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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
61/078,365	07/04/2008		105			

CONFIRMATION NO. 6815

Jeffrey Raymond Eastlack
301 E. 4TH ST #314
Austin, TX 78701

FILING RECEIPT



OC000000031329782

Date Mailed: 08/04/2008

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Applicant(s)

Jeffrey Raymond Eastlack, Austin, TX;

Power of Attorney: None

If Required, Foreign Filing License Granted: 08/01/2008

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 61/078,365**

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

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

Vampire Proof Analog Controlled Mobile Device Battery Charger

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Vampire Proof Analog Controlled Mobile Device Battery Charger

Inventor – J. R. Eastlack, Vampire Labs

Abstract— Vampire energy loss occurs when an electronic or mechanical machine consumes energy while not being utilized for any useful purpose. Vampire energy losses in consumer electronic devices are under intense scrutiny for needlessly wasting an estimated 12% of the electric power production in the United States. The current invention proposes a method to eliminate vampire energy loss in battery chargers by employing the use of an analog control circuit to eliminate this power loss.

Index Terms— “Zero No Load Loss” (ZNLL), Vampire Energy Loss, Vampire Proof, Standby Power

I. BACKGROUND

FIELD OF INVENTION

This invention relates to power efficient battery chargers and technology that eliminates vampire energy loss using analog control circuits.

THE basic DC power supply or battery charger plugs into a AC source via a wall receptacle and employs the use of a step-down transformer **104**, signal rectification circuitry **106**, and voltage regulation circuitry **108**. The transformer consists of two conductively independent coils that are mutually coupled by magnetic flux when current flows in one of them. The AC current flowing in the primary coil produces a changing magnetic field within the transformer core and there by induces an electric current in the secondary coil as described by Faraday’s Law.

From transformer theory “no-load loss” is when energy loss occurs even when the secondary coil is left open or not attached to a load. According to academic literature the cause of no-load loss is attributed to eddy currents and magnetic hysteresis within the transformer core. In addition to no-load loss from the transformer, DC power supplies also incur dynamic and static power loss within the rectification and regulation circuitry. All of these combined losses within the DC power supply attribute to a significant portion of “vampire energy loss” which exists in many electronic product domains. In addition to no-load loss, it was noted during characterization experiments of charging batteries that the

chargers incurred loading from the target device even after the target device battery had been charged as shown in section **706**. This power usage from the target device after the battery is charged is defined as parasitic loading within this document. The term “parasitic” is used by Electrical Engineers to illustrate that a particular quantity is undesired in the context of a circuit or a specific application domain. Techniques have been in place to reduce no-load loss within transformers and parasitic loading of electronic devices; however the only way to stop no-load loss and parasitic loading of existing devices is to take the DC power supply and the target device completely off of the power grid.

There are solutions existing for reducing vampire power loss but they are markedly different from the proposed invention.

The first of these inventions is the USB Ecostrip. In the design of this USB connected power strip, the power bus of a standard USB compliant port of a host device is used to provide the power to the switching mechanisms of the power strip. If the USB host is turned off then the power strip has no power for other devices on the power strip. In another power strip design called the Smart Power Strip, one master outlet on the strip controls six other slave outlets. When the power usage of the master outlet decreases, it automatically turns off the slave outlets.

These inventions differ from the proposed invention as they lack application specific shutdown intelligence. They both monitor the power usage of a master device and make the assumption that a slave device adheres to the same use case as the master device. There are many possible cases where slave devices require power during times that a master device does not. These conditions may render both the USB Ecostrip and the Smart Power Strip useless for many peripheral devices which could result in vampire energy loss.

II. SUMMARY

The “vampire-proof analog controlled mobile device battery charger” is specifically tailored to accommodate the power usage characteristics of charging batteries which is illustrated by the current vs. time plot in **FIG. 7**. Power is cut to the charger at the exact moment when the battery is charged, resulting in zero vampire energy loss. Another main advantage is that the power monitoring circuitry initiates the “self-disconnect” to completely disconnect itself and the charger

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from the electrical power grid once the battery has been completely charged **814**. This means that the analog power monitoring circuitry **212** will also not be using any power after the battery has been charged.

The Vampire Proof ZNLL mobile device battery charger eliminates all components of vampire energy loss in this particular application domain which includes the “no load loss” of the step down transformer **104**, static and dynamic power consumption of the rectification **106** and regulation **108** circuitry within the device battery charger **112**, and the post charge parasitic loading as shown in section **706** of **FIG. 7** of the connected mobile device **110**. The Vampire Proof ZNLL mobile device battery charger circuitry has been modularly designed to be integrated into future charger designs or aftermarket additions to existing mobile device battery chargers. **FIG. 2** shows an application block diagram with the proposed vampire proof technology incorporated into existing charger designs. **FIG. 5** illustrates how the proposed technology will be incorporated into charger enclosures **506** with typical wall receptacle prongs **504**, a two port power and ground connector **508**, and the only visible difference being the push button switch **502**. For vampire proof charging operation **802** as described in **FIG. 8**, the user must first connect the target device to the charger connector **508** as described in step **804**, and press the push button switch **502** as spoken of in step **806**. At this point in the sequence the analog control circuitry powers up as described in step **808** and then takes control of the charger as shown in step **810**. In step **812** the analog control circuitry monitors the charge status of the battery, and then based on the status makes a decision to either continue to allow AC power to the charger components or to electrically disconnect itself and the charger from the power grid once the battery is completely charged as described in step **814**.

FIG. 6 illustrates that the concept of this invention can be extended to many other battery operated devices that require frequent battery charging which include GPS navigation systems **602**, electric razors **604**, notebook computers **606**, MP3/media players **610**, and electric toothbrushes **612**.

III. DESCRIPTION OF THE DRAWINGS

FIG. 1 shows the basic components of a typical battery charger without vampire proof capabilities.

FIG. 2 shows a modular application block diagram that illustrates the integration of the analog control circuitry with future and existing charger design as illustrated in **FIG. 1**.

FIG. 3 outlines the basic block components of the analog control circuitry with arrows representing the flow of input and output of the signals.

FIG. 4 shows a detailed design schematic of all the components of the analog control circuitry and the connection ports which map to signals in the modular application block diagram shown **FIG. 2**.

FIG. 5 illustrates an image of how the analog control module could be realized in current charger designs showing the only difference being the push button switch.

FIG. 6 illustrates how the invention concept could be expanded to other products. The examples include various types of battery operated portable devices that require frequent battery charging.

FIG. 7 shows the current draw characterization of a battery from a typical mobile device charging over time. The current magnitudes are broken into sections that depict the different phases of a battery charge and then finally the parasitic loading of the charger.

FIG. 8 shows a usage flow chart that illustrates temporal operation between the user initiated charging session, and the analog control circuitry's functional operations.

IV. DETAILED DESCRIPTION

The Vampire Proof ZNLL phone charger employs the use of analog control circuitry composed of a differential sense amplifier **302**, a low pass filter **304**, an analog voltage comparator **306**, a signal inverter **308**, and an opto-coupled relay **310** as illustrated in **FIG. 3**. The function of the circuit is to monitor the charging status of the battery as depicted in step **812** of **FIG. 8** and control the self-disconnecting of the DC power supply's primary coil within the transformer as shown in step **814**.

The differential amplifier **302** employs the use of an operational amplifier **424** with the particular arrangement of resistors **414**, **416**, **418**, and **420**. The differential amplifier senses and amplifies the voltage difference across a very low valued resistor **412** which is placed in series with the target load **110** which can be electrically modeled as a varying resistor as shown in **FIG. 4**. **FIG. 7** shows the magnitude of the current drawn by the target device over time. From charging characterization experiments of cell phones and mobile devices, it has been observed that the current drawn while the target battery is being charged will start out constant at the maximum level as shown by section **702** and then decay exponentially as shown by section **704**. As the battery becomes charged there is a sudden drop in the current drawn. The amplified output of the differential amplifier **302** is fed into a low pass filter **304** composed of resistor **434** and capacitor **432**. The output signal of the low pass filter is fed into an analog comparator circuit **306** which is composed of another operational amplifier **428**, resistors **426** and **422**. Resistors **426** and **422** are arranged as a voltage divider with an output value that dictates the comparator's voltage threshold and is fed into the non-inverting input of the second operational amplifier **428**. The low pass filter is used to

condition the signal between the differential amplifier **302** and the comparator **306** to prevent any high frequency noise from prematurely crossing the voltage threshold of the analog comparator **306**. The output of the comparator **306** is fed into an inverter **308** which outputs a high voltage signal which is required to provide the minimum amount of operational current or “on current” to the internal LED of the opto-coupled relay **310** when the output of the voltage comparator **306** is low. A current limiting resistor **438** is placed in series with the output of the inverter **308** and the input of the opto-coupled relay **310** to keep the current level from exceeding the maximum current value of the relays internal LED. When the output voltage of the low pass filter **304** crosses the threshold of the comparator **306**, its output changes from low to high which is then inverted by the inverter **308** to provide a low voltage to the opto-coupled relay **310**. The low voltage signal provides zero voltage potential difference across the internal LED of the opto-coupled relay **310** which stops the necessary “on current” for closed switch operation of the relay’s AC ports **208** and **210** as shown in step **810** of FIG. 8.

The push button switch **440** is used to provide initial power to the control circuit **212** as shown in step **808**. The push button switch **440** once pressed bypasses the opto-coupled relay for less than a second and provides direct AC current to the power supply components **104**, **106**, and **108**, thus providing power to the analog control circuit **212** which then provides the “on current” to the opto-coupled relay **310** within milliseconds of the pressing of the push button **440**.

With “on current” not present to the opto-coupled relay **310** the connection from the AC source **102** from the wall receptacle and the primary coil of the voltage transformer **104** is electrically open as shown in step **814**. The “on current” to the opto-coupled relay effectively shorts together the AC ports **208** and **210** on the control module allowing AC power to the primary coil **104**. The AC source will remain open until the push button switch **440** is pressed again as described in **806** for the next charging session.

The output of the voltage divider that is composed of **426** and **422** is set by adjusting the variable resistor **422**. This output sets the voltage threshold of the analog comparator **306** and is to be set to an amplified voltage level that equates to the lower current demand that is consistent with a charged battery described by section **706**. By setting the voltage cutoff threshold to a level that equates to a current region just below where the battery has been charged which is just below the lowest current level in region **704**, the vampire proof smart charger will self-disconnect immediately after the device battery has been charged and before any parasitic loads can draw power.

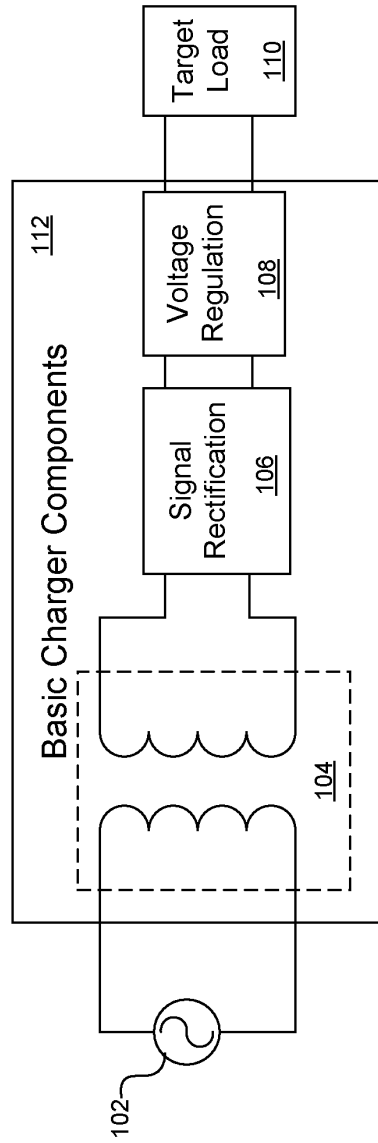


FIG. 1

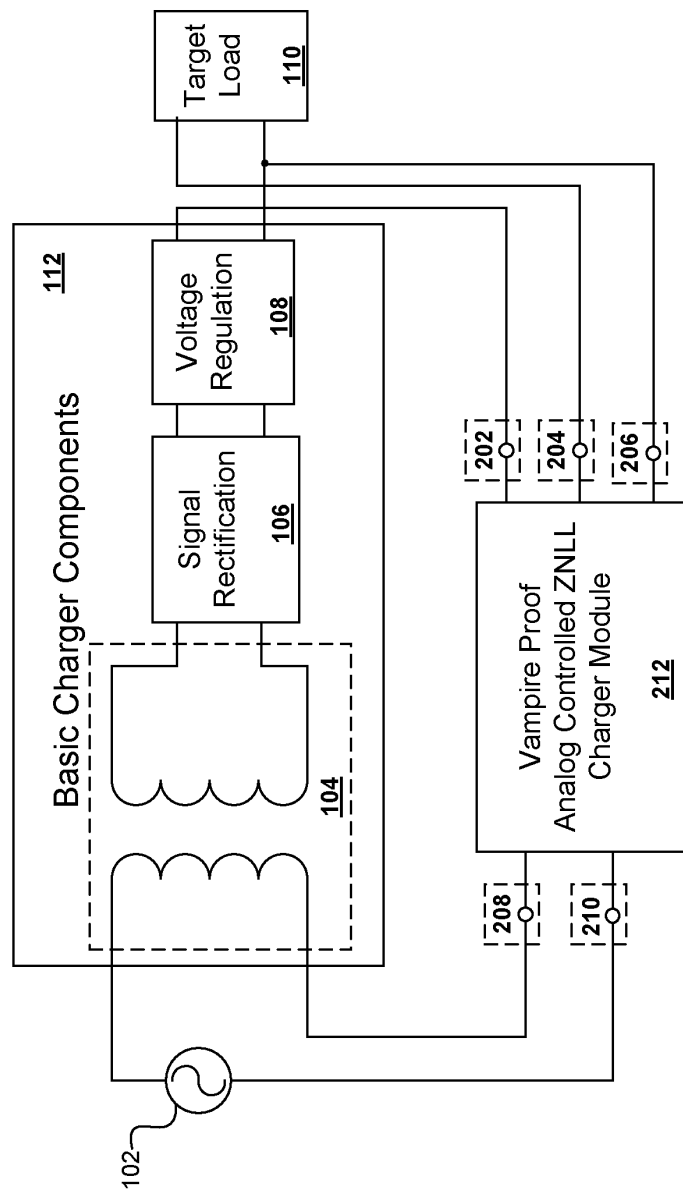


FIG. 2

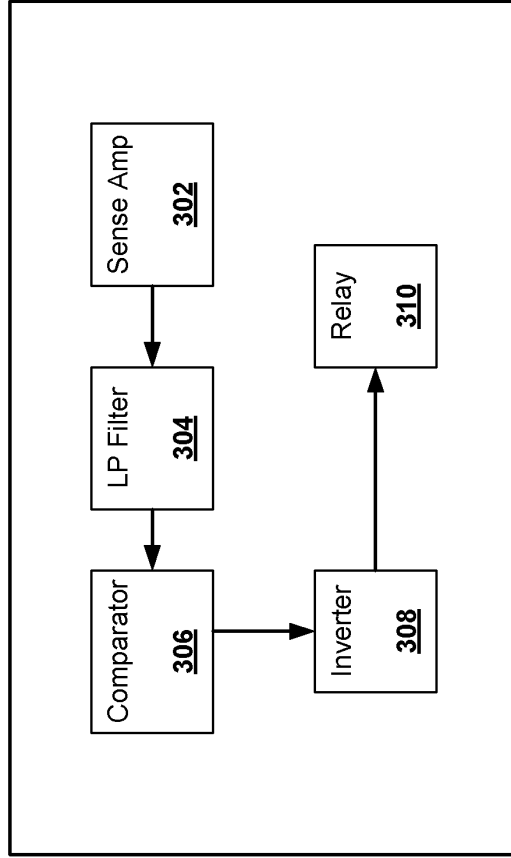


FIG. 3

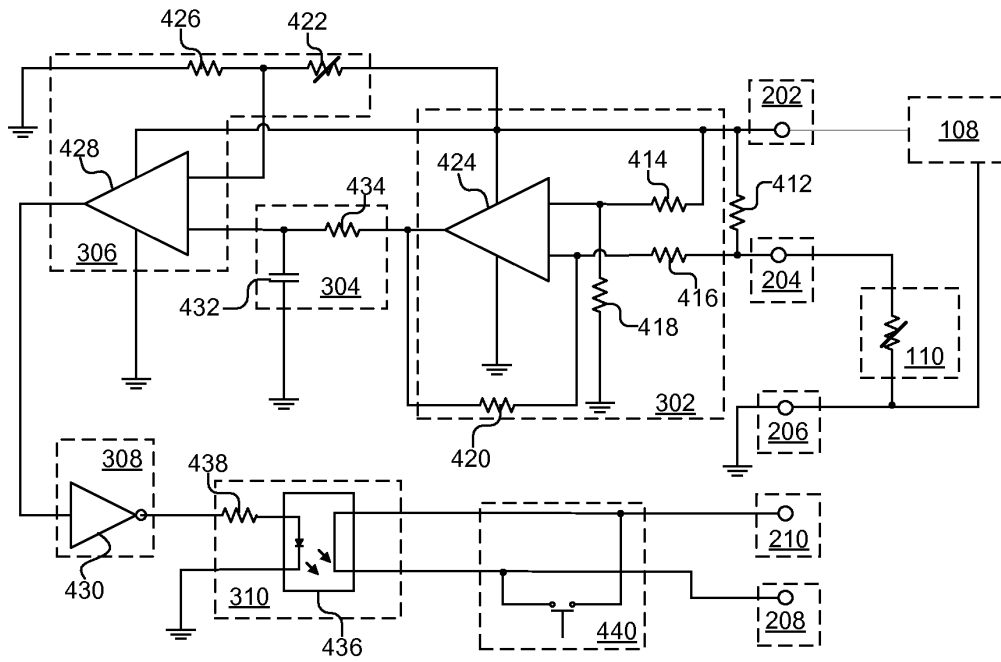


FIG. 4

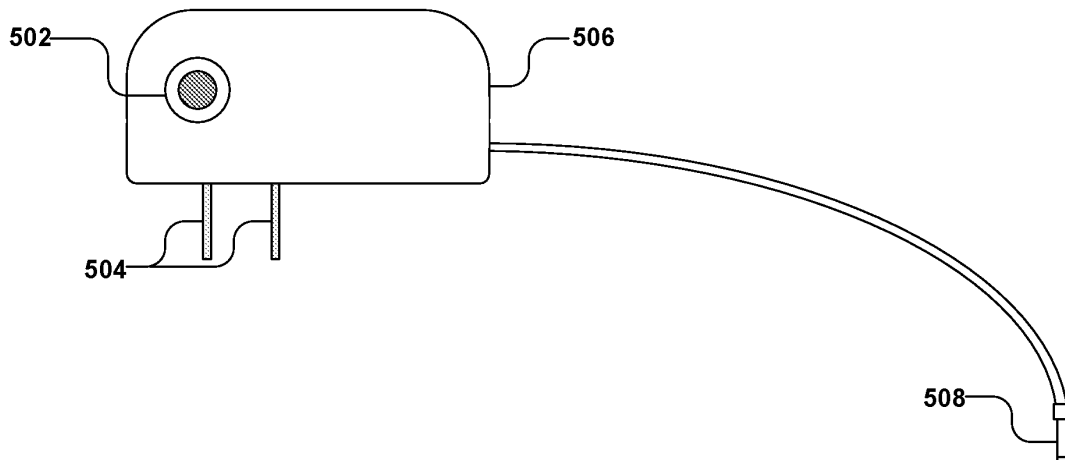


FIG. 5

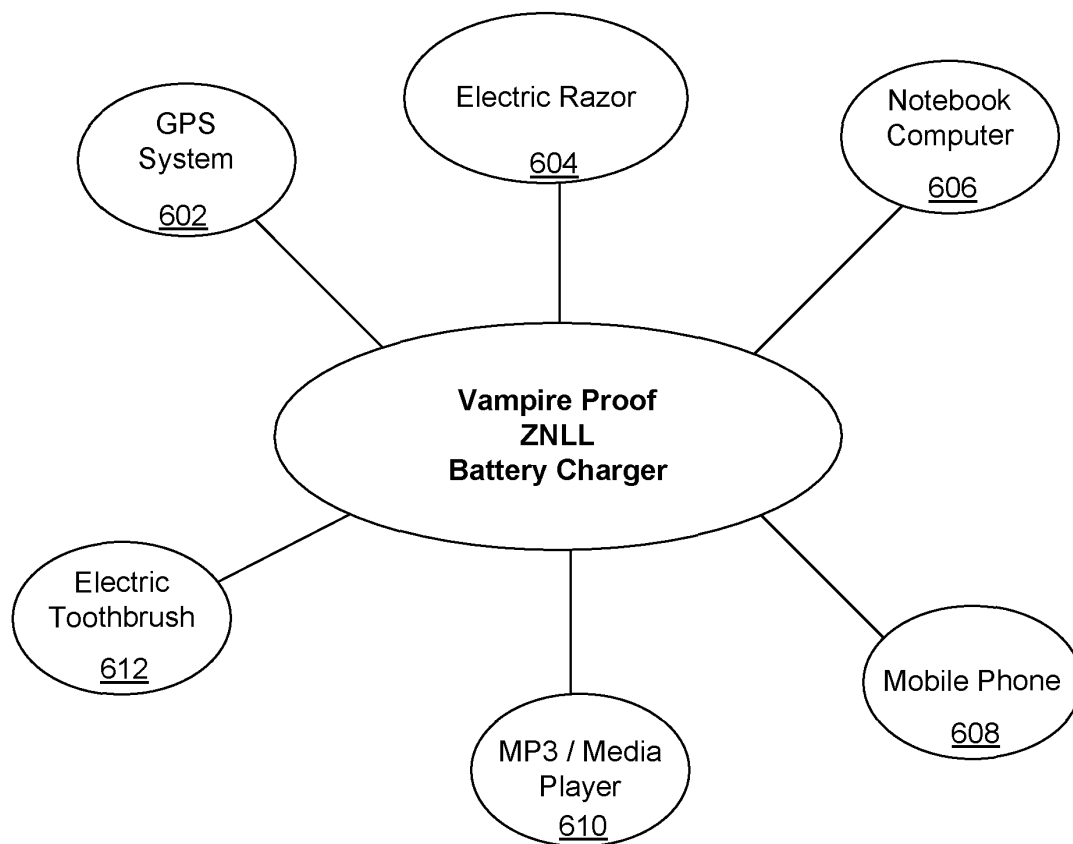


FIG. 6

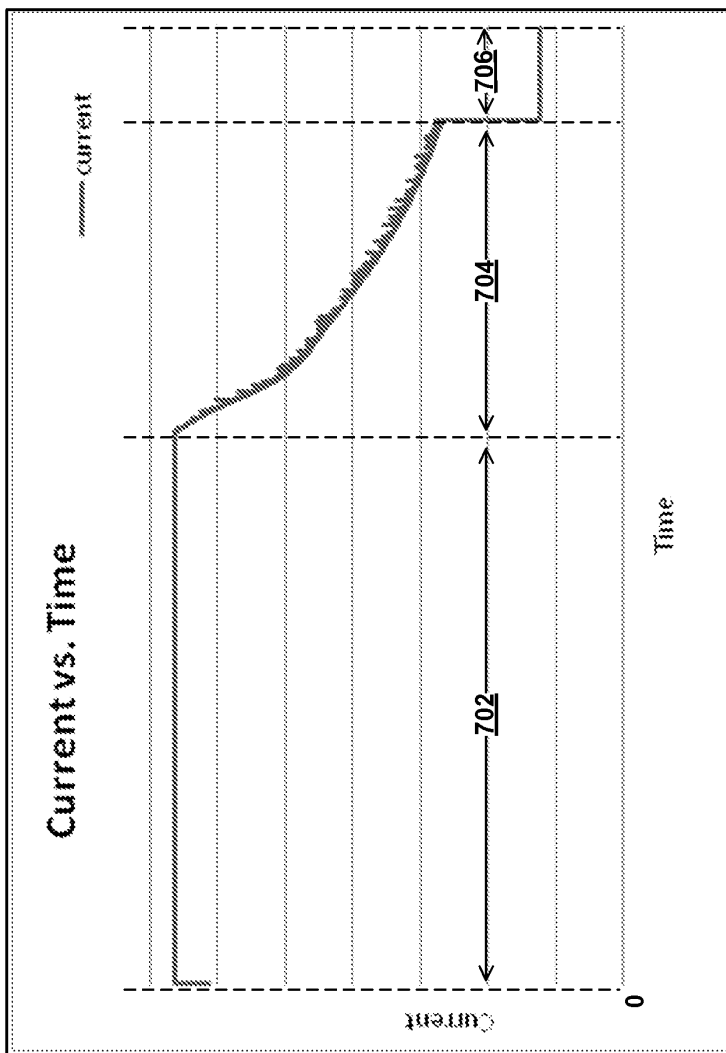


FIG. 7

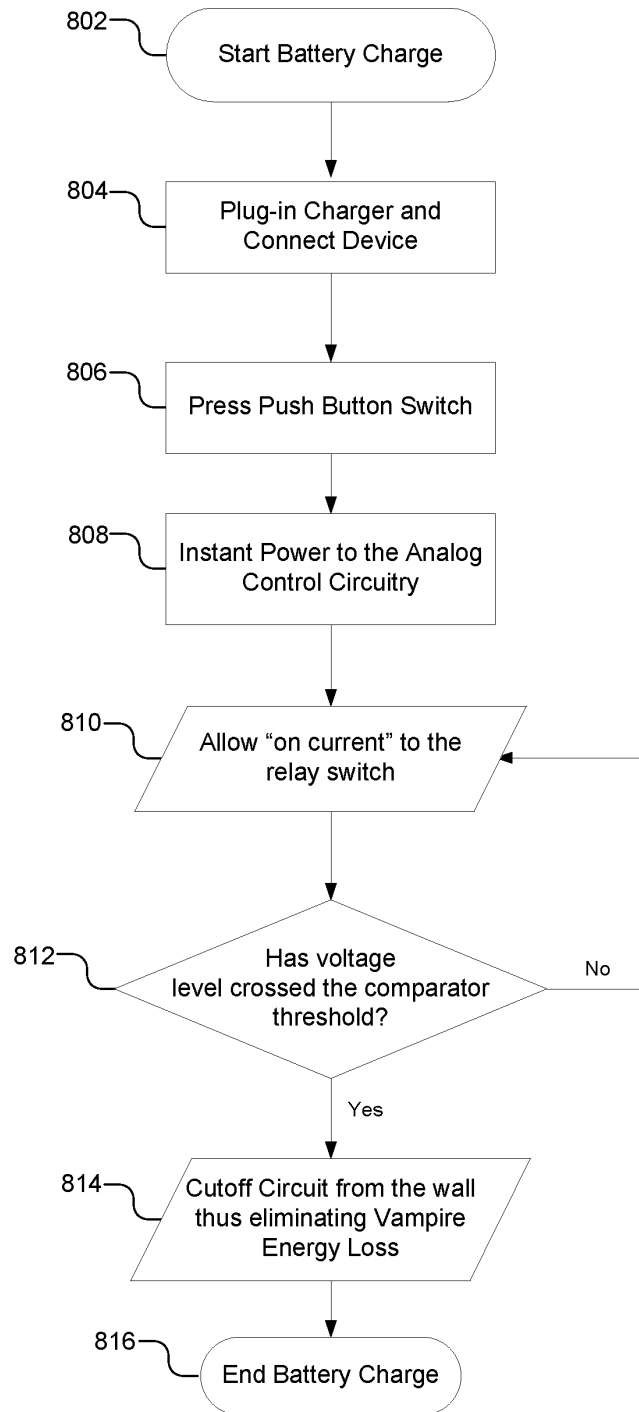


FIG. 8

Provisional Application for Patent Cover Sheet

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c)

Inventor(s)

Inventor 1

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Given Name	Middle Name	Family Name	City	State	Country i
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All Inventors Must Be Listed – Additional Inventor Information blocks may be generated within this form by selecting the **Add** button.**Add****Title of Invention**

Vampire Proof Analog Controlled Mobile Device Battery Charger

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Firm or Individual Name 1

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Phone	512-784-4307		

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

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Entity Status

Applicant claims small entity status under 37 CFR 1.27

☒ Yes, applicant qualifies for small entity status under 37 CFR 1.27☐ No**Warning**

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Signature

Please see 37 CFR 1.4(d) for the form of the signature.

Signature	/Jeffrey R. Eastlack/			Date (YYYY-MM-DD)	Jul 4, 2008
First Name	Jeffrey	Last Name	Eastlack	Registration Number (If appropriate)	

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Title of Invention:		Vampire Proof Analog Controlled Mobile Device Battery Charger		
First Named Inventor/Applicant Name:		Jeffrey Raymond Eastlack		
Filer:		Jeffrey Eastlack		
Attorney Docket Number:				
Filed as Small Entity				
Provisional Filing Fees				
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Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Total in USD (\$)				105

Electronic Acknowledgement Receipt	
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Application Number:	61078365
International Application Number:	
Confirmation Number:	6815
Title of Invention:	Vampire Proof Analog Controlled Mobile Device Battery Charger
First Named Inventor/Applicant Name:	Jeffrey Raymond Eastlack
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Application Type:	Provisional

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Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1		Final_Eastlack_001_WOCS.pdf	169714	yes	10
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	Abstract		1	1	
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	Drawings-only black and white line drawings		4	10	
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