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Application Number	TO BE ASSIGNED
Filing Date	March 19, 2008
First Named Inventor	Randall J. Amerson
Attorney Docket Number	2008P05081 US
Title (Required)	Methods To Manage Power Of Wireless Multi-sensor Device

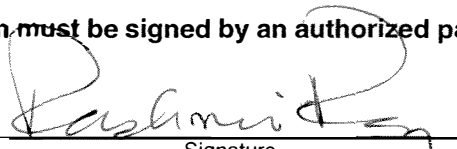
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Signature

March 19, 2008
Date

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Typed or printed name

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Telephone Number

Attorney for Applicant
Title

50.500
Registration Number, if applicable

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A. Abstract

Our proposed invention relates to several methods to manage the battery power needed to send sensed values from a battery-powered multi-sensor wireless device. The goal is to extend battery life.

In a typical multi-sensor wireless device, the device always sends all of the sensed values to the receiving device (i.e., field panel controller, application specific controller) regardless of whether or not all of the values are currently being used by the control application that resides in the receiving device. The disclosed method #1 and #2 propose that the receiving controller communicate to the wireless multi-sensor information about which sensed values are currently being used by the controller's software. With this information, the wireless multi-sensor can limit its battery-draining radio transmissions to only those containing the sensed values currently needed.

Method #3 proposes a method by which the receiving device can command the multi-sensor wireless device to the ON state, when it should transmit sensor values, or to the OFF state, when it should not transmit sensor values and save battery power.

B. Background Information

The battery-powered multi-wireless sensor device is composed of:

- multiple sensors (temperature, humidity, carbon dioxide, volatile organic compounds)
- microprocessor
- signal processing hardware and software
- radio transmitter and receiver hardware and software
- battery

A long life for the battery that powers the wireless multi-sensor is a desirable product feature. The part of the wireless multi-sensor that consumes the most power is the radio transmitter when it is transmitting a signal. Significant power draw can also come from some sensors (such as the CO₂ sensor) that need to be pre-heated to get an accurate measurement.

Traditionally, a wireless multi-sensor updates the values of all of its sensors every predefined number of milliseconds. Sensors that need to be pre-heated to get an accurate measurement (such as CO₂ sensors) have their circuitry energized at intervals determined by the heating time requirements. The wireless multi-sensor transmits a signal containing the values of all of its sensors in the one message. Transmission occurs whenever any of the sensors' values exceed their respective change-of-value (COV) threshold value. The receiving device (field panel controller or application specific controller) accepts all of the sensor values from the wireless multi-sensor. The application software in the receiving device (controller) may be such that only one sensed value at a time is actually controlling the output device. The other sensor values are ignored. An example is a cooling device capable of both cooling and dehumidifying the air. If the sensed humidity is very high, the cooling device will be controlled by the humidity sensor. Changes in the air temperature will have no effect on the cooling device. Therefore, the battery power to transmit air temperature values from a wireless multi-sensor device is wasted.

C. Details

1. Method #1 to disclose consists of a multi-sensor wireless device that:

- a. that continually senses the values of all of its sensors every predefined number of milliseconds
- b. compares each sensed value against each sensor's respective change-of-value (COV) threshold value
- c. receives information from the receiving device regarding which sensor is currently in control
- d. then only transmits changes of the sensed value(s) that are in control as refer to the above
- e. regardless of sensed value in control, still transmits all of its sensor values at a specified interval to indicate that its sensors are still operating and to provide the sensed values not in control to the receiving device so that it may make necessary switchover decisions concerning which sensor should be in control.

By sending only the sensed value that is in control, the following advantages are realized:

- conservation of the battery usage to energize the radio transmitter and send a sensor value, thus extending the life of the battery.
- reduction of message size that needs to be transmitted by the wireless network, because the wireless message will only contain the sensed value that is in control.
- network throughput can be especially increased if the wireless messages, which are reduced in size by this invention, have encryption or additional error-checking.
- Additional battery power can be conserved by not unnecessarily energizing those sensing elements that require heating or some other significant power draw.

2. Method #2 to disclose is a multi-sensor wireless device that:

- a. same as #1a above
- b. same as #1b above
- c. receives data from the receiving controller that can be processed by the multi-sensor wireless device's own processor in order to determine which sensed value is in control
- d. same as #1d above
- e. same as #1e above

3. Method #3 to disclose is a multi-sensor wireless device that receives an ON/OFF signal from the receiving device. Upon receiving an ON signal, the multi-sensor wireless device will implement a transmission method that may be method #1 or #2 above or some other method. Upon receiving an OFF signal, the multi-sensor wireless device will go into a "sleep" mode during which it will not transmit sensor value signals. It may or may not transmit short "I'm OK" signals during this "sleep" mode. By limiting its transmissions while in the "sleep mode," battery power is conserved.

Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		METHODS TO MANAGE POWER OF WIRELESS MULTI-SENSOR DEVICE		
First Named Inventor/Applicant Name:		Pornsak Songakul		
Filer:		Rashmi S. Raj/Ruth Rocky		
Attorney Docket Number:		2008P05081US		
Filed as Large Entity				
Provisional Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Provisional application filing	1005	1	210	210
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Total in USD (\$)				210

Electronic Acknowledgement Receipt

EFS ID:	3020700
Application Number:	61037739
International Application Number:	
Confirmation Number:	9798
Title of Invention:	METHODS TO MANAGE POWER OF WIRELESS MULTI-SENSOR DEVICE
First Named Inventor/Applicant Name:	Pornsak Songakul
Customer Number:	28524
Filer:	Rashmi S. Raj/Ruth Rocky
Filer Authorized By:	Rashmi S. Raj
Attorney Docket Number:	2008P05081US
Receipt Date:	19-MAR-2008
Filing Date:	
Time Stamp:	11:12:41
Application Type:	Provisional

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$210
RAM confirmation Number	7472
Deposit Account	192179
Authorized User	

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1		2008P05081US.pdf	298830	yes	5
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	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
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This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. _____

2008P05081 US

INVENTOR(S)		
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William Thomas	Pienta	Prospect Heights, Illinois
James J.	Coogan	Des Plaines, Illinois
Randall J.	Amerson	Spring Grove, Illinois
Additional inventors are being named on the _____ separately numbered sheets attached hereto		
TITLE OF THE INVENTION (500 characters max)		
Methods To Manage Power Of Wireless Multi-sensor Device		
Direct all correspondence to: CORRESPONDENCE ADDRESS		
☒ The address corresponding to Customer Number: <u>028524 (Siemens)</u> OR		
☐ Firm or Individual Name		
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ENCLOSED APPLICATION PARTS (check all that apply)		
☐ Application Data Sheet. See 37 CFR 1.76 ☐ CD(s), Number of CDs _____		
☐ Drawing(s) Number of Sheets ☐ Other (specify) _____		
☒ Specification (e.g. description of the invention) Number of Pages <u>2</u>		
Fees Due: Filing Fee of \$210 (\$105 for small entity). If the specification and drawings exceed 100 sheets of paper, an application size fee is also due, which is \$260 (\$130 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s)		
METHOD OF PAYMENT OF THE FILING FEE AND APPLICATION SIZE FEE FOR THIS PROVISIONAL APPLICATION FOR PATENT		
☐ Applicant claims small entity status. See 37 CFR 1.27. <u>210.00</u>		
☐ A check or money order is enclosed to cover the filing fee and application size fee (if applicable)		
☐ Payment by credit card. Form PTO-2038 is attached TOTAL FEE AMOUNT (\$)		
☒ The Director is hereby authorized to charge filing fee and application size fee (if applicable) or credit any overpayment to Deposit Account Number: 19-2179 (Siemens) A duplicative copy of this form is enclosed for fee processing.		

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Page 2 of 2

PTO/SB/16 (10-07)
Approved for use through 06/30/2010. OMB 0651-0032
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SIGNATURE Rashmi Raj DATE March 19, 2008

TYPED or PRINTED NAME

Rashmi S. Raj

REGISTRATION No.

50,500
(if appropriate)

TELEPHONE +1 732 321 3872 Docket Number: 2008P05081 US / RSR / RRO



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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
61/037,739	03/19/2008		210	2008P05081 US / RSR / RRO		

CONFIRMATION NO. 9798

28524
SIEMENS CORPORATION
INTELLECTUAL PROPERTY DEPARTMENT
170 WOOD AVENUE SOUTH
ISELIN, NJ 08830

FILING RECEIPT



OC00000029006987

Date Mailed: 03/24/2008

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Applicant(s)

Pornsak Songkakul, Mequon, IL;
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Power of Attorney:

Rashmi Raj--50500

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The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 61/037,739**

Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No

Title

METHODS TO MANAGE POWER OF WIRELESS MULTI-SENSOR DEVICE

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