M - If the period fo - If NO period fo - Failure to reply - Any reply rece earned patent	NED STATUTORY PERIOI IG DATE OF THIS COMMI time may be available under the provis IONTHS from the mailing date of this c r reply specified above, the maximu y within the set or extended period for I vied by the Office later than three mon term adjustment. See 37 CFR 1.704(t	UNICATION. sions of 37 CFR 1.136(a). communication. ty (30) days, a reply withi m statutory period will ap reply will, by statute, caus ths after the mailing date	In no event, however, may a r n the statutory minimum of thirt ply and will expire SIX (6) MON e the application to become AB	eply be timely filed y (30) days will be considered timely. THS from the mailing date of this communicati MANDONED (35.11.5.0.5.123)	ion.
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	action is FINAL.		ction is non-final.		
3) Since close Disposition of	d in accordance with the p	ition for allowance ractice under <i>Ex p</i>	except for formal mat parte Quayle, 1935 C.I	ters, prosecution as to the merits D. 11, 453 O.G. 213.	is is
4) Claim	(s) <u>1-22</u> is/are pending in t	he application.			
4a) Of	the above claim(s) i	s/are withdrawn fr	om consideration.		
5) Claim	(s) is/are allowed.				
6) Claim	(s) 1.8 and 12 is/are rejecte	ed.			
7) Claim	(s) <u>2-7,9-11 and 13-22</u> is/ar	e objected to.			
8) Claim	(s) are subject to res pers	striction and/or ele	ction requirement.		
9) The sp	ecification is objected to by	the Examiner.			
10) The dra	awing(s) filed on is/a	re: a) accepted	or b) objected to by th	ne Examiner.	
Appli	cant may not request that any	objection to the dra	wing(s) be held in abeya	nce. See 37 CFR 1.85(a).	
11) The pro	posed drawing correction t	filed on is: a	a) approved b) di	isapproved by the Examiner.	
	roved, corrected drawings are				
12) The oat	th or declaration is objected	d to by the Examin	ner.	2	
Priority under 3	5 U.S.C. §§ 119 and 120				
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Page 2

#### DETAILED ACTION

#### **Double Patenting**

1. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

 Claims 1, 8, and 12 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent No. 6,539,918. Although the conflicting claims are not identical, they are not patentably distinct from each other because claims1, 2, and 10 of patent contain additional steps over claims 1, 8, and 12 of patent application. The step of commanding the positioning

device to change to a full stop position ; and learning a positioning device voltage at said full stop position. It is has been held that omission of an element and its function is obvious If the function of the element is not desired. Ex parte Wu, 10 USPQ 2031 (Bd. Pat. App. & Inter. 1989See also In re Larson, 340 F.2d 965, 144 USPQ 347 (CCPA 1965) (Omission of additional framework and axle which served to increase the cargo carrying capacity of prior art mobile fluid carrying unit would have been obvious if this feature was not desired.); and In re Kuhle, 526 F.2d 553, 188 USPQ 7 (CCPA 1975) (deleting a prior art switch member and thereby eliminating its function was an obvious expedient). Thus it would be obvious not to complete the extra steps of claims 1, 2, and 10.

Page 3

#### Allowable Subject Matter

3. Claims 2-7, 9-11, and 13-22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

4. Claims 1, 8, and 12 are allowable pending a timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) to overcome rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

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#### Conclusion

 The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Pursifull US 6,488,006, Keegan 5,115,396 and Fujiyoshi JP 03226283 A are protection systems for servomotors.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arnold Castro whose telephone number is (703) 305-0039. The examiner can normally be reached on 7:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yuen Henry can be reached on (703) 308-1946. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9302 for regular communications and (703) 872-9303 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0861.

Arnold Castro Examiner Art Unit 3747

AC April 21, 2003

		Notice of Reference	s Cited		Application/Control N 09/973,030	Ree PUR	camination SIFULL	tent Under
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	A	US-6,488,006	12-2002	Pursifu	III, Ross Dykstra	11 D 2495 21 D 2		123/339.25
	в	US-5,115,396	05-1992	Keega	n, Kevin R.			701/102
	с	US-6,539,918	04-1993	Pursifu	11			123/399
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U.S. Patent and Trademark Office PTO-892 (Rev. 01-2001)

Notice of References Cited

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	Attorney Docket	No: 199-1343 (VGT	0118 PUS)			
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# Serial No. 09/973,030

### 199-1343 (VGT 0118 PUS)

It is Applicant's opinion that the claims presently on file patentably distinguish the present invention from each of these references. The above references are being cited only in the interests of candor and without any admission that they constitute statutory prior art or contain matter which anticipates the invention or which would render the same obvious, either singly or in combination, to a person of ordinary skill in the art.

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The Commissioner is authorized to charge any additional fees, which may be required, or credit any overpayment, to Deposit Account No. 50-0476.

Respectfully submitted,

Vincent C. Ilagan

Registration No. 53,053 28333 Telegraph Road, Suite 250 Southfield, MI 48034 (248) 223-9500

Attorney for Applicant(s)

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Date: April 11, 2003

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\* Or part of the applicant of the applicant.
\* Unique citation designation number.
\* See attached Kinds of U.S. Patent Documents.
\* Enter Office that issued the document, by the two-letter code (WIPO Standard ST, 3).
\* For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.
\* Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST, 16 if possible.
\* Applicant is to place a check mark here if English language Translation is attached.

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Application No: Claims searched: GB 0220055.8 1-24 Examiner: Date of search: Dave Mobbs 20 February 2003

# Patents Act 1977 : Search Report under Section 17

# Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance				
X	1-4, 8, 12-15, 19.	DE 3608555 A	(Robert Bosch) - see particularly the abstract and claims 1 and 4.			

#### Categories:

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x	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

### Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKCV:

Worldwide search of patent documents classified in the following areas of the IPC7:

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The following online and other databases have been used in the preparation of this search report : EPODOC, JAPIO, WPI.

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Your ref: P3509.P4/RAM		P4/RAM	Examiner:	Dave Mobbs	
Application No: GB 0220055.8			Tel:	01633 814812	
		Global Technologies, Inc.	Date of report:	21 February 2003	
Latest date for reply:		9 October 2003	Page 1/1		

# Patents Act 1977

Combined Search and Examination Report under Sections 17 & 18(3)

#### Novelty

1. The invention as defined in claims 1 and 12 is not new because it has already been disclosed in the following document:

DE 3608555 A (Robert Bosch) - see particularly the abstract and claims 1 and 4.

#### **Inventive step**

2. The invention as defined in claims 2-4, 8, 13-15 and 19 is obvious in view of what has already been disclosed in the following document:

#### DE 3608555 A

3. The DE patent discloses all the requirements of claims 1 and 12. The parameters of 6 volts and 300 milliseconds required by claims 2,3, 13 and 14 are threshold and time parameters which apply in the particular system which has been chosen by the applicants, and do not provide an inventive step over the disclosure of the system generally in the DE patent. Similarly, the features of claims 4, 8, 15 and 19 that the command parameter is issued in what is referred to as either a "hold open mode" or "hold close mode" do not provide an inventive step over the disclosure in the DE patent.

#### **Clarity and Support**

4. There is at present no clear link in claims 1 and 12 between the "control effort required to change to the commanded position" and the "electric motor". These claims should apparently specify that the electric motor provides this "control effort".

5. There is apparently no support in the description for the subject matter of claims 7, 11, 18 and 22.

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TRADEMARY	Applicant(s):	Ross Dykstra I	Pursifull		L	$\mathcal{U}$
	Serial No:	09/973,030		Group Art Unit: 37	747	
25	Filed:	October 9, 2003	1	Examiner:		
	For:	ELECTRONIC SYSTEM	THROTTLE SE	RVO OVERHEAT P	ROTECTION	
	Attorney Docket	No: 199-1343 (VC	GT 0118 PUS)			
- K)	I hereby certi first class mail in an e 20231 on:	fy that this correspond nvelope addressed to:	lence is being deposit Assistant Commissio	ed with the United States i oner for Patents, Box DD, V	Postal Service as Vashington, D.C.	
	April 10, 2003 Date of Deposit	Jo Anne Croskey	Joan	ne Cro-s. Signature	key	
		SUPPLEMENTA	L DISCLOSURE DER 37 C.F.R. § 1			
	Assistant Commis	sioner for Patents	3	RECE	EIVED	2

Box DD Washington, D.C. 20231

Sir:

# JUL 0 2 2003 TECHNOLOGY CENTER R3700

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In compliance with 37 C.F.R. § 1.56, the art listed and identified on the attached PTO Form 1449A is being submitted herewith for consideration by the Examiner. A copy of each of the listed references is included herewith as well as a copy of the foreign search report.

It is hereby certified that this Disclosure Statement is being submitted to the Patent Office within three (3) months from the date the International Search Report was received.

It is Applicant's opinion that the claims presently on file patentably distinguish the present invention from each of these references. The above references are being Serial No. 09/978,408

### V200-0171 (VGT 0163 PUS)

It is Applicant's opinion that the claims presently on file patentably distinguish the present invention from each of these references. The above references are being cited only in the interests of candor and without any admission that they constitute statutory prior art or contain matter which anticipates the invention or which would render the same obvious, either singly or in combination, to a person of ordinary skill in the art.

2

The Commissioner is authorized to charge any additional fees, which may be required, or credit any overpayment, to Deposit Account No. 50-0476.

Respectfully submitted,

Vincent C. Ilàgan Registration No. 53,053 28333 Telegraph Road, Suite 250 Southfield, MI 48034 (248) 223-9500

Attorney for Applicant(s)

Date: June 26, 2003

7		Substitute for Form 1449A/PTO			13	Complete			e if Known		
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup> Unique cl tation designation number. <sup>2</sup> See attached Kinds of U.S. Patent Documents. <sup>3</sup> Enter Office that issued the document, by the twoletter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>3</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. <sup>4</sup> Applicant is to place a check mark here if English language Translation is attached.





Application No: Claims searched:

GB 0223142.1 1-11 Examiner: Date of search: Tyrone Moore 27 March 2003

# Patents Act 1977 : Search Report under Section 17

#### Documents considered to be relevant:

Category	Relevant to claims	Identity of document and p	passage or figure of particular relevance				
х	X <sup>1-11</sup> US 5809966 A		(BOSCH GMBH ROBERT) See figures 1-5 and the description, especially i column 3 at line 13 to column 4 at line 10.				
AE	E US 6393350 B1			(FORD GLOBAL TECHNOLOGIES) Whole document			
Categories				1			
X Docum	ent indicating	lack of novelty or inventive step	А	Document indicating technological background and/or state of the art.			
	Document indicating lack of inventive step if combined with one or more other documents of same category.			Document published on or after the declared priority date but before the filing date of this invention.			
& Memb	Member of the same patent family			Patent document published on or after, but with priority date earlier than, the filing date of this application.			

#### Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKCV:

G3N

Worldwide search of patent documents classified in the following areas of the IPC7:

B60K; F02D

The following online and other databases have been used in the preparation of this search report : WPI, EPODOC, JAPIO.

An Executive Agency of the Department of Trade and Industry







Your ref:	P3508.	P4/PAG		Exam	
<b>Application No:</b>	: GB 0223142.1				
Applicant:	pplicant: VISTEON GLOBAL TECHNOLOGIES, Inc.			Date	
Latest date for r	eply:	16 October 2003		Page 1	

 xaminer:
 Tyrone Moore

 el:
 01633 813689

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 27 March 2003

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# Patents Act 1977 Combined Search and Examination Report under Sections 17 & 18(3)

#### Novelty or inventive step

1. Although your statement of claim is set out clearly, it seems that it might not be new or that it might be obvious in view of what is disclosed in the following document:

US 5809966 A (BOSCH GMBH ROBERT) See figures 1-5 and the description, especially in column 3 at line 13 to column 4 at line 10.

2. You should consider this document carefully when amending your specification.

The cited document above claims a method for controlling a positioning device, this method is practically identical to that of this GB application with one exception, this being, an actual position of the throttle is specified instead of the commanded position of the throttle. However, in the description of Bosch (col.3, ln.13 to col.4, ln.10) an embodiment is described with wording which is substantially identical to the preferred embodiment described in this GB application (pages 8 to 10). It is therefore considered that as the scope of the embodiments described are the same, Bosch must therefore anticipate this application. Furthermore, there would appear to be no inventive step involved in applying a commanded position term in replacement of an actual position term.

4.

3.

The dependent claims of Bosch appear to be substantially identical to that of this GB application. Therefore claims 2-11 are also believed to be anticipated.

#### Clarity / Support - Section 14(5).

- 5. There appears to be an inconsistency with claim 1 and the description on page 8. Claim 1 clearly states the use of "a commanded position" for forming a drive signal for the motor, whereas in the description (pg.8, ln.14-20), the preferred embodiment describes a throttle control unit (TCU) which uses an actual position of the positioning device. The TCU then forms an output signal based on the actual position. Furthermore, there appears to be no embodiment describing the use of a commanded position of a positioning device used for forming an output signal.
- There appears to be no antecedent for the term "commanded position" used in claim 1 at line 11.

An Executive Agency of the Department of Trade and Industry







 Your ref:
 P3508.P4/PAG

 Application No:
 GB 0223142.1

Date of Report: 27 March 2003 Page 2/2

[Examination Report contd.]

7. The term "region" used in claims 1 and 9 is considered to be unclear in scope, thus rendering the scope of these claims indeterminate.

8. The term "said current" used in claim 2, (pg.11, ln.21), appears to have no antecedent.

9. The term 'approximately' used in claim 2 (pg.11, ln.23) is unclear in scope. Furthermore the phrase 'approximately compensated' used at the above reference point is also unclear in its meaning and therefore casting doubt on the scope of this claim.

10. In claim 3, (pg.11, ln.26) there appears to be no antecedent for the term "the magnitude"

11. The statement of invention on page 3 is not fully consistent with the statement of claim.

An Executive Agency of the Department of Trade and Industry



# IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Ross Pursifull

Serial No.:	09/973,030

Filed: October 9, 2001

Group Art Unit: 3747

Examiner: Arnold Castro

For: ELECTRONIC THROTTLE SERVO OVERHEAT PROTECTION SYSTEM

Atty Docket: 199-1343 (VGT 0118 PUS)

I hereby certify that this correspondence is being deposited with the United States Postal Service as first-class mail in an envelope addressed to: Mail Stop Non-Fee Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on:

8/22/2073 Date of Deposit

#### **RESPONSE TO OFFICE ACTION**

Assistant Commissioner for Patents Washington, D.C. 20231

Sir:

This is in response to the Office Action mailed April 22, 2003 in the aboveidentified application. This Response is being accompanied by a Petition for One Month Extension of Time and the appropriate fee and is therefore due on or before August 22, 2003.

RECEIVED TECHNOLOGY CENTER R3700

#### 199-1343 (VGT 0118 PUS)

- 2 -

#### Serial No. 09/973,030

### REMARKS

The Examiner rejected claims 1, 8, and 12 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent No. 6,539,918. The Applicant appreciates the Examiner's indication that claims 2-7, 9-11, and 13-22, which are objected to a being dependent upon a rejected base claim, would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The Applicant also appreciates the Examiner's indication that claims 1, 8, and 12 would be allowable pending a timely filed terminal disclaimer.

Accordingly, the Applicant files herewith a terminal disclaimer in compliance with 37 CFR 1.321(c) to overcome the obviousness-type double patenting rejection.

It is therefore submitted that all objections and rejections of record have been overcome and that all pending claims are in addition for allowance. A notice of allowability is therefore earnestly solicited.

# 199-1343 (VGT 0118 PUS)

Serial No. 09/973,030

If the Examiner should have any questions, he is urged to contact the undersigned at 248-223-9500.

- 3 -

Respectfully Submitted

ARTZ & ARTZ, P.C.

John S. Artz, Reg. No. 36,431 28333 Telegraph Road, Suite 250 Southfield, MI 48034 (248) 223-9500

Dated: August 22, 2003

PTO/SB/26 (05-03) proved for use through 4/30/2003. OMB 0651-0031 U.S. Patent and 'i. mark Office; U.S. DEPARTMENT OF COMMERCE Ubder the Raperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING Docket Number (Optional) 2 5 2003 24 199-1343 (VGT 0118 PUS) **REJECTION OVER A PRIOR PATENT** In re Application of: Ross Dykstra Pursifull 4.2 Application No.: 09/973,030 Filed: October 9, 2001 10 For: Electronic Throttle Servo Overheat Protection System Visteon Global The owner\*, Technologies, Inc.\_\_\_\_\_, of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application, which would extend beyond the expiration date of the full statutory term defined in 35 U.S.C. 154 and 173, as presently so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns. In making the above disclaimer, the owner does not disclaim the terminal part of any patent granted on the instant application that would extend to the expiration date of the full statutory term as defined in 35 U.S.C. 154 and 173 of the prior patent, as presently shortened by any terminal disclaimer, in the event that it later: expires for failure to pay a maintenance fee, is held unenforceable, is found invalid by a court of competent jurisdiction, is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321, has all claims canceled by a reexamination certificate, is reissued, or is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer. Check either box 1 or 2 below, if appropriate. For submissions on behalf of an organization (e.g., corporation, partnership, university, government agency, 1. [ etc.), the undersigned is empowered to act on behalf of the organization. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon. 2. Let The undersigned is an attorney or agent of record. RECEIVED AUG 2 8 2003 22103 gignature Date TECHNOLOGY CENTER R3700 John S. Artz Typed or printed name (248) 223-9500 **Telephone Number** Terminal disclaimer fee under 37 CFR 1.20(d) included. WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038. \*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner). Form PTO/SB/96 may be used for making this certification. See MPEP § 324. This collection of information is required by 37 CFR 1.321. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450. If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

AND -	Under the P						PTO/SB/22 (10-00)	A.
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PPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/973,030	10/09/2001	Ross Dykstra Pursifull	199-1343 (VGT 0118 PUS)	5130
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John S. Artz Artz & Artz, PC	e.		CASTRO,	ARNOLD
Suite 250			ART UNIT	PAPER NUMBER
28333 Telegrap			3747	
Southfield, MI	48034		DATE MAILED: 11/05/200	

Please find below and/or attached an Office communication concerning this application or proceeding.

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PTO-90C (Rev. 10/03)

	Annlingting		/VI
	Application No.	Applicant(s)	2
Office Action Summary	09/973,030	PURSIFULL, ROSS	S DYKSTRA
Onice Action Summary	Examiner	Art Unit	
The MAILING DATE of this communica	Arnold Castro	3747	1
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A SHORTENED STATUTORY PERIOD FOR THE MAILING DATE OF THIS COMMUNICA - Extensions of time may be available under the provisions of 3 after S1X (6) MONTHS from the mailing date of this communic - If the period for reply specified above, is less than thirty (30) da - If INO period for reply is specified above, the maximum statuto - Failure to reply within the sot or extended period for reply will, - Any reply received by the Office later than three months after earned patent term adjustment. See 37 CFR 1.704(b).	TION. 7 CFR 1.136(a). In no event, however, m ation. ays, a reply within the statutory minimum ry period will apply and will expire SIX (6) by statute. cause the apolication to beco	ay a reply be timely filed of thirty (30) days will be considered timely. MONTHS from the mailing date of this cor ne ABANDONED (35 U.S.C. § 133).	nmunication.
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Since this application is in condition fo closed in accordance with the practice Disposition of Claims	r allowance except for formal		emerits is
4) Claim(s) <u>1-22</u> is/are pending in the app	lication.		
4a) Of the above claim(s) is/are v	withdrawn from consideration	· ·	
5) Claim(s) is/are allowed.			
6) Claim(s) 1-22 is/are rejected.			
7) Claim(s) is/are objected to.			
8) Claim(s) are subject to restriction Application Papers	n and/or election requirement	r.	
9) The specification is objected to by the Ex	xaminer.		
10) The drawing(s) filed on is/are: a)	accepted or b) objected to	by the Examiner.	
Applicant may not request that any objection	on to the drawing(s) be held in a	beyance. See 37 CFR 1.85(a).	
11) The proposed drawing correction filed or		disapproved by the Examine	r.
If approved, corrected drawings are require			
12) The oath or declaration is objected to by	the Examiner.		
Priority under 35 U.S.C. §§ 119 and 120			·
<ul> <li>13) Acknowledgment is made of a claim for</li> <li>a) All b) Some * c) None of:</li> </ul>	foreign priority under 35 U.S	.C. § 119(a)-(d) or (f).	
1. Certified copies of the priority doc	uments have been received		
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<ul> <li>Copies of the certified copies of the application from the Internatic</li> <li>* See the attached detailed Office action for</li> </ul>	he priority documents have b onal Bureau (PCT Rule 17.2(a	een received in this National S	itage
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Notice of References Cited (PTO-892) Notice of Draftsperson's Patent Drawing Review (PTO- Information Disclosure Statement(s) (PTO-1449) Paper	948) 5) Notic	iew Summary (PTO-413) Paper No(s e of Informal Patent Application (PTO	
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Page 2

#### DETAILED ACTION

#### **Double Patenting**

A timely filed terminal disclaimer filed a5 august 2003 is found to comply with 37 CFR 1.321(c). The obviousness-type double patenting rejection pertaining to claims 1, 8, and 12 is withdrawn.

#### Information Disclosure Statement

1. The information disclosure statement (IDS) submitted on received April 18, 2003 was filed before the mailing date of the First Office Action on April 22, 2003. The submission is in compliance with the provisions of 37 CFR 1.97 b (3). Accordingly, the information disclosure statement is being considered by the examiner.

2. **NOTE:** Examiner would like to point out that if the first office action had been mailed five days earlier the statement submitted by applicant's attorney to comply with 37 CFR 1.97 e (1) would not have been accepted. A statement under this section must state **"That each item** of information contained in the information disclosure statement was **first cited** in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement.

3. The information disclosure statement was received by OIPE on 30 June 2003 and placed in this case because first page listed Applicant as Ross Dykstra Pursifull and case Serial No. 09/973,030 with certified date of deposit of April 10, 2003 signed by Jo Anne Croskey. However, page 2 is signed by Vincent C liagan, who is not an attorney of record, on June 26, 2003. Page 3, the PTO-1449 is for SN 09/978,408 which is now

Patent number **6,612,287**. The first prior art 5,809,966 was considered in prosecution of that application however, the second prior art document is not of record in that case. The submitted IDS fails to comply with the provisions of 37 CFR 1.97, 1.98 and MPEP § 609 for the reasons listed above and furthermore for not having a proper satement under 37 CFR 1.97 e (1) . It has been placed in the application file, but the information referred to therein has not been considered as to the merits. Applicant is advised that the date of any re-submission of any item of information contained in this information disclosure statement or the submission of any missing element(s) will be the date of submission for purposes of determining compliance with the requirements based on the time of filing the statement, including all certification requirements for statements under 37 CFR 1.97(e). See MPEP § 609 ¶ C(1).

#### Allowable Subject Matter

 The indicated allowability of claim 1-22 is withdrawn in view of the newly discovered reference to Japan patent JP\$03226283A. Rejections based on the newly cited reference follow.

#### Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

 Claims 1 and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Fujyoshi, Koji JP 03226283 A.

Koji discloses how to feed a maximum effective current from a servo amplifier and to make full use of the capacity of a semiconductor by limiting current to be fed to the servo amplifier so that the estimated junction temperature of the semiconductor will not be lower than a predetermined value. A current detector 6 directly detects the load current (i) of a servo motor 4 which is then fed back, as a current feedback signal If, to an observer 7 and a speed control section 1. Junction temperature of a semiconductor 3 is then estimated through the observer 7 based on the load current (i) of the servo motor 4 and the duration thereof. Current to be fed from the servo motor 4 is then limited so that the junction temperature does not exceed a predetermined value at any time thus protecting servo amplifier while feeding a maximum effective current thereto.

# Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the z invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claim 2-11, and 13-22 are rejected under 35 U.S.C. 103(a) as being

unpatentable over JP 03226283 A.

9. The parameters of 6 volts and 300 milliseconds required in claims 2,3,13,14 are threshold and time parameters which apply to the particular system which has been chosen by applicant. At the time the invention was made, it would have been an obvious matter of design choice to a person of ordinary skill in the art to use parameters of 6

volts and 300 milliseconds [because Applicant has not disclosed that parameters of 6 volts and 300 milliseconds provides an advantage, is used for a particular purpose, or solves a stated problem. Claims 2-7, 9-11, and 13-22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

#### Conclusion

 Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arnold Castro whose telephone number is (703) 305-0039. The examiner can normally be reached on 7:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yuen Henry can be reached on (703) 308-1946. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9302 for regular communications and (703) 872-9303 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0861.

Arnold Castro Examiner Art Unit 3747

Henry C. Yuen Supervisory Patent Examiner Group 3700

AC November 2, 2003

		Notice of Poferones	e Cited	Application/Control No. 09/973,030	Applicant(s)/Patent Under Reexamination PURSIFULL, ROSS DYKSTF	
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				Arnold Castro	3747	Page 1 of 1
20.0			U	S. PATENT DOCUMENTS		
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#### FOREIGN PATENT DOCUMENTS

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#### NON-PATENT DOCUMENTS

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A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).) Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

U.S. Patent and Trademark Office PTO-892 (Rev. 01-2001)

Notice of References Cited

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# **RESPONSE TO OFFICE ACTION**

Mail Stop Non-Fee Amendment Commissioner for Patents P. O. Box 1450 Alexandria, VA 22313-1450

Sir:

This is in response to the Office Action mailed November 5, 2003. This response is timely filed as it is being submitted within the three (3) month period set for response.

Please enter the following amendments and remarks:

PAGE 1/8 \* RCVD AT 2/4/2004 2:12:56 PM [Eastern Standard Time] \* SVR:USPTO-EFXRF-1/4 \* DNIS:8729306 \* CSID:248 2239522 \* DURATION (mm-ss):01-48

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199-1343 (VGT 0118 PUS)

In the Claims:

Serial No. 09/973,030

Claim 1 (Cancelled)

Claim 2 (Currently Amended): The method as recited in claim [[1]] 23, wherein said threshold has an absolute value of 6 volts.

2

Claim 3 (Currently Amended): The method as recited in claim [[1]] 23, wherein said predetermined time period is 300 milliseconds.

Claim 4 (Cancelled)

Claim 5 (Currently Amended): The method as recited in claim [[4]] 23, further comprising the step of applying a maximum control effort to the positioning device for a hard open time period.

Claim 6 (Original): The method as recited in claim 5, wherein said maximum control effort is +14.5 volts.

Claim (Original): The method as recited in claim 5, wherein said hard open time period is 30 milliseconds.

Claim & (Currently Amended): The method as recited in claim [[1]].23, wherein the step of commanding the positioning device to change to [[a]] <u>said</u> commanded position, comprises commanding the positioning device to close to [[a]] <u>said</u> commanded position in a hold close mode.

PAGE 2/8 \* RCVD AT 2/4/2004 2:12:56 PM [Eastern Standard Time] \* SVR:USPTO-EFXRF-1/4 \* DNIS:8729306 \* CSID:248 2239522 \* DURATION (mm-ss):01-48

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Serial No. 09/973,030

## 199-1343 (VGT 0118 PUS)

Claim 9 (Original): The method as recited in claim 8, further comprising the step of applying a maximum control effort to the positioning device for a hard close time period.

3

Claim 10 (Original): The method as recited in claim 9; wherein said maximum control effort is -14.5 volts.

/D Claim IT (Previously Presented): The method as recited in claim 9, wherein said hard close time period is 30 milliseconds.

# Claim 12 (Cancelled)

// Claim 13 (Currently Amended): The system as recited in claim [[12]] 24; wherein said threshold has an absolute value of 6 volts.

/3- //
Claim 14 (Currently Amended): The system as recited in claim [[12]].24,
wherein said predetermined time period is 300 milliseconds.

14 Claim 15 (Currently Amended): The system as recited in claim [[12]] 24, wherein said controller further includes control logic operative to command the positioning device to open to [[a]] <u>said</u> commanded position in a hold open mode.

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Claim 16 (Original): The system as recited in claim 15, wherein said controller further includes control logic operative to apply a maximum control effort to the positioning device for said hard open time period.

PAGE 3/8 \* RCVD AT 2/4/2004 2:12:56 PM [Eastern Standard Time] \* SVR:USPTO-EFXRF-1/4 \* DNIS:8729306 \* CSID:248 2239522 \* DURATION (mm-ss):01-48

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Serial No. 09/973,030

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199-1343 (VGT 0118 PUS)

15 Claim 27 (Original): The system as recited in claim 16, wherein said maximum control effort is +14.5 volts.

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Claim 18 (Original): The system as recited in claim 16, wherein said hard open time period is 30 milliseconds.

Claim 19 (Cancelled)

[8 [/ Claim, 20 (Currently Amended): The system as recited in claim [[19]] 24 wherein said controller further includes control logic operative to command application of a maximum control effort to the positioning device for a hard close time period.

19 Claim, 27 (Original): The system as recited in claim 20, wherein said maximum control effort is -14.5 volts.

Claim 22 (Currently Amended): The method system as recited in claim 20, wherein said hard close time period is 30 milliseconds.

Claim 23 (New): A method for controlling a positioning device of an internal combustion engine, the method comprising the steps of:

providing an electric motor for actuating the positioning device;

commanding the positioning device to change to a commanded position;

detecting a control effort required to change to said commanded position;

determining whether said control effort exceeds a threshold for a predetermined time period; and

reducing said control effort when said control effort exceeds said threshold for said predetermined time period;

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Serial No. 09/973,030

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199-1343 (VGT 0118 PUS)

wherein commanding the positioning device to change to said commanded position comprises at least one of commanding the positioning device to open to a hold open mode and commanding the positioning device to close to a hold close mode.

Claim 24 (New): A system for controlling a positioning device of an internal combustion engine to prevent overheat conditions, the system comprising:

an electric motor for actuating the positioning device with a control effort; a control effort detector coupled to said electric motor and intended to detect said control effort; and

a controller coupled to said electric motor and said control effort detector, said controller including control logic operative to command the positioning device to change to a commanded position, detect a control effort required to change to said commanded position, determine whether said control effort exceeds a threshold for a predetermined time period, and reduce said control effort when said control effort exceeds said threshold for said predetermined time period;

wherein said controller further includes control logic operative to command the positioning device to close to said commanded position in a hold close mode.

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### Serial No. 09/973,030

# 199-1343 (VGT 0118 PUS)

#### REMARKS

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Claims 1-24 are currently pending in this application and are being retained with claims 1, 4, 8, 12, 15, and 19 being cancelled. New claims 23 and 24 have been added. Claims 2, 3, 5, and 8 have been amended to depend from claim 23. Also, claims 13-15 and 20 have been amended to depend from claim 24.

In the Office Action, the Examiner stated that the information disclosure statement ("IDS"), which was received by the OIPE on April 18, 2003, is in compliance with 37 CFR 1.97(b)(3) and is being considered by him. This IDS contains the Foreign Patent Document Number DE 3608555 A. Furthermore, the Examiner also stated that the IDS, which was received by the OIPE on June 30, 2003, was placed in the application file but was not considered as to the merits.

Regarding the merits, the obviousness-type double patenting rejection pertaining to claims 1, 8, and 12 has been withdrawn. However, the allowability of claims 1-22 has also been withdrawn in view of the newly discovered reference to Japan patent JP 03226283A ("the Koji patent"). Claims 1 and 12 stand rejected under 35 U.S.C. §102 as being anticipated by the Koji patent. Also, claims 2, 3, 13, and 14 are rejected under 35 U.S.C. 103 as being unpatentable over the Koji patent. Finally, claims 2-7, 9-11, and 13-22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all the limitations of the base claim and any intervening claim.

By this Amendment, new claim 23 has been added including the limitations of the allowable dependent claim 4 and the rejected base claim 1. Also, claims 2, 3, 5, and 8 have been amended to depend from claim 23. It is therefore respectfully submitted that claim 23 and claims 2, 3, and 5-11, which depend from claim 23, are allowable.

Also by this Amendment, new claim 24 has been added having the limitations of allowable dependent claim 19 and the rejected base claim 12. In

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addition, claims 13-16 and 20 have been amended to depend from claim 24. Therefore, the Applicants respectfully submit that claim 24 and claims 13-18, 20-22, which depend from claim 24, are allowable.

7

#### The §102 Rejections:

Claims 1 and 12 stand rejected under 35 U.S.C. §102 as being anticipated by the Koji patent. However, by this Amendment, claims 1 and 12 have been cancelled and withdrawn from consideration. The limitations of claims 1 and 12 have been included in allowable claims 23 and 24, respectively. It is therefore respectfully submitted that the rejection of claims 1 and 12 is moot. The §103 Rejections:

Claims 2, 3, 13, and 14 are rejected under 35 U.S.C. 103 as being unpatentable over the Koji patent. By this Amendment, claims 2 and 3 depend from allowable claim 23. Likewise, claims 13 and 14 depend from allowable claim 24. It is therefore respectfully submitted that claims 2, 3, 13, and 14 are allowable.

#### Conclusion:

In view of the foregoing amendments and remarks, the Applicant submits that all of the claims remaining in the case, namely claims 2, 3, 5-11, 13-18, and 20-24, are allowable. The Examiner is invited to telephone the Applicant's undersigned attorney at (248) 223-9500, if any unresolved matters remain.

Respectfully submitted, ARTZ & ARTZ, P.C.

B

Vincent & Ilagan Reg. No. 53,053 28333 Telegraph Road, Ste. 250 Southfield, MI 48034

Date: February 5, 2004

Attorney for Applicants

PAGE 7/8 \* RCVD AT 2/4/2004 2:12:56 PM [Eastern Standard Time] \* SVR:USPTO-EFXRF-1/4 \* DNIS:8729306 \* CSID:248 2239522 \* DURATION (mm-ss):01-48

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## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of

Ross D. Pursifull

Group Art Unit: 3747

Serial No. 09/973,030

Filed: October 9, 2001

For: ELECTRONIC THROTTLE SERVO OVERHEAT PROTECTION SYSTEM

Attorney Docket No: 199-1343 (VGT 0118 PUS)

#### ASSOCIATE POWER OF ATTORNEY

Please recognize \*, Registration \*, as our Associate Attorney in the aboveentitled application.

In the future, please address all correspondence and telephone inquiries to:

Artz & Artz, PC 28333 Telegraph Road, Suite 250 Southfield, MI 48034

Respectfully submitted,

John S Artz Registration No. 36,431 Artz & Artz, P.C. 28333 Telegraph Road, Suite 250 Southfield, MI 48034

Date: February 4, 2004

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PAGE 8/8 \* RCVD AT 2/4/2004 2:12:56 PM [Eastern Standard Time] \* SVR:USPTO-EFXRF-1/4 \* DNIS:8729306 \* CSID:248 2239522 \* DURATION (mm-ss):01-48, DTEI P. 28

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ART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE

i.

Mail Stop ISSUE FEE Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450

			or <u>Fax</u>	(703) 746-400	0	
INSTRUCTIONS: This forr appropriate. All further com- indicated unless corrected be maintenance fee notifications	n should be used for trans espondence including the P elow or directed otherwise i i.	nitting the ISSUE FEE ttent, advance orders ar n Block 1, by (a) speci	and PUBLIC and notification fying a new co	ATION FEE (if of maintenance for rrespondence add	required). Blocks 1 through 4 ees will be mailed to the curren dress; and/or (b) indicating a sep	should be completed where t correspondence address as parate "FEE ADDRESS" for
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Southfield, MI 4803						(Depositor's name)
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09/973,030	10/09/2001	Ross	Dykstra Pursif	all	199-1343 (VGT 0118	5130
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#### Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 100 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 100 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) system (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (703) 305-1383. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at (703) 305-8283.

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PTOL-85 (Rev. 11/03) Approved for use through 04/30/2004.

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John S. Artz				CASTRO,	ARNOLD
Artz & Artz, PC Suite 250				ART UNIT	PAPER NUMBER
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APPLICATION NO.	FILING DATE	FIRST NAME	D INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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#### Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 100 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 100 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) system (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (703) 305-1383. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at (703) 305-8283.

Page 3 of 3

PTOL-85 (Rev. 11/03) Approved for use through 04/30/2004.

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# PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1 Stylesheet Version v1.2 EPAS ID: PAT4575384

SUBMISSION TYPE:		NEW ASSIGNMENT		
IATURE OF CONVEY	ANCE:	ASSIGNMENT		
CONVEYING PARTY	DATA			
		Name		Execution Date
MOBILE AUTOMOTIV	/E TECHNOLO	DGIES, LLC		08/28/2017
RECEIVING PARTY I	DATA			
Name:	MICHIGAN	MOTOR TECHNOLOGIES LLC		
Street Address:	2360 ORC	HARD LAKE ROAD SUITE 100		
City:	SYLVAN L	AKE		
State/Country:	MICHIGAN	١		
Postal Code:	48320			
PROPERTY NUMBE	RS Total: 42			
Property Typ	e	Number		
Patent Number:	634	45604	-	
Patent Number:	634	17680		
Patent Number:	63	79281		
Patent Number:	644	13128	1	
Patent Number:	65	10839		
Patent Number:	65	57540		
Patent Number:	650	61166		
Patent Number:	65	71157		
Patent Number:	658	31565		
Patent Number:	658	31574		
Patent Number:	658	38260		
Patent Number:	659	98581		
Patent Number:	660	07302		
Patent Number:	660	09497		
Patent Number:	66	12287		
Patent Number:	66	19106		
Patent Number:	664	14115		
Patent Number:	673	36122		
Patent Number:	674	11441		
Patent Number:	675	52741		

Property Type	Number	
Patent Number:	6757149	
Patent Number:	6758885	
Patent Number:	6763804	
Patent Number:	6766788	
Patent Number:	6817592	
Patent Number:	6847882	
Patent Number:	6856209	
Patent Number:	6874362	
Patent Number:	6976477	
Patent Number:	6988031	
Patent Number:	7089894	
Patent Number:	7116081	
Patent Number:	7124963	
Patent Number:	7137577	
Patent Number:	7143501	
Patent Number:	7168637	
Patent Number:	7191755	
Patent Number:	7198207	
Patent Number:	7293554	
Patent Number:	7487761	
Patent Number:	7712451	
Patent Number:	7982358	
Faterit Number.	7902000	
CORRESPONDENCE DATA		
Fax Number:	(302)449-9010	
	nt to the e-mail address first; if that i	s unsuccessful, it will be se
	ided; if that is unsuccessful, it will b	
Phone:	3024499010	
Email:	mmcclain@devlinlawfirm.com	
Correspondent Name:	TIMOTHY DEVLIN	
Address Line 1:	1306 N. BROOM STREET	
Address Line 2:	1ST FLOOR	
Address Line 4:	WILMINGTON, DELAWARE 1980	6
NAME OF SUBMITTER:	TIMOTHY DEVLIN	
SIGNATURE:	/TIMOTHY DEVLIN/	

# NAME OF SUBMITTER: TIMOTHY DEVLIN SIGNATURE: /TIMOTHY DEVLIN/ DATE SIGNED: 08/31/2017 This document serves as an Oath/Declaration (37 CFR 1.63). Total Attachments: 2

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#### EXHIBIT B

## U.S. PATENT ASSIGNMENT

WHEREAS, Mobile Automotive Technologies, LLC, an Alabama limited liability company ("Assignor"), is the owner of (i) United States Patent and Patent Applications listed in Schedule A and the following (ii) through (iv) to the extent Assignor owns, controls or has the right to license or enforce them at any time: (ii) any patents or patent applications that claim priority directly or indirectly from any of the foregoing patent(s) in subsection (i), or from which priority is directly or indirectly claimed by any such patent(s) in subsection (i), or that have common priority with any such patent(s) in subsection (i); (iii) any foreign counterparts, foreign related patents, continuations, divisionals, continuations-in-part, extensions, substitutions, reissues, renewals and all results of oppositions, reexaminations, supplemental examinations, requests for continued examination and other review procedures of any of the foregoing in subsections (i) and (ii); and (iv) all patents issuing on patent applications covered by any of the foregoing subsections (i) through (iii) (together the "Assigned Patents").

WHEREAS, Michigan Motor Technologies LLC ("Assignee") is desirous of acquiring title in and to the Assigned Patents.

WHEREAS, Assignor is the owner of any and all right, title, and interest in and to the Assigned Patents.

WHEREAS, Assignor desires to sell, assign, and transfer all its right, title, and interest in the Assigned Patents to Assignee, and Assignee desires to obtain all such right, title, and interest in the Assigned Patents from Assignor.

NOW, THEREFORE, in consideration of good and valuable consideration, the receipt and adequacy of which is hereby acknowledged, Assignor hereby sells, assigns, transfers and conveys unto Assignee, its permitted successors and assigns, all of Assignor's right, title, and interest in and to the Assigned Patents, together with all claims, demands, or causes of action that Assignor has or might have by reason of any infringement of the Assigned Patents prior to the effective date of this assignment, including the right to sue and collect damages for all past, present and future infringement and all lost profits resulting therefrom.

IN WITNESS WHEREOF, this Agreement has been executed by duly authorized representatives of the Parties on the dates below.

Signature Nam Date:

KEUIN C BRADY Name MKHIGAN MUTOR TECH Date:

## SCHEDULE A

Patents:

US6345604 US6347680 US6379281 US6443128 US6510839 US6557540 US6561166 US6571157 US6581565 US6581574 US6588260 US6598581 US6607302 US6609497 US6612287 US6619106 US6644115 US6736122 US6741441 US6752741 US6757149 US6758885 US6763804 US6766788 US6817592 US6847882 US6856209 US6874362 US6976477 US6988031 -US7089894 US7116081 US7124963 US7137577 US7143501 US7168637 US7191755 US7198207 US7293554 US7487761 US7712451 US7982358 DE103 44 494.7-34 GB2385013 GB2422688 JP4235485 DE103 22 529.3

## 504528590 08/31/2017

# PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1 Stylesheet Version v1.2 EPAS ID: PAT4575296

SUBMISSION TYPE:		NEW ASSIGNMENT	
ATURE OF CONVEY	ANCE:	ASSIGNMENT	
CONVEYING PARTY	DATA		
		Name	Execution Date
GODO KAISHA IP BI	RIDGE		11/02/2016
RECEIVING PARTY	DATA		
Name:	MOBILE	AUTOMOTIVE TECHNOLOGIES, LI	LC
Street Address:	951 GOV	ERNMENT STREET, SUITE B	
City:	MOBILE		
State/Country:	ALABAMA	Ą	
Postal Code:	36604		
PROPERTY NUMBE	RS Total: 42		
Property Typ	pe 🛛	Number	
Patent Number:	63	45604	
Patent Number:	63	47680	_
Patent Number:	63	79281	_
Patent Number:	64	43128	
Patent Number:	65	10839	
Patent Number:	65	57540	
Patent Number:	65	61166	
Patent Number:	65	71157	
Patent Number:	65	81565	
Patent Number:	65	81574	
Patent Number:	65	88260	
Patent Number:	65	98581	
Patent Number:	66	07302	
Patent Number:	66	09497	
Patent Number:	66	12287	
Patent Number:	66	19106	
Patent Number:	66	44115	
Patent Number:	67	36122	
Patent Number:	67	41441	
	100 m - 1	52741	

Property Type	Number	
Patent Number:	6757149	
Patent Number:	6758885	
Patent Number:	6763804	
Patent Number:	6766788	
Patent Number:	6817592	
Patent Number:	6847882	
Patent Number:	6856209	
Patent Number:	6874362	
Patent Number:	6976477	
Patent Number:	6988031	
Patent Number:	7089894	
Patent Number:	7116081	
Patent Number:	7124963	
Patent Number:	7137577	
Patent Number:	7143501	
Patent Number:	7168637	
Patent Number:	7191755	
Patent Number:	7198207	
Patent Number:	7293554	
Patent Number:	7487761	
Patent Number:	7712451	
Patent Number:	7982358	
CORRESPONDENCE DATA	N.	
Fax Number:	(302)449-9010	
	nt to the e-mail address first; if that is	unsuccessful, it will be se
	vided; if that is unsuccessful, it will be	sent via US Mail.
Phone:	3024499010 3024499010	
Email:	mmcclain@devlinlawfirm.com	
Correspondent Name:		
Address Line 1:	1306 N. BROOM STREET	
Address Line 2:	1ST FLOOR	
Address Line 4:	WILMINGTON, DELAWARE 19806	

NAME OF SUBMITTER:	TIMOTHY DEVLIN
SIGNATURE:	/TIMOTHY DEVLIN/
DATE SIGNED:	08/31/2017
	This document serves as an Oath/Declaration (37 CFR 1.63).
Total Attachments: 3	

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# PATENT ASSIGNMENT COVER SHEET

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SUBMISSION TYPE:		NEW ASSIGNMENT	
IATURE OF CONVEY	ANCE:	ASSIGNMENT	
CONVEYING PARTY	DATA		
		Name	Execution Date
GODO KAISHA IP BF	RIDGE		09/02/2016
RECEIVING PARTY	DATA		
Name:	MOBILE	AUTOMOTIVE TECHNOLOGIES, LI	LC
Street Address:	951 GOV	ERNMENT STREET, SUITE B	
City:	MOBILE		
State/Country:	ALABAMA	4	
Postal Code:	36604		
PROPERTY NUMBE	RS Total: 42		
Property Typ	be	Number	
Patent Number:	63	45604	
Patent Number:	63	47680	
Patent Number:	63	79281	-
Patent Number:	64	43128	-
Patent Number:	65	10839	
Patent Number:	65	57540	
Patent Number:	65	61166	
Patent Number:	65	71157	_
Patent Number:	65	81565	
Patent Number:	65	81574	
Patent Number:	65	88260	
Patent Number:	65	98581	
Patent Number:	66	07302	
Patent Number:	66	09497	
Patent Number:	66	12287	1
Patent Number:	66	19106	
Patent Number:	66	44115	
Patent Number:	67	36122	
Patent Number:	67	41441	
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Property Type	Number	
Patent Number:	6757149	
Patent Number:	6758885	
Patent Number:	6763804	
Patent Number:	6766788	
Patent Number:	6817592	
Patent Number:	6847882	
Patent Number:	6856209	
Patent Number:	6874362	
Patent Number:	6976477	
Patent Number:	6988031	
Patent Number:	7089894	
Patent Number:	7116081	
Patent Number:	7124963	
Patent Number:	7137577	
Patent Number:	7143501	
Patent Number:	7168637	_
Patent Number:	7191755	
Patent Number:	7198207	
Patent Number:	7293554	
Patent Number:	7487761	
Patent Number:	7712451	
Patent Number:	7982358	
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CORRESPONDENCE DATA	A	
Fax Number:	(302)449-9010	
	nt to the e-mail address first; if that is rided; if that is unsuccessful, it will be	
Phone:	3024499010	Sent via 05 man.
Email:	mmcclain@devlinlawfirm.com	
Correspondent Name:	TIMOTHY DEVLIN	
Address Line 1:	1306 N. BROOM STREET	
Address Line 1:	1ST FLOOR	
Address Line 2.		

NAME OF SUBMITTER:	TIMOTHY DEVLIN
SIGNATURE:	/TIMOTHY DEVLIN/
DATE SIGNED: 08/31/2017	
	This document serves as an Oath/Declaration (37 CFR 1.63).
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## **Total Attachments: 3**

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### EXHIBIT B

## U.S. PATENT ASSIGNMENT

WHEREAS, Godo Kaisha IP Bridge 1 ("Assignor"), is the owner of (i) United States Patent and Patent Applications listed in Schedule A and the following (ii) through (iv) to the extent Assignor owns, controls or has the right to license or enforce them at any time: (ii) any patents or patent applications that claim priority directly or indirectly from any of the foregoing patent(s) in subsection (i), or from which priority is directly or indirectly clauned by any such patent(s) in subsection (i), or from which priority is directly or indirectly clauned by any such patent(s) in subsection (i), or that have common priority with any such patent(s) in subsection (i); (ii) any foreign counterparts, foreign related patents, continuations, divisionals, continuationsin-part, extensions, subplemental examinations, requests for continued examination and other review procedures of any of the foregoing in subsections (i) and (ii); and (iv) all patents issuing on patent applications covered by any of the foregoing subsections (i) through (iii) (together the "Assigned Patents").

WHEREAS, Mobile Automotive Technologies, LLC, an Alabama limited liability company ("Assignee") is desirous of acquiring title in and to the Assigned Patents.

WHEREAS, Assignor is the owner of any and all right, title, and interest in and to the Assigned Patents.

WHEREAS, Assignor desires to sell, assign, and transfer all its right, title, and interest in the Assigned Patents to Assignee, and Assignee desires to obtain all such right, title, and interest in the Assigned Patents from Assignor.

NOW. THEREFORE, in consideration of good and valuable consideration, the receipt and adequacy of which is hereby acknowledged. Assignor hereby sells, assigns, transfers and conveys unto Assignee, its permitted successors and assigns, all of Assignor's right, title, and interest in and to the Assigned Patents, together with all claims, demands, or causes of action that Assignor has or might have by reason of any infringement of the Assigned Patents prior to the effective date of this assignment, including the right to sue and collect damages for all past, present and future infringement and all lost profits resulting therefrom.

IN WITNESS WHEREOF, this Agreement has been executed by duly authorized representatives of the Parties on the dates below.

Signature

Hideyaki Ogata Name

Date: Sept. 2. 2016

Dale: AUG 27,2016

#### SCHEDULE A

Patents:

US6345604 US6347680 US6379281 US6443128 US6510839 US6557540 US6561166 US6571157 US6581565 US6581574 US6588260 US6598581 US6607302 US6609497 US6612287 US6619106 US6644115 US6736122 US6741441 US6752741 US6757149 US6758885 US6763804 US6766788 US6817592 US6847882 US6856209 US6874362 US6976477 US6988031 US7089894 US7116081 US7124963 US7137577 US7143501 US7168637 US7191755 US7198207

US7293554 US7487761 US7712451 US7982358

DE103 44 494.7-34 GB2385013 GB2422688 JP4235485

## 504584165 10/06/2017

# PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1 Stylesheet Version v1.2 EPAS ID: PAT4630877

SUBMISSION TYPE:	RESUBMISSION	
NATURE OF CONVEYANCE:	ASSIGNMENT	
RESUBMIT DOCUMENT ID:	504528590	
RESOBMIT DOCOMENTID.	001020000	
CONVEYING PARTY DATA	Name	Execution Date

## **RECEIVING PARTY DATA**

Name:	MOBILE AUTOMOTIVE TECHNOLOGIES, LLC
Street Address:	951 GOVERNMENT STREET, SUITE B
City:	MOBILE
State/Country:	ALABAMA
Postal Code:	36604

## **PROPERTY NUMBERS Total: 42**

Property Type	Number	
Patent Number:	6345604	
Patent Number:	6347680	
Patent Number:	6379281	
Patent Number:	6443128	
Patent Number:	6510839	
Patent Number:	6557540	
Patent Number:	6561166	
Patent Number:	6571157	
Patent Number:	6581565	
Patent Number:	6581574	
Patent Number:	6588260	
Patent Number:	6598581	
Patent Number:	6607302	
Patent Number:	6609497	
Patent Number:	6612287	
Patent Number:	6619106	
Patent Number:	6644115	
Patent Number:	6736122	
Patent Number:	6741441	

Property Type	Number	
Patent Number:	6752741	
Patent Number:	6757149	
Patent Number:	6758885	
Patent Number:	6763804	
Patent Number:	6766788	
Patent Number:	6817592	
Patent Number:	6847882	
Patent Number:	6856209	
Patent Number:	6874362	
Patent Number:	6976477	
Patent Number:	6988031	
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Patent Number:	7191755	
Patent Number:	7198207	
Patent Number:	7293554	
Patent Number:	7487761	
Patent Number:	7712451	
Patent Number:	7982358	
	(302)449-9010 <b>nt to the e-mail address first; if th</b> <b>ided; if that is unsuccessful, it w</b> 3024499010 mmcclain@devlinlawfirm.com TIMOTHY DEVLIN	
Address Line 1:	1306 N. BROOM STREET	
Address Line 2:	1ST FLOOR	
Address Line 4:	WILMINGTON, DELAWARE 1	9806
NAME OF SUBMITTER:	TIMOTHY DEVLIN	
	/Timothy Doylin/	

NAME OF SUBMITTER:	TIMOTHY DEVLIN
SIGNATURE:	/Timothy Devlin/
DATE SIGNED:	10/06/2017
	This document serves as an Oath/Declaration (37 CFR 1.63).
Total Attachments: 6	

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#### AMENDMENT NO. 1 TO THE PATENT ASSIGNMENT AGREEMENT

This Amendment No. 1 (the "Amendment"), dated as of the latest execution date below, is entered into by Mobile Automotive Technologies, LLC, an Alabama limited liability company and Godo Kaisha IP Bridge 1, with its principal offices at c/o Sakura Sogo Jimusho, 1-11 Kanda Jimbocho, Chiyoda-ku, Tokyo 102-0083, Japan, and amends the Patent Assignment Agreement entered into by the parties, executed on September 2, 2016 (the "PTA"). Capitalized terms not defined herein are defined in the PTA.

The parties agree to retroactively amend the PTA as follows:

1. Exhibit A to the PTA is hereby retroactively amended and restated in its entirety in the form of Exhibit A attached hereto.

2. The parties intend and agree that this Amendment shall be effective as of the Effective Date of the PTA with the same force and effect as if executed on that date. Except as expressly amended by this Amendment, all other terms, conditions and provisions of the PTA shall apply.

IN WITNESS WHEREOF, the parties have executed this Amendment through their duly authorized representatives.

Mobile Automotive Technologies, LLC

Name: Kevin C. Brady

Title: Managing Member

10-21-2016 Date:

7

Godo Kaisha IP Bridge 1

a a su de la company de la

Name: Hideyuki Ogata

Title: Executive Manager

Date: 11-2-2016

## EXHIBIT A

Patents:

1 US6345604

- 2 US6347680
- 3 US6379281
- 4 US6443128
- 5 US6510839
- 6 US6557540
- 7 US6561166
- 8 US6571157
- 9 US6581565
- 10 US6581574
- 11 US6588260
- 12 US6598581
- 13 US6607302
- 14 US6609497
- 15 US6612287
- 16 US6619106
- 17 US6644115
- 18 US6736122
- 19 US6741441 20 US6752741
- 21 US6757149
- 22 US6758885
- 23 US6763804
- 24 US6766788
- 25 US6817592
- 26 US6847882
- 27 US6856209
- 28 US6874362
- 29 US6976477
- 30 US6988031
- 31 US7089894
- 32 US7116081
- 33 US7124963
- 34 US7137577
- 35 US7143501
- 36 US7168637

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- 38 US7198207
- 39 US7293554
- 40 US7487761
- 41 US7712451
- 42 US7982358
- 43 DE103 44 494.7-34
- 44 GB2385013
- 45 GB2422688
- 46 JP4235485

47 DE103 22 529.3

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### EXHIBIT B

## U.S. PATENT ASSIGNMENT

WHEREAS, Godo Kaisha IP Bridge 1 ("Assignor"), is the owner of (i) United States Patent and Patent Applications listed in Schedule A and the following (ii) through (iv) to the extent Assignor owns, controls or has the right to license or enforce them at any time: (ii) any patents or patent applications that claim priority directly or indirectly from any of the foregoing patent(s) in subsection (i), or from which priority is directly or indirectly clauned by any such patent(s) in subsection (i), or from which priority is directly or indirectly clauned by any such patent(s) in subsection (i), or that have common priority with any such patent(s) in subsection (i); (ii) any foreign counterparts, foreign related patents, continuations, divisionals, continuationsin-part, extensions, subplemental examinations, requests for continued examination and other review procedures of any of the foregoing in subsections (i) and (ii); and (iv) all patents issuing on patent applications covered by any of the foregoing subsections (i) through (iii) (together the "Assigned Patents").

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WHEREAS, Assignor desires to sell, assign, and transfer all its right, title, and interest in the Assigned Patents to Assignee, and Assignee desires to obtain all such right, title, and interest in the Assigned Patents from Assignor.

NOW. THEREFORE, in consideration of good and valuable consideration, the receipt and adequacy of which is hereby acknowledged. Assignor hereby sells, assigns, transfers and conveys unto Assignee, its permitted successors and assigns, all of Assignor's right, title, and interest in and to the Assigned Patents, together with all claims, demands, or causes of action that Assignor has or might have by reason of any infringement of the Assigned Patents prior to the effective date of this assignment, including the right to sue and collect damages for all past, present and future infringement and all lost profits resulting therefrom.

IN WITNESS WHEREOF, this Agreement has been executed by duly authorized representatives of the Parties on the dates below.

Signature

Hideyaki Ogata Name

Date: Sept. 2. 2016

Dale: AUG 27,2016

#### SCHEDULE A

Patents:

US6345604 US6347680 US6379281 US6443128 US6510839 US6557540 US6561166 US6571157 US6581565 US6581574 US6588260 US6598581 US6607302 US6609497 US6612287 US6619106 US6644115 US6736122 US6741441 US6752741 US6757149 US6758885 US6763804 US6766788 US6817592 US6847882 US6856209 US6874362 US6976477 US6988031 US7089894 US7116081 US7124963 US7137577 US7143501 US7168637 US7191755 US7198207
US7293554 US7487761 US7712451 US7982358

DE103 44 494.7-34 GB2385013 GB2422688 JP4235485

		CLAIMS AS	Griled -	1000000	(Colu	mn 2)				OR	OTHER	
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-	1546	(internal adj combustion adj engine) and ((electic or electrical) adj2 motor)	IBM_TDB USPAT; US-PGPUB; EPO; JPO;	2003/04/14 11:00
	1253	((internal adj combustion adj engine) and ((electic or electrical) adj2 motor)) and (control controller ECU PCM )	DERWENT; IBM_TDB USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/04/14 11:02
-	17	(((internal adj combustion adj engine) and ((electic or electrical) adj2 motor)) and (control controller ECU PCM )) and (exceed\$4 with ((time adj period) or	IBM_TDB USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/04/14 11:06
	0	<pre>duration)) (((internal adj combustion adj engine) and ((electic or electrical) adj2 motor)) and (exceed\$4 with ((time adj period) or duration))) not ((((internal adj combustion adj engine) and ((electic or electrical) adj2 motor)) and (exceed\$4 with</pre>	IBM_TDB USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/04/14 11:07
	201	<pre>(exceed\$4 with ((time adj period) or duration))) not ((((internal adj combustion adj engine) and ((electic or electrical) adj2 motor)) and (control controller ECU PCM )) and (exceed\$4 with</pre>	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/04/14 11:09
	120	<pre>((time adj period) or duration))) (position adj sensor) and ((internal adj combustion adj engine) and ((electic or electrical) adj2 motor))</pre>	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/04/14 11:13
	52409	(time or period) with (greater exceed\$3) with (threshold limit maximum)	IBM_TDB USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2003/04/14 11:44
	120	((position adj sensor) and ((internal adj combustion adj engine) and ((electic or electrical) adj2 motor))) and ((electic or electrical) adj2 motor)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2003/04/14 11:46
	0	(((position adj sensor) and ((internal adj combustion adj engine) and ((electic or electrical) adj2 motor))) and ((electic or electrical) adj2 motor)) not ((position adj sensor) and ((internal adj combustion adj engine) and ((electic or electrical)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/04/14 11:45
	48	<pre>adj engine) and ((electic or electrical) adj2 motor))) ((time or period) with (greater exceed\$3) with (threshold limit maximum)) and ((internal adj combustion adj engine) and ((electic or electrical) adj2 motor))</pre>	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/04/14 11:55
-	23	overheat adj protection adj system	IBM_TDB USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2003/04/14 12:10

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-	10	("4399781"   "4924112"   "5431620"   "5509881"   "5838133"   "5838578"   "5872441"   "5936820"   "6014003"	IBM_TDB USPAT	2003/04/14 12:04
		"6100660"   "2001/0010453").PN.		
	4	("5070426"   "5430636"   "5483167"   "5936820").PN.	USPAT	2003/04/14 12:09
-	150	overheat same throttle	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM TDB	2003/04/14 12:10
_	66	overheat with throttle	USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/04/17 07:43
<u>-</u>	1	("6539918").PN.	IBM_TDB USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/04/14 12:13
	2	("5947086"   "5992383").PN.	IBM_TDB USPAT	2003/04/14 12:13
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_	9	5992383.URPN.	USPAT	2003/04/14 12:14
-	164		USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/04/17 07:35
-	15	protect\$5.ab. and (((318/566) or (318/635)).CCLS.)	IBM_TDB USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/04/17 07:35
-	2	overheat and (((318/566) or (318/635)).CCLS.)	IBM_TDB USPAT; US-PGPUB; EPO; JPO; DERWENT;	2003/04/17 07:44
-	37	prevent\$3.ab. and (((318/566) or (318/635)).CCLS.)	IBM_TDB USPAT; US-PGPUB; EPO; JPO;	2003/04/17 07:44
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SEARCHED SEARCH NOTES (INCLUDING SEARCH STRATEGY) Class Sub. Date Exmr. Date Exmr. 318 4-15-03 563 AC 4-14-03 K EAST 565 k 318 4-13-03 4-15-03 K 626 318 4-15-3 te 396 123 397 123 4-15-03 to 399 123 339,15 4-15-03 4 123 339.16 4-15-03 42 123 368,24 4-15-03 AC 123 251 129.11 4-15-03 de 129,12 4-15.03 DC 251 129,13 4-15-03 DC 251 566 4-17.03 le 318 635 4-17-03 K 318 updated 9-4-03 te 2-6-04 be uppeta **INTERFERENCE SEARCHED** Class Sub. Date Exmr. 313 563,565 9-4-03 -be 6261635 318 318 566 396,397 123 399/39/11 \$39,16, 123 5682.1 123 251 129.11 -1 129.13 9-4-03 251 se (RIGHT OUTSIDE)



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# (12) United States Patent Pursifull

## (54) ELECTRONIC THROTTLE SERVO OVERHEAT PROTECTION SYSTEM

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- (73) Assignee: Visteon Global Technologies, Inc., Dearborn, MI (US)
- (\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 100 days.

This patent is subject to a terminal disclaimer.

- (21) Appl. No.: 09/973,030
- (22) Filed: Oct. 9, 2001

#### (65) Prior Publication Data

US 2003/0066513 A1 Apr. 10, 2003

- (51) Int. Cl.<sup>7</sup> ..... F02D 41/08
- (52) U.S. Cl. ..... 123/396; 123/399; 318/635
- 339.15, 339.16, 568.24; 251/129.11, 129.12, 129.13

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Primary Examiner—Mahmoud Gimie Assistant Examiner—Arnold Castro (74) Attorney, Agent, or Firm—John E. Kajander

# (57) ABSTRACT

A method for controlling a positioning device (34) of an internal combustion engine includes the step of providing an electric motor (30) for actuating a positioning device (34). A user employs an actuator (21) to command the throttle plate (34) to change to a commanded position. A motor effort sensor (38) then detects a control effort required by the motor (30) to change to the commanded position. A throttle control unit (28) determines whether the control effort exceeds a threshold for a predetermined time period. If the control effort exceeds the threshold for the predetermined time period, the throttle control unit (28) actuates the motor (30) to reduce the control effort.

# 20 Claims, 2 Drawing Sheets





FIG.1



## ELECTRONIC THROTTLE SERVO OVERHEAT PROTECTION SYSTEM

#### TECHNICAL FIELD

The present invention relates generally to control systems for internal combustion engines, and more particularly, to an electronic throttle servo temperature protection system.

#### BACKGROUND ART

Many previously known motor vehicle throttle controls have a direct physical linkage between an accelerator pedal and the throttle body so that the throttle plate is pulled open by the accelerator cable as the driver presses the pedal. The direct mechanical linkage includes biasing that defaults the linkage to a reduced operating position, in a manner consistent with regulations. Nevertheless, such mechanisms are often simple and unable to adapt fuel efficiency to changing traveling conditions, and add significant weight and components to the motor vehicle.

An alternative control for improving throttle control and the precise introduction of fuel air mixtures into the engine cylinders is accomplished by electronic throttle control. The electronic throttle control includes a throttle control unit that <sup>25</sup> positions the throttle plate by an actuator controlled by a microprocessor based on the current operating state determined by sensors. The processors are often included as part of a powertrain electronic control that can adjust the fuel air intake and ignition in response to changing conditions of <sup>30</sup> vehicle operation as well as operator control. Protection may be provided so that an electronic system does not misread or misdirect the control and so that unintended operation is avoided when portions of the electronic control suffer a failure. <sup>35</sup>

Typically, the actuator or servomotor used to position the throttle plate is designed to have the maximum control effort available (motor voltage, current, duty cycle) to enhance throttle plate position response. Having a large control effort continuously available or available for maximum effort could possibly lead to overstressing the system's physical components if a blockage of the throttle plate occurs or the mechanism encounters a mechanical limit. For example, a mechanical limit may be an open stop or a close stop. Specifically, the H-driver and the servomotor could overheat with sustained full control effort under some environmental conditions. In an effort to avoid permanent damage, some electronic systems shut down when they get to a threshold temperature.

The disadvantages associated with these conventional electronic throttle overheat protection techniques have made it apparent that a new technique for electronic throttle overheat protection is needed. The new technique should allow full control effort while preventing overheat conditions. The present invention is directed to these ends.

# SUMMARY OF THE INVENTION

It is, therefore, an object of the invention to provide an actu improved and reliable electronic throttle servo temperature 60 ing. protection system. Another object of the invention is to allow full control effort while preventing overheat conditions.

In accordance with the above and other objects of the present invention, an electronic throttle servo overheat protection system is provided. In one embodiment of the invention, a method for controlling a positioning device 2

associated with internal combustion engine control is provided. In accordance with the method, an electric motor actuates the positioning device. The positioning device is then commanded to change to a commanded position. The control effort required to change to the commanded position is detected. It is then determined whether the control effort exceeds a threshold for a predetermined time period. When the control effort exceeds the threshold for the predetermined time period, the control effort is reduced.

The present invention thus achieves an improved electronic throttle servo overheat protection system. The present invention is advantageous in that it will not cause mechanism failure or require significant and costly added robustness to the mechanism.

Additional advantages and features of the present invention will become apparent from the description that follows, and may be realized by means of the instrumentalities and combinations particularly pointed out in the appended claims, taken in conjunction with the accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention may be well understood, there will now be described some embodiments thereof, given by way of example, reference being made to the accompanying drawings, in which:

FIG. 1 is a block diagram of an electronic throttle servo overheat protection system in accordance with one embodiment of the present invention; and

FIG. 2 is a flow chart depicting a method of providing electronic throttle servo overheat protection in accordance with one embodiment of the present invention.

#### BEST MODES FOR CARRYING OUT THE INVENTION

The present invention is illustrated herein with respect to an electronic throttle servo overheat protection system, <sub>40</sub> particularly suited for the automotive field. However, the present invention is applicable to various other uses that may require electronic throttle servo overheat protection systems.

Referring to FIG. 1, a motor vehicle powertrain system 10 including electronic throttle control system 12 includes an electronic control unit 14. In the preferred embodiment, the electronic control unit 14 includes a powertrain control module (PCM) 16, including a main processor and an electronic throttle monitor (ETM) 18, including an independent processor. The PCM and ETM each share sensors 19 and actuators that are associated with the powertrain system 17 and control module 16. Preferably, the electronic throttle monitor 18 includes a processor physically located within the powertrain control module housing, although a separate housing, separate locations and other embodiments can also be employed in practicing the invention. Moreover, while the electronic throttle monitor 18 and the powertrain control module 16 have independent processors, they preferably share the inputs and outputs of powertrain sensors 19 and actuators 21 and 34, respectively, for independent process-

A wide variety of inputs are represented in the diagram of FIG. 1 by the diagrammatic representation of redundant pedal position sensors 20. The sensors 20 are coupled through inputs 22 and are representative of many different driver controls that may demonstrate the demand for power. In addition, the electronic control unit 14 includes inputs 26a and 26b for detecting throttle position. A variety of ways for

providing such indications are diagrammatically represented in FIG. 1 by a first throttle position sensor 24*a* and a redundant second throttle position sensor 24*b* to obtain a power output indication. As a result of the many inputs represented at 19, 22, 26*a* and 26*b*, the electronic controller 14 provides outputs for limiting output power so that the output power does not exceed the power demand. A variety of outputs are also diagrammatically represented in FIG. 1 by the illustrated example of inputs to a throttle control unit 28 that in turn powers an actuator and motor interface 30 for displacing the throttle plate 34. For example, an actuator and interface may comprise redundant drive motors powering a gear interface to change the angle of the throttle plate 34 in the throttle body 36.

Likewise, the responsive equipment, such as a motor, may also provide feedback. For example, the motor effort sensor 15 **38** or the throttle position sensors 24a and 24b may provide feedback to the throttle control unit **28**, as shown at **37**, 27a and 27b, respectively, to determine whether alternative responses are required or to maintain information for service or repair. 20

Referring to FIG. 2, a flow chart depicting a method of providing electronic throttle servo overheat protection in accordance with one embodiment of the present invention is illustrated. In operation, the preferred method of the present invention is initiated at step 40 and immediately proceeds to <sup>25</sup> step 42. In step 42, the controller preferably determined if the control effort has been more positive than a predetermined limit for at least a predetermined time period. Typically, an effort limit of approximately +6 volts and a contiguous time interval of about 300 milliseconds are used. Obviously, these <sup>30</sup> values may vary as required. If the predetermined threshold has been exceeded, then the sequence proceeds to step 44.

A hold open mode is initiated at step 44 and the immediately continued in step 46. In step 46, the controller preferably determines if it has called for the hold open mode for less than a hard open time period. A person skilled in the art understands that the hard open time period may depend upon the voltage applied to the motor. For example, a given servo motor would not overheat under the following conditions: 40

	Duration (seconds)	Positioning Effort (volts)
4	10	18
	12	16
	18	14
	18 32 62 82	12
	62	10
	82	9
5	128	8
	219	7
	445	6
	indefinite	5

These operating conditions may keep a motor at less than a 55 threshold temperature to prevent overheating. For example, a threshold temperature may be 220 degrees Celsius.

If the throttle plate has been in a hold open mode for less than the hard open time period, then the sequence proceeds to step **48**. In step **48**, the controller preferably applies a 60 maximum opening control effort to the motor. In the hold open mode, a typical maximum opening control effort has a magnitude of +14.5 volts. Obviously, the magnitude of the effort may vary as required. Then, the sequence returns to step **46**. If the throttle plate has been in the hold open mode 65 for longer than the hard open time period, then the sequence proceeds to step **50**.

In step 50, the controller preferably reduces the opening control effort applied to the motor to a moderate opening control effort. The moderate opening control effort can be applied to the motor for an indefinite period of time without permitting the motor to overheat. Typically, the moderate opening effort has a magnitude of approximately +5 volts. Then, the sequence returns to step 42.

Thus, the following sequence typically occurs when the controller is in the hold open mode. First, the system detects that it should go into the hold open mode. Then, full voltage is applied to clear or crush any small debris obstructing movement of the throttle plate. The voltage is reduced to approximately +5 volts to prevent the motor from overheating.

15 If in step 42 the effort has not been more positive, then the sequence proceeds to step 52. In step 52, the controller preferably determines if the control effort has been more negative than a predetermined limit for at least a predetermined time period. Typically, an effort limit of approxi-20 mately -6 volts and a contiguous time interval of about 300 milliseconds are used. If the predetermined threshold has been exceeded, then the sequence proceeds to step 54.

A hold close mode is initiated in step 54 and then immediately continued in step 56. In step 56, the controller preferably determines whether it has called for a hold close mode for less than a hard close time period. A typical time period is approximately 30 milliseconds. If the throttle plate has been in the hold close mode for less than the hard close time period, then the sequence proceeds to step 58.

In step 58, the controller applies a maximum closing control effort to the motor. In the hold close mode, a typical maximum closing control effort has a magnitude of -14.5 volts. Then, the sequence returns to step 56. If the throttle plate has been in the hold close mode for longer than the hard close time period, then the sequence proceeds to step 60.

In step **60**, the controller reduces the closing control effort applied to the motor to a moderate closing control effort. The moderate closing control effort can be applied to the motor 40 for an indefinite period of time without permitting the motor to overheat. Typically, a moderate control effort of approximately –5 volts is applied to the motor. Then, the sequence returns to step **52**.

Thus, the following sequence typically occurs when the controller is in the hold close mode. First, full voltage is applied to clear or crush any small debris obstructing throttle plate movement. Then, approximately –5 volts is applied to hold the plate against the close stop for a period of time determined by the method of the present invention. A voltage approximately equal to –5 volts typically prevents the motor from overheating. Then the sequence returns to step **52**.

If in step 52 the effort has not been more negative than a predetermined limit for a given time period, then the sequence proceeds to step 62. In step 62, the controller initiates a control normal mode. Subsequently, the sequence immediately proceeds to step 64 in which the controller controls the throttle plate normally. The sequence then returns to step 42.

The present invention thus achieves an improved and reliable electronic throttle servo overheat protection system by monitoring when the closing or opening control effort exceeds a threshold for a given amount of time. In this way, the present invention allows full control effort while preventing overheat conditions. Additionally, the present invention does not cause mechanism failure or require significant and costly added robustness to the mechanism. From the foregoing, it can be seen that there has been brought to the art a new and improved electronic throttle servo overheat protection system. It is to be understood that the preceding description of the preferred embodiment is merely illustrative of some of the many specific embodi-5 ments that represent applications of the principles of the present invention. Clearly, numerous and other arrangements would be evident to those skilled in the art without departing from the scope of the invention as defined by the following claims. 10

What is claimed is:

1. A method for controlling a positioning device of an internal combustion engine, the method comprising the steps of:

- providing an electric motor for actuating the positioning <sup>15</sup> device;
- commanding the positioning device to change to a commanded position;
- detecting a control effort required to change to said 20 commanded position;
- determining whether said control effort exceeds a threshold for a predetermined time period; and
- reducing said control effort when said control effort exceeds said threshold for said predetermined time 25 period;
- wherein commanding the positioning device to change to said commanded position comprises at least one of commanding the positioning device to open to a hold open mode and commanding the positioning device to <sup>30</sup> dose to a hold close mode.

2. The method as recited in claim 1, wherein said threshold has an absolute value of 6 volts.

- 3. The method as recited in claim 1, wherein said predetermined time period is 300 milliseconds. 35
- 4. The method as recited in claim 1, further comprising the step of applying a maximum control effort to the positioning device for a hard open time period.
- 5. The method as recited in claim 4, wherein said maximum control effort is +14.5 volts.
- 6. The method as recited in claim 4, wherein said hard open time period is 30 milliseconds.
- 7. The method as recited in claim 1, wherein the step of commanding the positioning device to change to said commanded position, comprises commanding the positioning <sup>45</sup> device to close to said commanded position in a hold close mode.
- 8. The method as recited in claim 7, further comprising the step of applying a maximum control effort to the positioning device for a hard dose time period.

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9. The method as recited in claim 8, wherein said maximum control effort is -14.5 volts.

10. The method as recited in claim 8, wherein said hard close time period is 30 milliseconds.

11. A system for controlling a positioning device of an internal combustion engine to prevent overheat conditions, the system comprising:

- an electric motor for actuating the positioning device with a control effort;
- a control effort detector coupled to said electric motor and intended to detect said control effort; and
- a controller coupled to said electric motor and said control effort detector, said controller including control logic operative to command the positioning device to change to a commanded position, detect a control effort required to change to said commanded position, determine whether said control effort exceeds a threshold for a predetermined time period, and reduce said control effort when said control effort exceeds said threshold for said predetermined time period;
- wherein said controller further includes control logic operative to command the positioning device to close to said commanded position in a hold close mode.

12. The system as recited in claim 11, wherein said threshold has an absolute value of 6 volts.

13. The system as recited in claim 11, wherein said predetermined time period is 300 milliseconds.

14. The system as recited in claim 11, wherein said controller further includes control logic operative to command the positioning device to open to said commanded position in a hold open mode.

15. The system as recited in claim 14, wherein said controller further includes control logic operative to apply a maximum control effort to the positioning device for said hard open time period.

16. The system as recited in claim 15, wherein said maximum control effort is +14.5 volts.

17. The system as recited in claim 15, wherein said hard open time period is 30 milliseconds.

18. The system as recited in claim 11, wherein said controller further includes control logic operative to command application of a maximum control effort to the positioning device for a hard close time period.

19. The system as recited in claim 18, wherein said maximum control effort is -14.5 volts.

**20**. The system as recited in claim **18**, wherein said hard close time period is 30 milliseconds.

\* \* \* \* \*