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Orozco

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(54) **APPARATUS AND METHOD FOR STANDBY LIGHTING**

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H05B 37/00 (2006.01)

(52) **U.S. Cl.** **702/188**; 315/86; 307/46

(58) **Field of Classification Search** .... None
See application file for complete search history.

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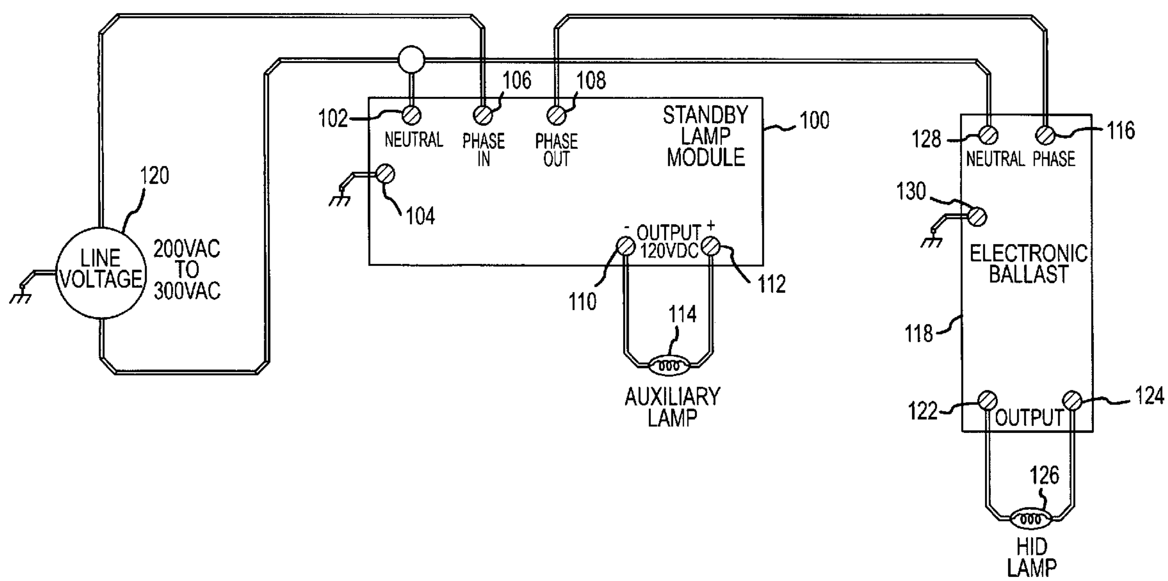
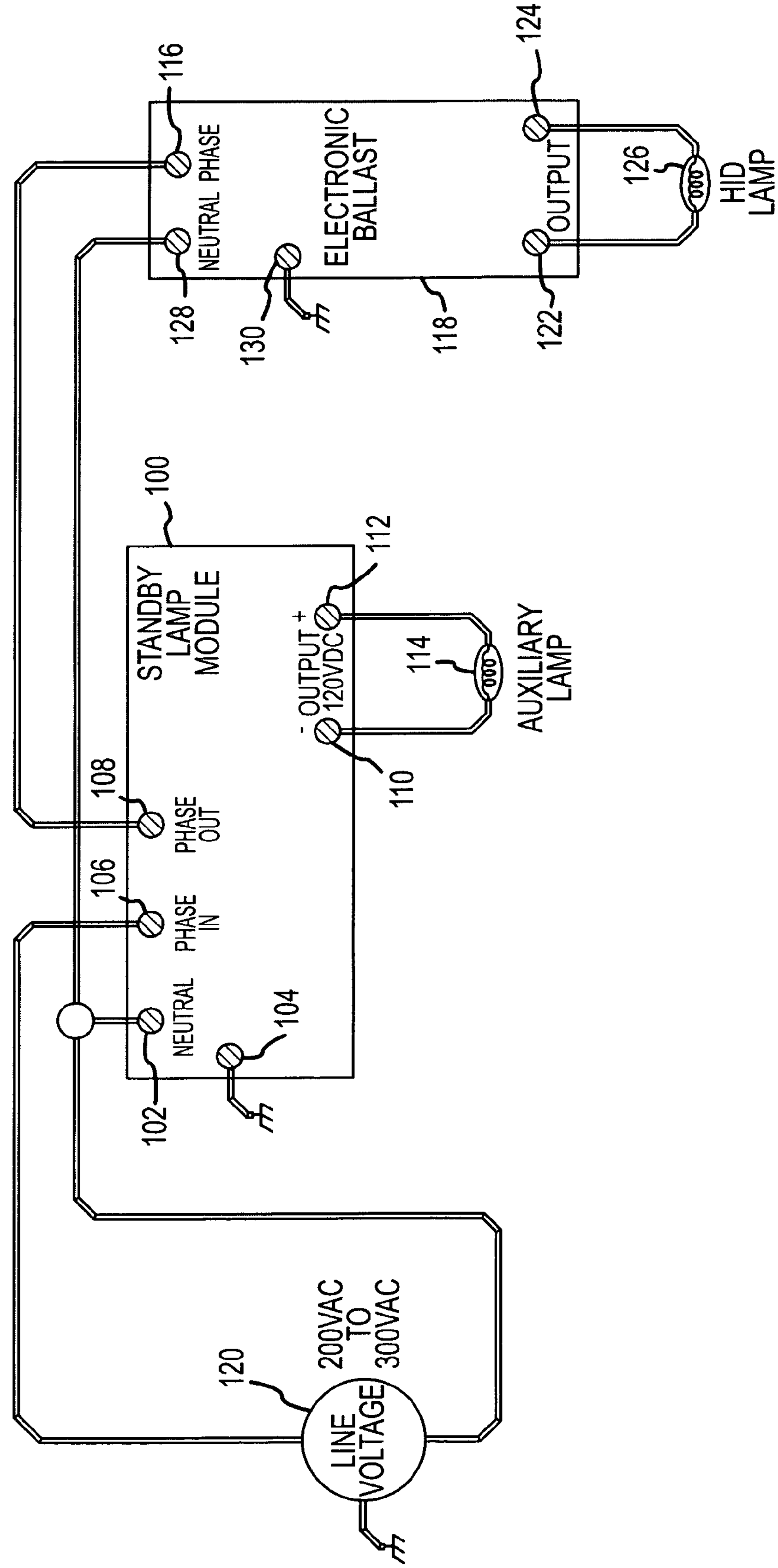
(57) **ABSTRACT**

A method and system for standby lighting uses a power supply module and a standby lamp in conjunction with an HID lamp. The power supply module has a processor with smart trigger circuitry, soft start capability, overlap timer, and an advanced current sense algorithm. The power supply module continuously monitors the electronic ballast current to the HID lamp. If the current drops for a period of time, the power supply module supplies DC current to turn on the standby lamp gradually over a couple of seconds. The standby lamp is kept on while the processor checks for a rise in the electronic ballast current to a threshold current level for more than two seconds. Then, an overlap timer starts to count down for the time it takes for HID lamp to reach full intensity, approximately fifteen minutes. The standby lamp is turned off at the end of the count down.

21 Claims, 7 Drawing Sheets





116
124
PHASE
NEUTRAL
ELECTRONIC BALLAST
OUTPUT
126
HID LAMP
128
130
118
122
100
STANDBY LAMP MODULE
112
- OUTPUT +
120VDC
114
AUXILIARY LAMP
110
108
PHASE OUT
106
PHASE IN
NEUTRAL
104
102
120
200VAC TO 300VAC
LINE VOLTAGE

FIG.1

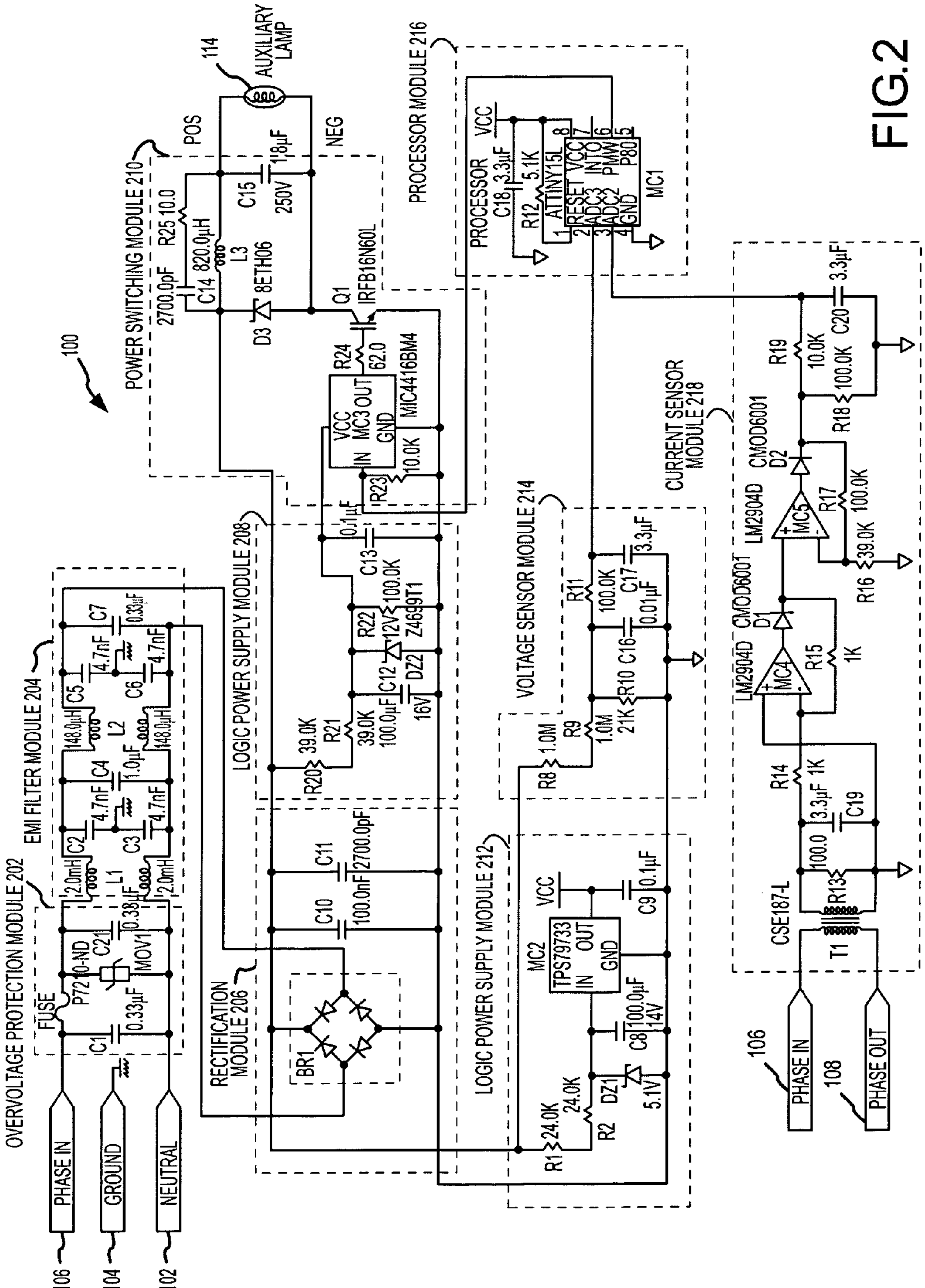

100
OVERVOLTAGE PROTECTION MODULE 202
EMI FILTER MODULE 204
RECTIFICATION MODULE 206
LOGIC POWER SUPPLY MODULE 208
POWER SWITCHING MODULE 210
LOGIC POWER SUPPLY MODULE 212
VOLTAGE SENSOR MODULE 214
PROCESSOR MODULE 216
CURRENT SENSOR MODULE 218
114
AUXILIARY LAMP
POS
NEG
PHASE IN
GROUND
NEUTRAL
106
104
102
PHASE IN
PHASE OUT
106
108
FUSE
P7210-ND
MOV1
BR1
PROCESSOR
ATTINY15L
MC1
VCC
MC2
TPS79733
MC3
MIC4416BM4
IRFB16N60L
Q1
8ETH06
D3
LM2904D
MC4
MC5
CMOD6001
D1
D2
CSE187-L
T1
Z4699T1
DZ1
DZ2

FIG.2

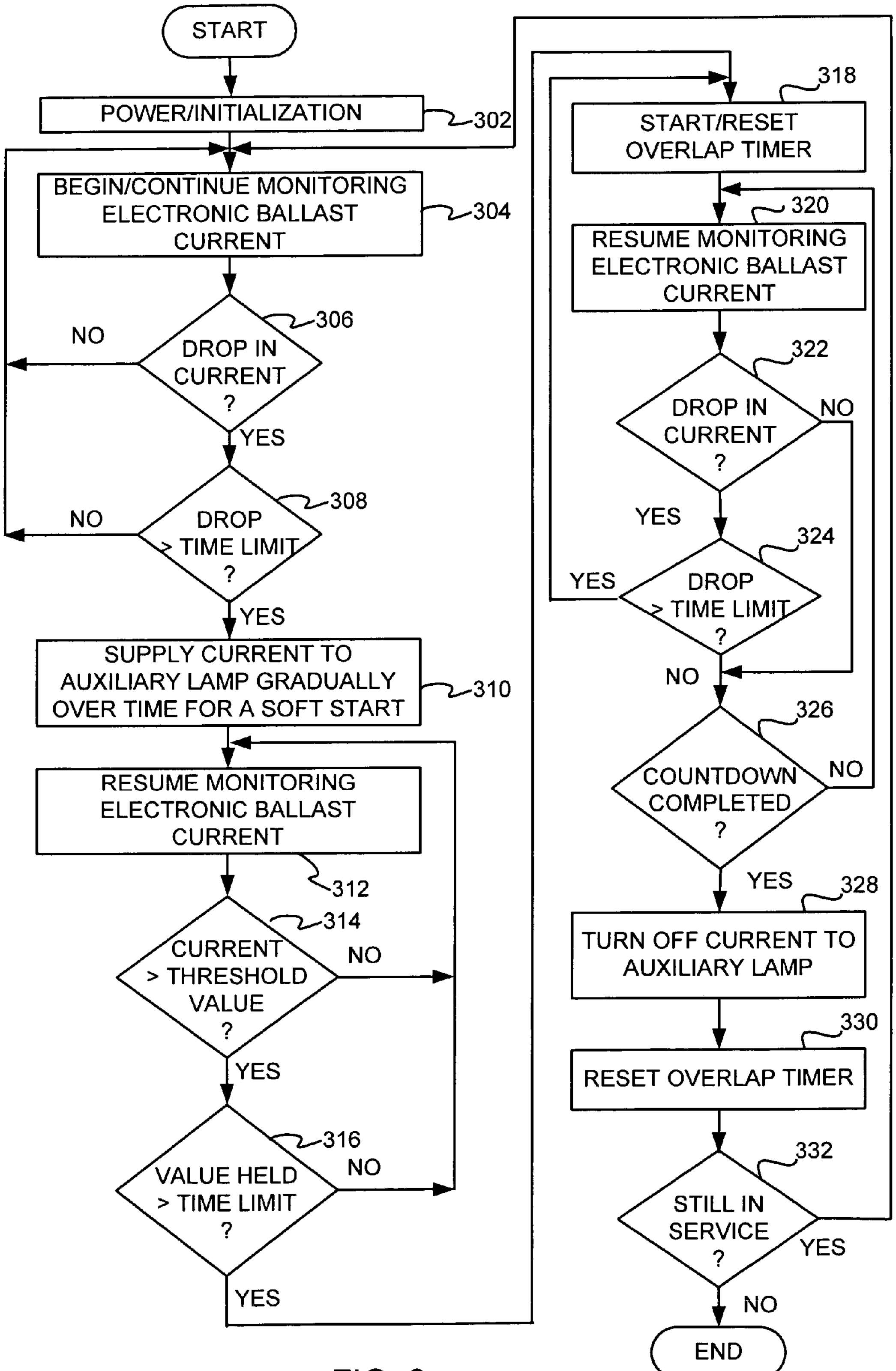

START
POWER/INITIALIZATION
302
BEGIN/CONTINUE MONITORING ELECTRONIC BALLAST CURRENT
304
DROP IN CURRENT ?
306
NO
YES
DROP > TIME LIMIT ?
308
NO
YES
SUPPLY CURRENT TO AUXILIARY LAMP GRADUALLY OVER TIME FOR A SOFT START
310
RESUME MONITORING ELECTRONIC BALLAST CURRENT
312
CURRENT > THRESHOLD VALUE ?
314
NO
YES
VALUE HELD > TIME LIMIT ?
316
NO
YES
START/RESET OVERLAP TIMER
318
RESUME MONITORING ELECTRONIC BALLAST CURRENT
320
DROP IN CURRENT ?
322
NO
YES
DROP > TIME LIMIT ?
324
YES
NO
COUNTDOWN COMPLETED ?
326
NO
YES
TURN OFF CURRENT TO AUXILIARY LAMP
328
RESET OVERLAP TIMER
330
STILL IN SERVICE ?
332
YES
NO
END

FIG. 3

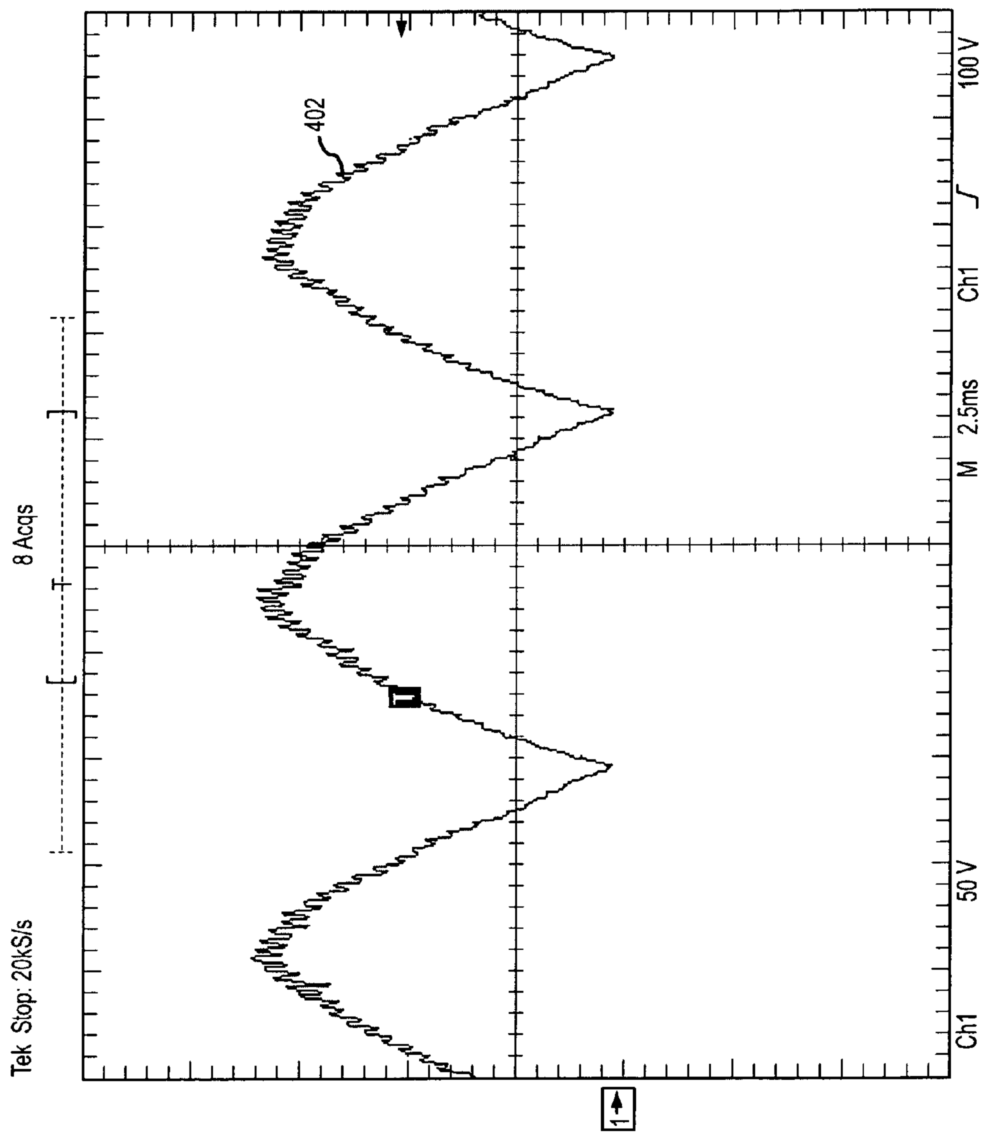


FIG.4

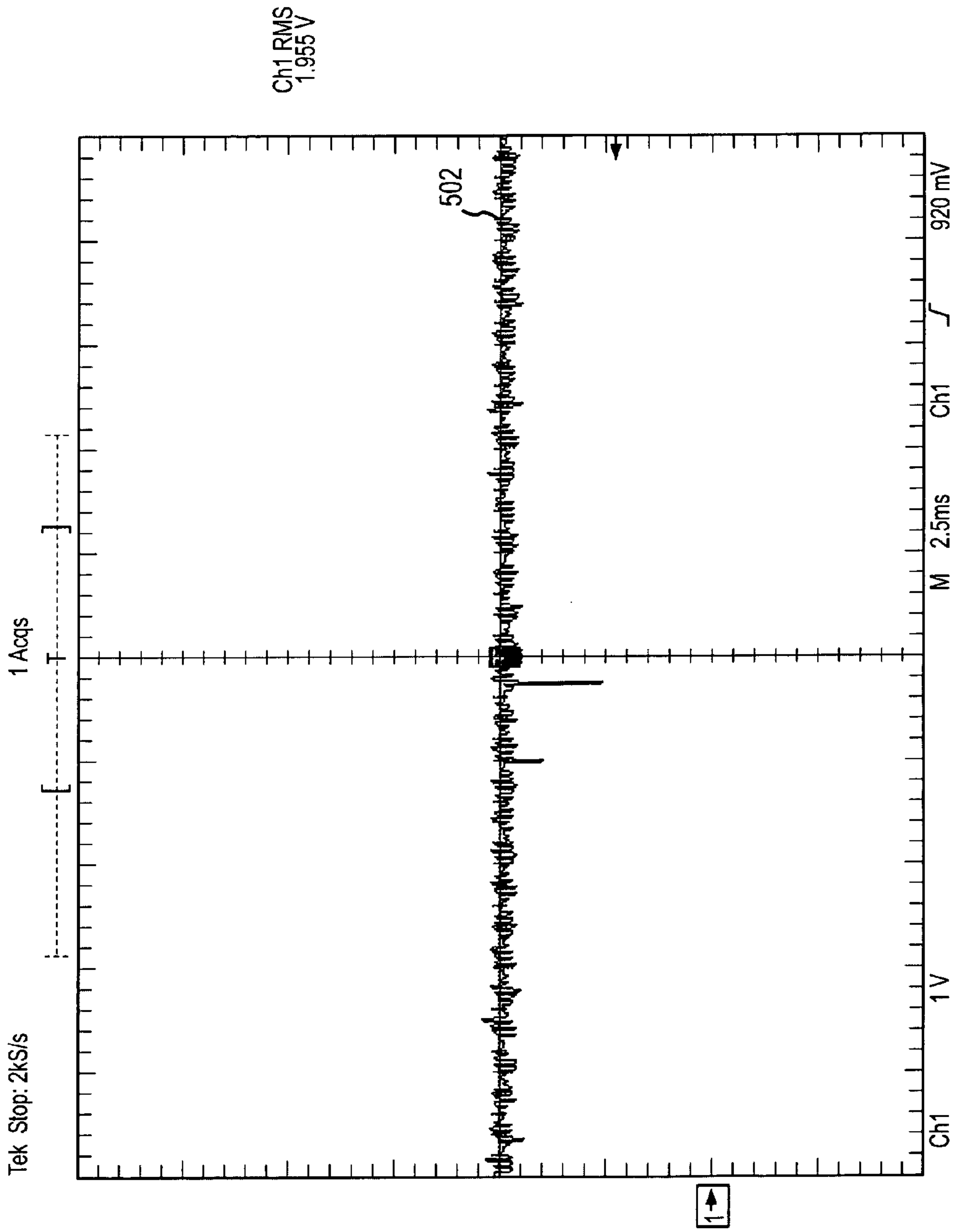


FIG.5

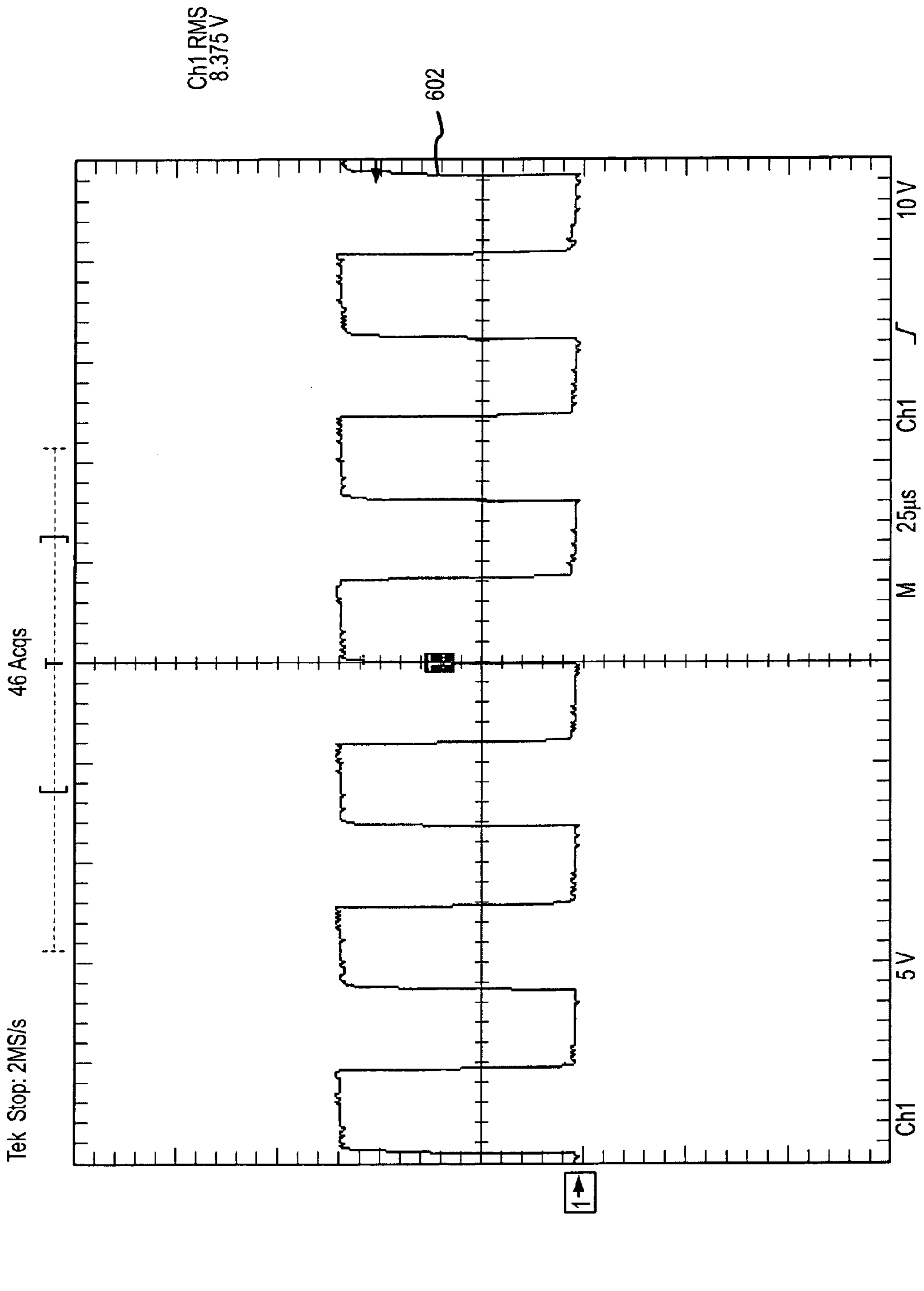


FIG.6

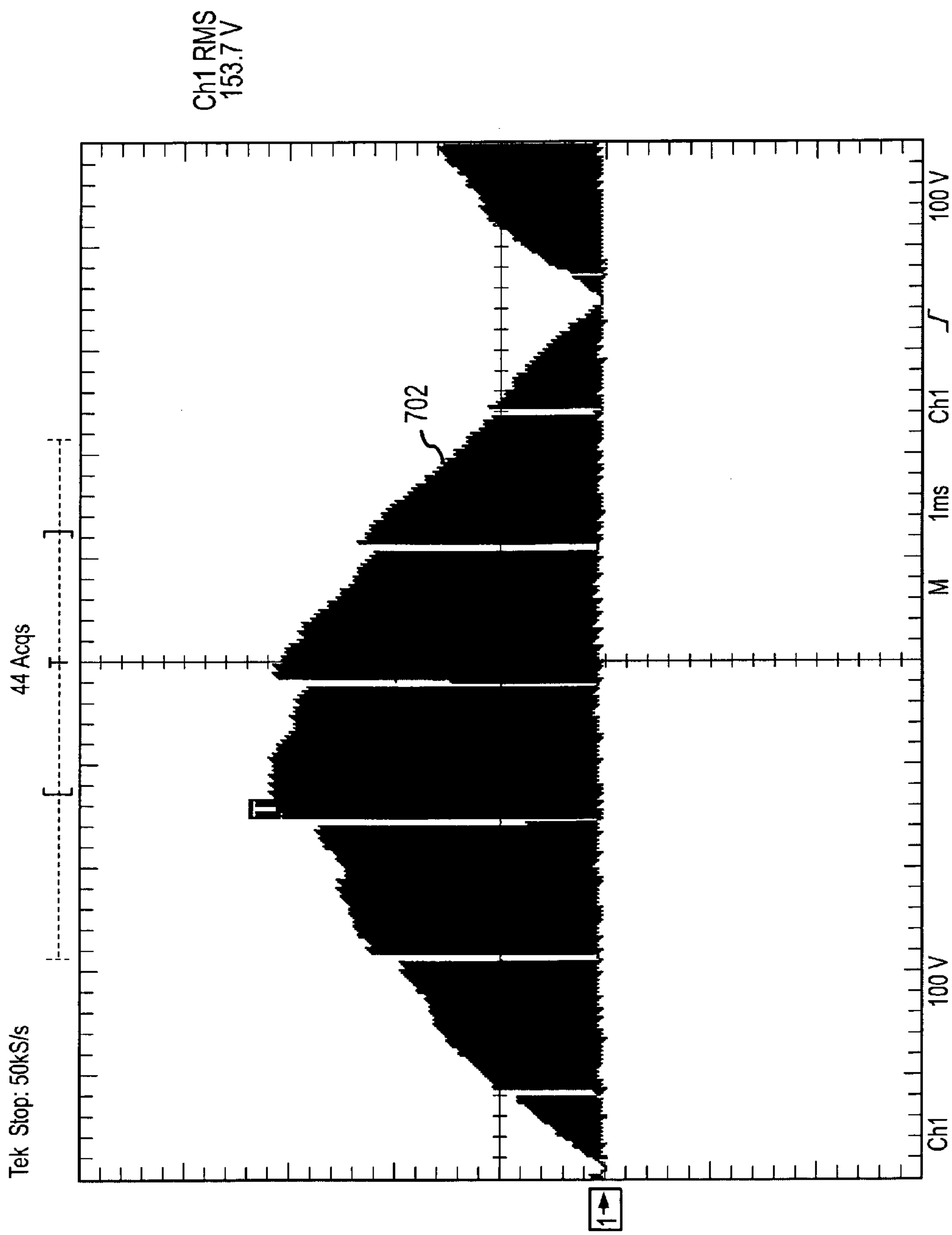

Tek Stop: 50kS/s
44 Acqs
Ch1 RMS
153.7 V
702
Ch1 100 V
100 V
M 1ms Ch1

FIG.7

APPARATUS AND METHOD FOR STANDBY LIGHTING

FIELD OF THE INVENTION

This invention relates to high intensity discharge ("HID") lamps, and more particularly, to standby lamps used in conjunction with HID lamps in the event of momentary power loss, and even more particularly, to a power supply module for supplying power to the standby lamps when a momentary power loss occurs to provide standby lighting.

BACKGROUND OF THE INVENTION

High intensity discharge lamps are typically used when high levels of light are required over large areas and when energy efficiency and/or long life are desired. These areas include gymnasiums, large public areas, warehouses, manufacturing facilities, outdoor activity areas, roadways, parking lots, and pathways. Like fluorescent lamps, HID lamps require a ballast which provides the necessary circuit conditions for starting and maintaining their operation. When HID lamps are initially turned on, it takes anywhere from five to fifteen minutes, depending upon the particular HID lamp, for the normal light intensity level to be reached. When a momentary interruption of the line voltage occurs, the same time period is required to restore the HID lamp to its normal intensity level. For situations where the lack of light for this time period is unacceptable, standby lamps (also referred to as auxiliary lamps) are typically incorporated into the lighting system. Usually, the conventional ballasts for the HID lamps have provided a voltage supply and trigger circuitry to turn on the auxiliary lamps until the HID lamps reach their normal intensity level. Then, the auxiliary lamps are turned off by the circuitry.

Conventional ballasts can operate over wide standard input voltages, typically 208–277 volts AC, which can normally be preset by the end user. The auxiliary lamps used in conjunction with HID lamps typically only operate at 120 volts AC. Conventional ballasts typically provide a transformer for the auxiliary lamp. Trigger circuitry for the auxiliary lamp is actuated by an electromechanical relay where the coil is connected in series to the HID lamp and the relay contacts are connected in series to the auxiliary lamp. When the HID lamp breaks down, such as occurs with a temporary loss of line voltage, the full voltage is presented on the coil, the relay contacts close, and the auxiliary lamp turns on.

Conventional ballasts are being rapidly being replaced with electronic ballasts which do not provide a voltage supply and trigger circuitry for systems that require auxiliary lamps. There is thus a need in the art to supply such a system.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a wiring diagram for a typical application of an embodiment of the power supply module for a standby lamp, used in conjunction with an HID lamp, of the present invention.

FIG. **2** shows an electronic schematic diagram of an embodiment of the power supply module for a standby lamp, used in conjunction with an HID lamp, of the present invention.

FIG. **3** shows a block flow diagram of the method of utilizing a power supply module with a standby lamp, used in conjunction with an HID lamp, of the present invention.

FIG. **4** shows oscilloscope traces of the voltage between the output terminals for the auxiliary lamp in the apparatus and method for standby lighting of the present invention.

FIG. **5** shows oscilloscope traces of the feedback signal from the voltage sensor module which is proportional to the line voltage in the apparatus and method for standby lighting of the present invention.

FIG. **6** shows oscilloscope traces of the output waveform from the processor module to the power switching module in the apparatus and method for standby lighting of the present invention.

FIG. **7** shows oscilloscope traces of the chopped rectified voltage output waveform of the bipolar signal transistor within the power switching module in the apparatus and method for standby lighting of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the Figures, in which like reference numerals and names refer to structurally and/or functionally similar elements thereof, FIG. **1** shows a wiring diagram for a typical application of an embodiment of the power supply module for a standby lamp, used in conjunction with an HID lamp, of the present invention. Referring now to FIG. **1**, Standby Lamp Module **100** has a three wire input: Neutral Terminal **102**, Ground **104**, and Phase which is made up of Phase In Terminal **106** and Phase Out Terminal **108**. Two Output Terminals **110**, **112** supply 120 volts DC to Auxiliary Lamp **114**. Phase Out Terminal **108** is connected to Phase Input Terminal **116** of Electronic Ballast **118**, and Neutral Terminal **102** is connected to Neutral Input Terminal **128** of Electronic Ballast **118**. Line Voltage Supply **120** supplies between 200 to 300 volts AC to Standby Lamp Module **100** and Electronic Ballast **118**. Electronic Ballast **118** has two Output Terminals **122**, **124** which supply HID Lamp **126** with the 200 to 300 volts AC. Electronic Ballast **118** also has Neutral Input **128** and Ground **130**.

FIG. **2** shows an electronic schematic diagram of an embodiment of the power supply module for a standby lamp, used in conjunction with an HID lamp, of the present invention. Referring now to FIG. **2**, Standby Lamp Module **100** provides a regulated power supply and trigger circuitry in a single module. In a phase control mode technique, two silicon controlled rectifiers ("SCR's") connected back to back could be used to reduce the voltage supplied to Auxiliary Lamp **114**. Even though the resulting voltage is 120 volts true root mean square ("trms"), the voltage peaks are very high for typical incandescent auxiliary lamps and is not recommended.

One embodiment of the invention reduces these high voltage peaks by employing a switching mode technique instead of a phase control mode technique. A twenty-five KHz carrier frequency is used along with a metal oxide semiconductor field effect transistor ("MOSFET"), or an insulated gate bipolar transistor ("IGBT"), as a power switching device and power inductor in series with Auxiliary Lamp **114**. The MOSFET embodiment is shown in FIG. **2**. Consequently, a rectified sine waveform is supplied to Auxiliary Lamp **114**.

One skilled in the art will recognize that one of the relevant changes to prior art practice provided by Standby Lamp Module **100** is that 120 volts DC, instead of 120 volts AC, is supplied to Auxiliary Lamp **114**. Because Auxiliary Lamp **114** is typically a quartz incandescent type lamp, it can operate with either AC or DC voltage. Some incandescent lamps however are very sensitive to pulsed current. This is due to the vibration caused to the filament, which can greatly reduce the life of the filament. Such lamps often have constraints regarding the ratio of root mean square current to average current that precludes the use of a phase controlled 60 Hz approach. The twenty-five KHz chopping frequency utilizing in the present invention eliminates audible noise and reduces the filter component sizes. Thus, Standby Lamp Module **100** can operate with a wide input voltage ranging between 200 to 300 volts AC, and provide a constant voltage of 120 volts DC to Auxiliary Lamp **114** of the incandescent variety that is sensitive to pulsed current.

Standby Lamp Module **100** has several circuit modules that provide the overall functionality as described above and herein below. Overvoltage Protection Module **202** has a varistor to protect Standby Lamp Module **100** against surge peaks and overvoltage. Individual components of Overvoltage Protection Module **202** include: polarized capacitors C**1** and C**21**, metal oxide varistor MOV**1**, and a Fuse. In one embodiment of the invention, the components of Overvoltage Protection Module **202** have the following values: C**1** and C**21** are 0.33 μF; MOV**1** is a ZNR P7210-ND varistor available from Panasonic; and the Fuse is a 4 ampere 250V AC.

EMI Filter Module **204** reduces the Electro Magnetic Interference ("EMI") conducted emissions to the AC line generated by Standby Lamp Module **100**. Individual components of EMI Filter Module **202** include: polarized capacitors C**2**, C**3**, C**4**, C**5**, C**6**, and C**7** and inductors L**1** and L**2**. In one embodiment of the invention, the components of EMI Filter Module **204** have the following values: C**2**, C**3**, C**5**, and C**6** are 4.7 nF, C**4** is 1.0 μF, C**7** is 0.33 μF, L**1** is 2.0 mH, and L**2** is 148.0 μH.

Rectification Module **206** provides a suitable DC voltage for Power Switching Module **210** using a diode bridge. Individual components of Rectification Module **206** include: full wave bridge rectifier BR**1** and polarized capacitors C**10** and C**11**. In one embodiment of the invention, the components of Rectification Module **206** have the following values: C**10** is 100.0 nF and C**11** is 2700.0 pF. Polarized capacitors C**10** and C**11** serve to reduce high frequency.

Logic Power Supply Module **208** regulates the voltage for the MOSFET driver circuitry. In one embodiment of the invention, the regulated voltage is 12 volts DC. Individual components of Logic Power Supply Module **208** include: resistors R**20**, R**21**, and R**22**; polarized capacitors C**12** and C**13**; and zener diode DZ**2**. In one embodiment of the invention, the components of Logic Power Supply Module **208** have the following values: R**20** and R**21** are 39.0 k Ohms, R**22** is 100.0 k Ohms, C**12** is 100.0 μF **16**V, C**13** is 0.1 μF, and DZ**2** is a MMSZ4699T1 12 V SOD-123 available from ON Semiconductor®.

Power Switching Module **210** has an inductor placed in series to the load and MOSFET switching at high frequency to reduce the output voltage. Individual components of Power Switching Module **210** include: low side MOSFET driver MC**3**; polarized capacitors C**14** and C**15**; resistors R**23**, R**24**, and R**25**; inductor L**3**; bipolar signal transistor Q**1**; and diode D**3**. In one embodiment of the invention, the components of Power Switching Module **210** have the following values: low side MOSFET driver MC**3** is an MIC**4416**BM**4** available from Micrel Inc., C**14** is 2700.0 pF, C**15** is 1.8 μF **250** V, R**23** is 10.0 k Ohms, R**24** is 62.0 Ohms, R**25** is 10.0 Ohms, L**3** is 820.0 μH bipolar signal transistor Q**1** is an IRFB16N60L 600 V Single N-Channel HEXFET Power MOSFET available from International Rectifier, and D**3** is an 8ETH06 600 V 8 A HyperFast Discrete Diode also available from International Rectifier.

Inductor L**3** is placed in series in order to get the effect of dynamic impedance (high frequency=high impedance, low frequency=short circuit). Polarized capacitor C**14** and resistor R**25** act as a snubber to reduce noise. FIG. **7** shows oscilloscope traces of the Chopped Rectified Voltage Output **702** of bipolar signal transistor Q**1**. After being smoothed by polarized capacitor C**15**, FIG. **4** shows oscilloscope traces of the Constant Voltage Output **402** between Output Terminals **110** and **112** for Auxiliary Lamp **114**.

Logic Power Supply Module **212** regulates the voltage for the microcontroller and its peripherals. In one embodiment of the invention, the regulated voltage is 3.3 volts DC. Individual components of Logic Power Supply Module **212** include: resistors R**1** and R**2**; zener diode DZ**1**; polarized capacitors C**8** and C**9**; microcontroller MC**2**; and control circuit DC bus VCC for sensing and regulating circuits. In one embodiment of the invention, the components of Logic Power Supply Module **212** have the following values: R**1** and R**2** are 24.0 k Ohms, DZ**1** is an MMSZ4689T1 5.1 V SOD-123 available from ON Semiconductor®, C**8** is 100.0 μF 14 V, C**9** is 0.1 μF, and MC**2** is a TPS79733 10 mA 3.3 V Micro-Power Low-Dropout ("LDO") Voltage Regulator in SOD-123 available from Texas Instruments.

Voltage Sensor Module **214** senses the input signal, which is proportional to the line voltage that is used to maintain constant output voltage, which is accomplished by adjusting the switching frequency. Individual components of Voltage Sensor Module **214** include: resistors RB, R**9**, R**10**, and R**11** and polarized capacitors C**16** and C**17**. In one embodiment of the invention, the components of Voltage Sensor Module **214** have the following values: C**16** is 0.01 μF, C**17** is 3.3 μF, R**8** and R**9** are 1.0 M, R**10** is 21.0 k Ohms, and R**11** is 100.0 k Ohms. FIG. **5** shows oscilloscope traces of the Feedback Signal **502** from Voltage Sensor Module **214** which is proportional to the line voltage.

Processor Module **216** has the central processing unit, which generates the appropriate switching duty cycle and frequency to maintain constant output voltage based upon the input signals it receives. Individual components of Processor Module **216** include: polarized capacitor C**18**; resistor R**12**; VCC; and Microcontroller MC**1** which may be one of many types of suitable microcontrollers. In one embodiment of the invention, the components of Processor Module **216** have the following values: C**18** is 3.3 μF, R**12** is 5.1 k Ohms, and microcontroller MC**1** is an ATtiny15L 8-bit Microcontroller with 1 K Byte Flash available from Atmel Corporation. FIG. **6** shows oscilloscope traces of the Switching Frequency Output **602** from Processor Module **216** to Power Switching Module **210** which is a twenty-five KHz switching frequency.

Auxiliary Lamp **114** is in series with inductor L**3**, which acts like a voltage divider. Therefore, in order to maintain a constant voltage output for Auxiliary Lamp **114** the characteristics of inductor L**3** are adjusted. If the input voltage increases, the voltage in both inductor L**3** and Auxiliary Lamp **114** will increase. A constant switching frequency of twenty-five KHz is maintained, and to compensate for the change in line voltage Processor Module **216** modifies the duty cycle according to the line voltage, which may range between 200–300 volts AC. For example, if the input line voltage is 200 volts AC, then the duty cycle will be 60% on and 40% off. If the input line voltage is 300 volts AC, the duty cycle will be adjusted to 30% on and 70% off. Processor Module **216** monitors the voltage level from Voltage Sensor Module **214**. The signal received from Voltage Sensor Module **214** has been smoothed by resistor R**11** and polarized capacitor C**17**. Microcontroller MC**1** within Processor Module **216** has a lookup table to compare the input line voltage, and find a reload value for updating the duty cycle of the switching output to obtain a constant output voltage.

Current Sensor Module **218** senses the current from Electronic Ballast **118** and amplifies it. Individual components of Current Sensor Module **218** include: transformer T**1**; resistors R**13**, R**14**, R**15**, R**16**, R**17**, R**18**, and R**19**; polarized capacitors C**19** and C**20**; amplifiers MC**4** and MC**5**; and switching diodes D**1** and D**2**. In one embodiment of the invention, the components of Current Sensor Module **218** have the following values: transformer T**1** is a CSE187-L low frequency current sense transformer available from Gopher Electronics, R**13** is 100.0 Ohms, R**14** and R**15** are 1.0 k Ohms, R**16** is 39.0 k Ohms, R**17** and R**18** are 100.0 k Ohms, R**19** is 10.0 k Ohms, C**19** and C**20** are 3.3 μF, amplifiers MC**4** and MC**5** are LM2904D single supply dual operational amplifiers available from ON Semiconductor®, and switching diodes D**1** and D**2** are CMOD6001 surface mount ULTRAmini™ low leakage silicon switching diodes available from Central™ Semiconductor Corp.

Processor Module **216** of Standby Lamp Module **100** has smart trigger circuitry that includes a soft start feature, overlap timer, and an advanced current sense algorithm. Processor Module **216** continuously monitors the electronic ballast current for HID Lamp **126**. If the current drops below one ampere for a period of time, typically about one to two seconds, then Standby Lamp Module **100** supplies direct current to turn on Auxiliary Lamp **114** in a gradual fashion, typically from off, or no current, to on, or total current, in about one to two seconds. This soft start feature reduces the inrush of current to Auxiliary Lamp **114** and helps prolong the bulb life of Auxiliary Lamp **114** as well as Standby Lamp Module **100** itself.

Auxiliary Lamp **114** is kept on until the electronic ballast current rises to a threshold current level, typically about one ampere, for more than two seconds, then an overlap timer starts to count down for a predetermined period of time, about fifteen minutes. This time may vary depending upon the individual characteristics of the HID lamp used. This count down time will vary, more or less, depending upon the characteristics of HID Lamp **126**. At the point where the electronic ballast current rises to the threshold current level and stabilizes, HID Lamp **126** starts to work properly, but the brightness is only about 20% of normal. The brightness level will increase slowly during the next fifteen minutes until 100% brightness is reached. Auxiliary Lamp **114** will be turned off when the overlap timer has count down fifteen minutes, and HID Lamp **126** has reached 100% brightness. Should the electronic ballast current drop again prior to reaching the fifteen minute count down, Processor Module **216** resets the overlap timer, and the fifteen minute count down begins again.

FIG. **3** shows a block flow diagram of the method of utilizing a power supply module with a standby lamp, used in conjunction with an HID lamp, of the present invention. Referring now to FIG. **3**, the method begins in step **302** when power is initially supplied to Standby Lamp Module **100**. The programs stored in the various microcontrollers initialize themselves in preparation for operation, setting ports, clocks, timers, and certain program variables.

In step **304**, Processor Module **216** begins monitoring the current being supplied to Electronic Ballast **118** by Line Voltage Supply **120**. Processor Module **216** continually checks in Step **306** for a drop in current below one ampere. When a drop in current is detected, then step **308** determines if the drop in current is sustained for a predetermined period of time, typically about one to two seconds. If the drop in current is less than the predetermined time, control returns to Step **304** where Processor Module **216** resumes checking for a drop in current. If step **308** determines that the drop in current exceeds the predetermined time, then in step **310** Standby Lamp Module **100** supplies current to soft start Auxiliary Lamp **114** in a gradual fashion over a predetermined period of time, typically in about one to two seconds.

In step **312**, Processor Module **216** resumes monitoring the current being supplied to Electronic Ballast **118** by Line Voltage Supply **120**. In step **314** Processor Module checks for a rise in current to a threshold current level, typically about one ampere. When the threshold current level is detected, then step **316** determines if the threshold current level is sustained for a predetermined period of time, typically for more than two seconds. If the threshold current level is held less than the predetermined time, control returns to Step **312** where Processor Module **216** resumes continually checking for a rise in current to a threshold current level. If step **316** determines that the threshold current level is sustained for the predetermined period of time, then in step **318** Processor Module **216** starts an overlap timer count down for an approximate fifteen minute period of time.

In step **320**, Processor Module **216** resumes monitoring the current being supplied to Electronic Ballast **118** by Line Voltage Supply **120**. Processor Module **216** checks in step **322** for a drop in current, typically below one ampere. If no drop in current of the predetermined amount is detected, then control flows to step **326**. When a drop in current is detected, then step **324** determines if the drop in current is sustained for a predetermined period of time, typically about one to two seconds. If the drop in current is less than the predetermined time, then control flows to step **326**. If step **324** determines that the drop in current exceeds the predetermined time, then control returns to step **318** where Processor Module **216** resets the overlap timer to begin again the approximate fifteen minute count down.

Step **326** determines if the count down has been completed. If not, then control returns to step **320** where Processor Module **216** continues to check for a drop in current until the count down is completed.

When step **326** determines that the count down has been completed, then in step **328** Processor Module **216** turns off the current that has been supplying Auxiliary Lamp **114**, and in step **330** resets the overlap timer. In step **332**, if Standby Lamp Module **100** is still in service, control returns to step **304** for continuation of the method, and if not, the method of the present invention ends.

Having described the present invention, it will be understood by those skilled in the art that many changes in construction and circuitry and widely differing embodiments and applications of the invention will suggest themselves without departing from the scope of the present invention.

What is claimed is:

1. An apparatus for standby lighting comprising:

a standby lamp module having a circuit, said circuit further comprising:

a current sensor module for sensing an alternating current from a line voltage supply;

a rectification module for converting said alternating current into a direct current;

a voltage sensor module for maintaining a constant output voltage by adjusting a switching frequency through sensing an input signal which is proportional to an input line voltage from said line voltage supply;

a processor module connectable to said current sensor module, said rectification module, and said voltage sensor module, for generating a switching duty cycle and a frequency to maintain a constant voltage direct current based upon input signals from said current sensor module and said voltage sensor module;

a power switching module connectable to said rectification module and to said processor module for outputting said constant voltage direct current; and wherein said power switching module produes said constant voltage direct current from said line voltage supply and not from a battery.

2. The apparatus according to claim **1** wherein said current sensor module further comprises a circuit having a transformer, at least one resistor, at least one polarized capacitor, at least one amplifier, and at least one switching diode.

3. The apparatus according to claim **1** wherein said rectification module further comprises a circuit having a full wave bridge rectifier, and at least one polarized capacitor.

4. The apparatus according to claim **1** wherein said voltage sensor module further comprises a circuit having at least one resistor, and at least one polarized capacitor.

5. The apparatus according to claim **1** wherein said power switching module further comprises a circuit having a low side metal oxide semiconductor field effect transistor driver, at least one polarized capacitor, at least one resistor, an inductor, a bipolar signal transistor, and a diode.

6. The apparatus according to claim **5** wherein said at least one polarized capacitor and said at least one resistor act as a snubber to reduce noise.

7. An apparatus for standby lighting comprising:

a standby lamp module having a circuit, said circuit further comprising:

a current sensor module for sensing an alternating current from a line voltage supply;

a rectification module for converting said alternating current into a direct current;

a voltage sensor module for maintaining a constant output voltage by adjusting a switching frequency through sensing an input signal which is proportional to an input line voltage from said line voltage supply;

a processor module connectable to said current sensor module, said rectification module, and said voltaae sensor module, for generating a switching duty cycle and a frequency to maintain a constant voltage direct current based upon input signals from said current sensor module and said voltage sensor module; and

a power switching module connectable to said rectification module and to said processor module for outputting said constant voltage direct current; wherein said standby lamp module further comprises:

a phase in terminal connectable to said circuit;

a phase out terminal connectable to said circuit;

a neutral terminal connectable to said circuit, wherein said line voltage supply is connectable between said phase in terminal and said neutral terminal;

a first output terminal;

a second output terminal, wherein said first and second output terminals are connected to said circuit; and

an auxiliary lamp connectable between said first and second output terminals, wherein said constant voltage direct current is supplied to said auxiliary lamp.

8. The apparatus according to claim **7** wherein said processor module further comprises a circuit having a polarized capacitor, a resistor, a control circuit direct current bus, and a microcontroller, wherein said processor module supplies said constant voltage direct current to said auxiliary lamp for a first predetermined period of time when said processor module detects a drop in current from said line voltage supply for a second predetermined period of time, wherein said first predetermined period of time is about fifteen minutes, and said second predetermined period of time is about one to two seconds.

9. The apparatus according to claim **8** further comprising:

a switching frequency output from said processor module to said power switching module, wherein said switching frequency output is held constant by said processor module by modifying said switching duty cycle based upon changes in said input line voltage.

10. The apparatus according to claim **9** wherein said microcontroller in said processor module further comprises:

a lookup table, wherein said processor module maintains said switching frequency output constant by comparing said input line voltage to a reload value stored in said lookup table, wherein said reload value is used to update said switching duty cycle.

11. The apparatus according to claim **9** wherein said switching frequency output has a frequency of 25 KHz.

12. The apparatus according to claim **7** further comprising:

an electronic ballast having a phase input terminal, a neutral input terminal, a first output terminal, and a second output terminal, wherein said phase out terminal of said standby lamp module is connectable to said phase input terminal, and said neutral terminal of said standby lamp module is connectable to said neutral input terminal; and

a high intensity discharge lamp connectable between said first and second output terminals of said electronic ballast.

13. The apparatus according to claim **7** wherein said input line voltage is between 200 to 300 volts, said auxiliary lamp is a quartz incandescent lamp, and said constant voltage direct current is 120 volts.

14. The apparatus according to claim **1** wherein said circuit further comprises:

a first logic power supply module for regulating the voltage for said power switching module.

15. The apparatus according to claim **14** wherein said first logic power supply module further comprises at least one resistor, at least one polarized capacitor, and a zener diode.

16. The apparatus according to claim **1** wherein said circuit further comprises:

a second logic power supply module for regulating the voltage for said processor module.

17. The apparatus according to claim **16** wherein said second logic power supply module further comprises at least one resistor, at least one polarized capacitor, a zener diode, a microcontroller, and a control circuit direct current bus.

18. The apparatus according to claim **1** wherein said circuit further comprises:

an overvoltage protection module for protecting said circuit from surge peaks and overvoltage.

19. The apparatus according to claim **18** wherein said overvoltage protection module further comprises at least one polarized capacitor, a metal oxide varistor, and a fuse.

20. The apparatus according to claim **1** wherein said circuit further comprises:

an electro magnetic interference filter module for reducing electro magnetic interference emissions to said input line voltage.

21. The apparatus according to claim **20** wherein said electro magnetic interference filter module further comprises at least one polarized capacitor, and at least one inductor.

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