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(54) STABILIZATION SYSTEM AND CURRENT CONTROLLER THEREOF

STABILISIERUNGSSYSTEM UND STROMSTEUERGERÄT DAFÜR

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Description

TECHNICAL FIELD

[0001] The present invention relates to a stabilization system and a current controller thereof, and more particularly, to a stabilization system for a conditional TRIAC (Triode for Alternating Current) controllable dimmer and a current controller designed for said stabilization system.

BACKGROUND

[0002] A conditional TRIAC (Triode for Alternating Current) dimmer may include a variable resistor, a constant resistor, a capacitor, a DIAC (Diode for Alternating Current) switch, and a TRIAC element. And the conventional TRIAC dimmer may further include a RC circuit that consists of the variable resistor, the constant resistor and the capacitor. After the conventional TRIAC dimmer is powered up, a current flow through the variable resistor, the constant resistor and then the capacitor for charging the capacitor. Moreover, when the capacitor is charged up to the DIAC switch's trigger voltage level, the DIAC switch is conducted, and the TRIAC element is in turn conducted, such that the TRIAC element starts charging a lamp that is connected to said TRIAC element.

[0003] As the variable resistor's resistance raises, the current that flows through the capacitor decreases, the capacitor's cross voltage will reach the DIAC switch's trigger voltage level slower, and the TRIAC element in turn conducts slower, such that part of a sinusoidal wave of an input AC voltage will not charge the capacitor. In turn, the lamp will receive lower energy and reduce its luminance. In summary, the higher the variable resistor's resistance is, the lower the lamp's luminance is.

[0004] For a LED (Light Emitting Diode) lamp that applies a TRIAC dimmer, the compatibility between the LED lamp and the TRIAC dimmer becomes a significant issue. Specifically, the conventional TRIAC dimmer is merely designed to process power of hundreds of watts for incandescent bulbs. However, for LED bulbs that consume merely less than twenty watts of power, such LED bulbs may not be capable of stably cooperating with the switches that are specifically designed for large scale of power, such that the LED bulbs may deteriorate its interaction with the conventional TRIAC dimmer. And in turn, such deteriorated interaction may introduce flickers in the LED lamp's illumination.

[0005] For example, EP2373124A1 provides a driver circuit for driving a lighting device, for being connected between a dimmed supply voltage and said lighting device. The driver circuit comprises a first bleeder resistor, which has a first end connected to a high-voltage terminal of the supply voltage, a second bleeder resistor, which has a first end connected to a low-voltage terminal of the supply voltage, a first semiconductor switching element connected between the second ends of the first and second bleeder resistors, and a second semiconductor switching element connected between the second end of the second bleeder resistor and the low-voltage terminal of the supply voltage. Under a further aspect, the invention provides a method for operating such a driver circuit. The method comprises detecting a predefined low-current phase of an input current of the driver circuit, the input current being below a predefined current threshold and the supply voltage being not below a predefined voltage threshold during the low-current phase. In a further step, upon detecting the low-current phase, a voltage drop across the second bleeder resistor is regulated during the low-current phase.

SUMMARY

[0006] The present disclosure aims at disclosing a stabilization system for a controllable dimmer. The stabilization system includes an AC power supply, a TRIAC (Triode for Alternating Current) dimmer circuit, a load conversion circuit and a current controller. First, the AC power supply provides an AC voltage. Second, the TRIAC dimmer circuit is electrically coupled to the AC power supply. Also, the TRIAC dimmer circuit dynamically generates a drive power. Third, the load conversion circuit is electrically coupled to the TRIAC dimmer circuit. In addition, the load conversion circuit filters noises off the drive power and drives an external LED unit using the filtered drive power. Fourth, the current controller is electrically coupled to the AC power supply, the TRIAC dimmer circuit and the load conversion circuit. Moreover, the current controller detects an activating phase of the AC voltage from the drive power. Specifically, during activating phase, the TRIAC dimmer circuit receives power from the AC power supply. Besides, the current controller keeps a sum of a buffer current of the current controller and a load current of the load conversion circuit to approximate a predetermined critical current value and to exceed an operating current of the TRIAC dimmer circuit in response to the detected activating phase of the AC voltage. Last, the TRIAC dimmer circuit further dynamically generates the drive power using the AC voltage and the TRIAC dimmer circuit's operating current in response to the activating phase of the AC voltage. The current controller includes a buffer current source, a buffer switch, a test resistor, a phase detection module and a current compensation module. The buffer current source is electrically coupled to the TRIAC dimmer circuit and the load conversion circuit. The buffer switch's drain terminal is electrically coupled to the buffer current source. The test resistor's first terminal electrically coupled to the load conversion circuit. Also, the test resistor's second terminal is electrically coupled to the AC power supply. The phase detection module's first terminal is electrically coupled to the TRIAC dimmer circuit. In addition, the phase detection module's second terminal is electrically coupled to a control terminal of the buffer switch. The current compensation module's sample terminal is electrically coupled to the load conversion circuit and the first terminal of the test resistor. Besides, the current compensation module's compensation terminal is electrically coupled to a control terminal of the buffer current source. The current compensation module receives the load current from the load conversion circuit. In addition, the current compensation module generates a compensation control signal to the control terminal of the buffer current source. In this way, the compensation control signal activates or deactivates the buffer current source in a manner that keeps the sum of the buffer current and the load current to approximate the predetermined critical current value and to exceed the operating current.

[0007] In one example, the stabilization system also includes a rectifier that is electrically coupled to the TRIAC dimmer circuit. Also, the rectifier rectifies the drive power.

[0008] In one example, the rectifier rectifies the drive power via half-bridge rectification.

[0009] In one example, the rectifier rectifies the drive power via full-bridge rectification.

[0010] In one example, the TRIAC dimmer circuit includes a variable resistor, a constant resistor, a DIAC (Diode for Alternating Current) switch, a capacitor and a TRIAC element. The variable resistor's first terminal is electrically coupled to the AC power supply. The constant resistor's first terminal is electrically coupled to a second terminal of the variable resistor. The DIAC switch's first terminal is electrically coupled to a second terminal of the constant resistor. The capacitor's first terminal is electrically coupled to a second terminal of the DIAC switch. Also, the capacitor's second terminal is electrically coupled to the load conversion circuit. The TRIAC element's trigger terminal is electrically coupled to a switch terminal of the DIAC switch. In addition, the TRIAC element's input terminal is electrically coupled to the AC power supply and the first terminal of the variable resistor. Besides, the TRIAC element's output terminal is electrically coupled to the load conversion circuit and a second terminal of the capacitor.

[0011] In one example, the DIAC switch triggers the TRIAC element when a cross voltage of the capacitor exceeds an activating threshold of the DIAC switch. Also, the TRIAC element powers up the load conversion circuit while being triggered by the DIAC switch.

[0012] In one example, the TRIAC dimmer circuit is implemented using a forward phase controller.

[0013] In one example, the TRIAC dimmer circuit is implemented using a reverse phase controller.

[0014] In one example, the phase detection module detects the activating phase of the AC voltage. Also, the phase detection module activates the buffer switch in response to the activating phase of the AC voltage.

[0015] In one example, the current compensation module renders the compensation control signal to deactivate the buffer current source when the load current is larger than the predetermined critical current value.

[0016] In one example, the current compensation module includes a voltage follower, an error amplifier and a voltage divider. The voltage follower's first input terminal is electrically coupled to an output terminal of the voltage follower. The error amplifier's first input terminal is electrically coupled to the output terminal of the voltage follower. Also, the error amplifier's second input terminal is electrically coupled to the load conversion circuit and the first terminal of the test resistor. Besides, the error amplifier's output terminal is electrically coupled to the control terminal of the buffer current source. The voltage divider's voltage dividing terminal is electrically coupled to a second input terminal of the voltage follower. Moreover, the voltage divider's ground terminal is electrically coupled to ground. In addition, the voltage divider's power terminal is electrically coupled to a direct-current (DC) voltage source.

[0017] In one example, the current compensation module also includes a capacitor. The capacitor's first terminal is electrically coupled to the first input terminal of the error amplifier. And the capacitor's second terminal is electrically coupled to the ground terminal of the voltage divider.

[0018] In one example, the voltage divider generates a constant divided voltage that corresponds to the predetermined critical current value.

[0019] In one example, the stabilization system also includes a voltage divider. The voltage divider's first terminal is electrically coupled to the TRIAC dimmer circuit and the load conversion circuit. Also, the voltage divider's second terminal is electrically coupled to the AC power supply and the second terminal of the test resistor. In addition, the voltage divider's voltage dividing terminal is electrically coupled to the first terminal of the phase detection module.

[0020] The present disclosure also discloses a current controller for a controllable dimmer. The current controller includes a buffer current source, a buffer switch, a test resistor, a phase detection module and a current compensation module. The buffer current source generates a buffer current in response to an external operating current of an TRIAC dimmer circuit. The buffer switch's drain terminal is electrically coupled to the buffer current source. The test resistor's first terminal receives a load current from an external load conversion circuit. The phase detection module is electrically coupled to a control terminal of the buffer switch. Also, the phase detection module detects an activating phase of an external AC voltage that synchronizes with the TRIAC dimmer circuit. In addition, the phase detection module activates the buffer switch in response to the activating phase of the AC voltage. The current compensation module's sample terminal is electrically coupled to the first terminal of the test resistor. Besides, the current compensation module's compensation terminal is electrically coupled to a control terminal of the buffer current source. And the current compensation module receives the load current. Moreover, the current compensation module generates a compensation control signal to the control terminal the buffer current source, such that the compensation control signal activates or deactivates the buffer current source in a manner that keeps the sum of the buffer current and the load current to approximate a predetermined critical current value and to exceed the operating current of the TRIAC dimmer circuit.

[0021] In one example, the current compensation module renders the compensation control signal to deactivate the buffer current source when the load current is larger than the predetermined critical current value.

[0022] In one example, the current compensation module includes a voltage follower, an error amplifier and a voltage divider. The voltage follower's first input terminal is electrically coupled to an output terminal of the voltage follower. The error amplifier's first input terminal is electrically coupled to the output terminal of the voltage follower. Also, the error amplifier's second input terminal is electrically coupled to the first terminal of the test resistor. Besides, the error amplifier's output terminal is electrically coupled to the control terminal of the buffer current source. The voltage divider's voltage dividing terminal is electrically coupled to a second input terminal of the voltage follower. Second, the voltage divider's ground terminal is electrically coupled to ground. Third, the voltage divider's power terminal is electrically coupled to a DC voltage source.

[0023] In one example, the current compensation module also includes a capacitor. The capacitor's first terminal is electrically coupled to the first input terminal of the error amplifier. And the capacitor's second terminal is electrically coupled to the ground terminal of the voltage divider.

[0024] In one example, the voltage divider generates a constant divided voltage that corresponds to the predetermined critical current value.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] FIG. 1, FIG. 2 and FIG. 3 illustrate schematic diagrams of a stabilization system for a controllable dimmer according to one embodiment of the present disclosure.

DESCRIPTION OF THE EMBODIMENTS

[0026] As mentioned above, the present disclosure discloses a stabilization system for a TRIAC (Triode for Alternating Current) controllable dimmer and a current controller designed for said stabilization system. The stabilization system aims at neutralizing the compatibility issue between the LED (Light Emitting Diode) bulbs for small scale of power and the conventional TRIAC dimmer that is designed for large scale of power. And the disclosed current controller acts as the core of fulfilling the stabilization system's functions.

[0027] FIG. 1, FIG. 2 and FIG. 3 illustrate schematic diagrams of a stabilization system 100 for a controllable dimmer according to one embodiment of the present disclosure. The stabilization system 100 includes an AC (Alternating Current) power supply 10, a TRIAC dimmer circuit 20, a load conversion circuit 30 and a current controller CP.

[0028] The AC power supply 10 provides an AC voltage. In some examples, the stabilization system 100 also includes a rectifier 11 that is electrically coupled to the TRIAC dimmer circuit 20. In addition, the rectifier 11 rectifies a drive power associated by the AC voltage. In some examples, the rectifier 11 rectifies the drive power via half-bridge rectification or full-bridge rectification. In this way, the AC voltage's negative voltage levels are transformed into positive voltage levels that have same absolute amplitudes in voltage level.

[0029] The TRIAC dimmer circuit 20 is electrically coupled to the AC power supply 10. Also, the TRIAC dimmer circuit 20 dynamically generates a drive power, e.g., by filtering, for aiding the load conversion circuit 30 in driving an external illuminating unit 60.

[0030] In some examples, the TRIAC dimmer circuit 20 includes a variable resistor 21, a constant resistor 22, a DIAC (Diode for Alternating Current) switch 24, a capacitor 23 and a TRIAC element 25. The variable resistor 21's first terminal is electrically coupled to the AC power supply 10. The constant resistor 22's first terminal is electrically coupled to a second terminal of the variable resistor 21. The DIAC switch 24's first terminal is electrically coupled to a second terminal of the constant resistor 22. The capacitor 23's first terminal is electrically coupled to a second terminal of the DIAC switch 24. Also, the capacitor 23's second terminal is electrically coupled to the load conversion circuit 30. The TRIAC element 25's trigger terminal is electrically coupled to a switch terminal of the DIAC switch 24. In addition, the TRIAC element 25's input terminal is electrically coupled to the AC power supply 10 and the first terminal of the variable resistor 21. Moreover, the TRIAC element 25's output terminal is electrically coupled to the load conversion circuit 30 and a second terminal of the capacitor 23.

[0031] The DIAC switch 24 triggers the TRIAC element 25 when a cross voltage of the capacitor 23 exceeds an activating threshold of the DIAC switch 24. Additionally, the TRIAC element 25 powers up the load conversion circuit 30 while being triggered by the DIAC switch 24.

[0032] As the variable resistor 21's resistance increases, a current flowing through the capacitor 23 decreases, such that the capacitor 23's cross voltage reaches the DIAC switch 24's trigger voltage in a slower manner. In turn, the TRIAC element 25 is corresponding conducted in a slower manner. As a result, the AC voltage from the AC power supply 10 will not be fully used in each of its duration (i.e., has some phase loss). Moreover, the drive power relayed to the load conversion circuit 30 decreases. And the illuminating unit 60's luminance decreases in response. In this way, the illuminating unit 60 can be substantially prevented from undesired power consumption.

[0033] In some examples, the TRIAC dimmer circuit

25 is implemented using a forward phase controller or a reverse phase controller.

[0034] The load conversion circuit 30 is electrically coupled to the TRIAC dimmer circuit 20. In addition, the load conversion circuit 30 filters noises off the drive power and drives the external LED unit 60 using the filtered drive power.

[0035] The current controller CP is electrically coupled to the AC power supply 10, the TRIAC dimmer circuit 20 and the load conversion circuit 30. Besides, the current controller CP detects an activating phase of the AC voltage from the drive power. Specifically, during the activating phase, the TRIAC dimmer circuit 20 receives power from the AC power supply 10. Moreover, the current controller CP keeps a sum of a buffer current Itc of the current controller CP and a load current load of the load conversion circuit 30 to (1) approximate a predetermined critical current value and to (2) exceed an operating current loop of the TRIAC dimmer circuit 20 in response to the detected activating phase of the AC voltage. Additionally, the TRIAC dimmer circuit 20 dynamically generates the drive power using the AC voltage and the TRIAC dimmer circuit 20's operating current loop in response to the activating phase of the AC voltage.

[0036] In some examples, the current controller CP includes a buffer current source TC, a buffer switch SW, a test resistor RT, a phase detection module 40 and a current compensation module 50. Also, the current controller CP can be exemplarily implemented using a programmable processor, such as at least one or a combination of a microprocessor, a digital signal processor (DSP), a programmable controller, an application specific integrated circuit (ASIC), and a RF (Radio-Frequency) SOC (System-On-Chip) system. Besides, the current controller CP may equip with a storage unit for storing parameters or failure records. The storage unit can be exemplarily implemented using an EEPROM (Electrically-Erasable Programmable Read-Only Memory).

[0037] The buffer current source TC is electrically coupled to the TRIAC dimmer circuit 20 and the load conversion circuit 30. The buffer switch SW's drain terminal is electrically coupled to the buffer current source TC for conducting a buffer current Itc or not. The test resistor RT's first terminal is electrically coupled to the load conversion circuit 30. Also, the test resistor RT's second terminal is electrically coupled to the AC power supply 10. The phase detection module 50's first terminal is electrically coupled to the TRIAC dimmer circuit 20. In addition, the phase detection module 50's second terminal is electrically coupled to a control terminal of the buffer switch SW. The current compensation module 50's sample terminal is electrically coupled to the load conversion circuit 30 and the first terminal of the test resistor RT. Moreover, the current compensation module 50's compensation terminal is electrically coupled to a control terminal of the buffer current source TC.

[0038] The phase detection module 40 detects the activating phase of the AC voltage. Therefore, the phase detection module 40 is capable of controlling the current compensation module 50's output period to limit its current consumption to a duration during which the TRIAC dimmer circuit 20 receives a current from the AC power supply 10. For such purpose, the phase detection module 40 activates the buffer switch SW in response to the activating phase of the AC voltage.

[0039] The current compensation module 50 receives the load current load from the load conversion circuit 30. Moreover, the current compensation module 50 generates a compensation control signal CC to the control terminal of the buffer current source TC, such that the current compensation module 50 activates or deactivates the buffer current source TC in a manner that keeps the sum of the buffer current Itc and the load current load to approximate the predetermined critical current value and to exceed the operating current loop.

[0040] In some examples, the current compensation module 50 also renders the compensation control signal CC to deactivate the buffer current source TC when the load current load is larger than the predetermined critical current value. That is, when the current compensation module 50 confirms that the sum of the buffer current Itc and the load current load is sufficient to activate the TRIAC element 25, the current compensation module 50 switches off the buffer current source TC's output current for efficient current/power consumption of both the AC power supply 10 and the TRIAC dimmer circuit 20.

[0041] In some examples, the current compensation module 50 includes a voltage follower 51, an error amplifier 52, and a voltage divider 511. The voltage follower 51's first input terminal is electrically coupled to its output terminal. The error amplifier 52's first input terminal is electrically coupled to the output terminal of the voltage follower 51. Also, the error amplifier 52's second input terminal is electrically coupled to the load conversion circuit 30 and the first terminal of the test resistor RT. In addition, the error amplifier 52's output terminal is electrically coupled to the control terminal of the buffer current source TC. The voltage divider 511's voltage dividing terminal is electrically coupled to a second input terminal of the voltage follower 51. In addition, the voltage divider 511's ground terminal is electrically coupled to ground. And the voltage divider 511's power terminal is electrically coupled to a direct-current (DC) voltage source VD. Specifically, in some examples, the voltage divider 511 includes two resistors 5111 and 5112 connected in series for generating a divided constant voltage VDS based on the DC voltage source VD. And the voltage divider 511's voltage dividing terminal is located at the intersection of the resistors 5111 and 5112 for relaying the divided voltage VDS to the voltage follower 51's second input terminal. It is noted that the divided voltage VDS corresponds to the predetermined critical value that a sum of the currents load and Itc should not exceed.

[0042] In some examples, the current compensation module 50 further includes a capacitor 512. The capacitor 512's first terminal is electrically coupled to the first input terminal of the error amplifier 52. Furthermore, the capacitor 512's second terminal is electrically coupled to the ground terminal of the voltage divider 511. Specifically, the combination of the capacitor 512, the error amplifier 52 and the voltage divider 511 forms a stable voltage source that has a high input impedance and a low output impedance, such that the current compensation module 50 can operate in a more stable manner. Also, the error amplifier 52 continuously and substantially compares the divided voltage VDS and the test resistor RT's cross voltage VRT for dynamically determining the compensation control signal CC and in turn for activating or deactivating the buffer switch SW. In this way, by appropriately setting the divided voltage VDS (e.g., by adjusting the resistor 5111 and 5112's resistances), the TRIAC dimmer circuit 20's operating current loop can be steadily controlled and maintained.

[0043] In some examples, the stabilization system 100 additionally includes another voltage divider RS. The voltage divider RS's first terminal is electrically coupled to the TRIAC dimmer circuit 20 and the load conversion circuit 30. Also, the voltage divider RS's second terminal is electrically coupled to the AC power supply 10 and the second terminal of the test resistor RT. In addition, the voltage divider RS' voltage dividing terminal is electrically coupled to the first terminal of the phase detection module 40.

[0044] In some examples, the voltage divider RS has two resistors RS1 and RS2 connected in series. The resistors RS1 and RS2's intersection generates a corresponding divided voltage VRS that is then relayed to the phase detection module 40 for detecting the activating phase of the AC voltage.

[0045] As mentioned above, since the TRIAC dimmer circuit 20's operating current loop can be maintained and prevented from undesired current/power consumption, the illuminating unit 60 that is driven by the load conversion circuit 30 (via the drive power/operating current from the TRIAC dimmer circuit 20) will not have flickers in its luminance and can be efficient in its consumed current/power.

Claims

1. A stabilization system (100) for a controllable dimmer, comprising:

an AC power supply (10) configured to provide an AC voltage;
a TRIAC dimmer circuit (20) electrically coupled to the AC power supply (10), and configured to dynamically generate a drive power;
a load conversion circuit (30) electrically coupled to the TRIAC dimmer circuit (20) and configured to filter noises off the drive power and drive an external LED unit (60) using the filtered drive power; and
a current controller (CP) electrically coupled to the AC power supply (10), the TRIAC dimmer circuit (20) and the load conversion circuit (30), configured to detect an activating phase of the AC voltage from the drive power, during which the TRIAC dimmer circuit (20) receives power from the AC power supply (10), and configured to keep a sum of a buffer current of the current controller (CP) and a load current of the load conversion circuit (30) to approximate a predetermined critical current value and to exceed an operating current of the TRIAC dimmer circuit (20) in response to the detected activating phase of the AC voltage;
wherein the TRIAC dimmer circuit (20) is further configured to dynamically generate the drive power using the AC voltage and the TRIAC dimmer circuit (20) 's operating current in response to the activating phase of the AC voltage;
characterized in that, the current controller (CP) comprises:

a buffer current source (TC) electrically coupled to the TRIAC dimmer circuit (20) and the load conversion circuit (30);
a buffer switch (SW) having a drain terminal electrically coupled to the buffer current source (TC);
a test resistor (RT) having a first terminal electrically coupled to the load conversion circuit (30), and having a second terminal electrically coupled to the AC power supply (10);
a phase detection module (40) having a first terminal electrically coupled to the TRIAC dimmer circuit (20), and having a second terminal electrically coupled to a control terminal of the buffer switch (SW), configured to detect an activating phase of the AC voltage that synchronizes with the TRIAC dimmer circuit (20), and configured to activate the buffer switch (SW) in response to the activating phase of the AC voltage; and
a current compensation module (50), having a sample terminal electrically coupled to the load conversion circuit (30) and the first terminal of the test resistor (RT), and having a compensation terminal electrically coupled to a control terminal of the buffer current source (TC);
wherein the current compensation module (50) is configured to receive the load current from the load conversion circuit (30), and configured to generate a compensation control signal to the control terminal of the buffer current source (TC) for activating or deactivating the buffer current source (TC) in a manner that keeps the sum of the buffer

current and the load current to approximate the predetermined critical current value and to exceed the operating current of the TRIAC dimmer circuit (20).

2. The stabilization system (100) of claim 1, further comprising:
a rectifier (11) electrically coupled to the TRIAC dimmer circuit (20), and configured to rectify the drive power.

3. The stabilization system (100) of claim 2, **characterized in that**, the rectifier (11) is further configured to rectify the drive power via half-bridge rectification.

4. The stabilization system (100) of claim 2, **characterized in that**, the rectifier (11) is further configured to rectify the drive power via full-bridge rectification.

5. The stabilization system (100) of claim 1, **characterized in that**, the TRIAC dimmer (20) circuit comprises:

a variable resistor (21) having a first terminal electrically coupled to the AC power supply (10);
a constant resistor (22) having a first terminal electrically coupled to a second terminal of the variable resistor (21);
a DIAC switch (24) having a first terminal electrically coupled to a second terminal of the constant resistor (22);
a capacitor (23) having a first terminal electrically coupled to a second terminal of the DIAC switch (24), and having a second terminal electrically coupled to the load conversion circuit (30); and
a TRIAC element (25) having a trigger terminal electrically coupled to a switch terminal of the DIAC switch (24), having an input terminal electrically coupled to the AC power supply and the first terminal of the variable resistor (21), and having an output terminal electrically coupled to the load conversion circuit (30) and a second terminal of the capacitor (23).

6. The stabilization system (100) of claim 5, **characterized in that**, the DIAC switch (24) is configured to trigger the TRIAC element (25) when a cross voltage of the capacitor (23) exceeds an activating threshold of the DIAC switch (24); and
wherein the TRIAC element (25) is configured to power up the load conversion circuit (30) while being triggered by the DIAC switch (24).

7. The stabilization system (100) of claim 1, **characterized in that**, the TRIAC dimmer circuit (20) is implemented using a forward phase controller.

8. The stabilization system (100) of claim 1, **characterized in that**, the TRIAC dimmer circuit (20) is implemented using a reverse phase controller.

9. The stabilization system (100) of claim 1, **characterized in that**, the phase detection module (40) is configured to detect the activating phase of the AC voltage, and configured to activate the buffer switch (SW) in response to the activating phase of the AC voltage.

10. The stabilization system (100) of claim 1, **characterized in that**, the current compensation module (50) is further configured to render the compensation control signal to deactivate the buffer current source (TC) when the load current is larger than the predetermined critical current value.

11. The stabilization system (100) of claim 1, **characterized in that**, the current compensation module (50) comprises:

a voltage follower (51) having a first input terminal electrically coupled to an output terminal of the voltage follower (51);
an error amplifier (52),having a first input terminal electrically coupled to the output terminal of the voltage follower (51), having a second input terminal electrically coupled to the load conversion circuit (30) and the first terminal of the test resistor (RT), and having an output terminal electrically coupled to the control terminal of the buffer current source (TC); and
a voltage divider (511) having a voltage dividing terminal electrically coupled to a second input terminal of the voltage follower (51), having a ground terminal electrically coupled to ground, and having a power terminal electrically coupled to a DC voltage source (VD).

12. The stabilization system (100) of claim 11, **characterized in that**, the current compensation module (50) further comprises:
a capacitor (512) having a first terminal electrically coupled to the first input terminal of the error amplifier (52), and having a second terminal electrically coupled to the ground terminal of the voltage divider (511).

13. The stabilization system (100) of claim 11, **characterized in that**, the voltage divider (511) is configured to generate a constant divided voltage that corresponds to the predetermined critical current value.

14. The stabilization system (100) of claim 1, further comprising:
a voltage divider (RS) having a first terminal electrically coupled to the TRIAC dimmer circuit (20) and

the load conversion circuit (30), having a second terminal electrically coupled to the AC power supply (10) and the second terminal of the test resistor (RT), and having a voltage dividing terminal electrically coupled to the first terminal of the phase detection module (40).

15. A current controller (CP) for a controllable dimmer, comprising:

a buffer current source (TC) configured to generate a buffer current in response to an external operating current of an TRIAC dimmer circuit (20);
a buffer switch (SW) having a drain terminal electrically coupled to the buffer current source (TC);
a test resistor (RT) having a first terminal to receive a load current from an external load conversion circuit (30);
a phase detection module (40) electrically coupled to a control terminal of the buffer switch (SW), configured to detect an activating phase of an AC voltage that synchronizes with the TRIAC dimmer circuit (20), and configured to activate the buffer switch (SW) in response to the activating phase of the AC voltage; and
a current compensation module (50) having a sample terminal electrically coupled to the first terminal of the test resistor (RT), and having a compensation terminal electrically coupled to a control terminal of the buffer current source (TC), wherein the current compensation module (50) is configured to receive the load current, and is configured to generate a compensation control signal to the control terminal of the buffer current source (TC) for activating or deactivating the buffer current source (TC) in a manner that keeps the sum of the buffer current and the load current to approximate a predetermined critical current value and to exceed the operating current of the TRIAC dimmer circuit.

16. The current controller (CP) of claim 15, **characterized in that**, the current compensation module (50) is further configured to render the compensation control signal to deactivate the buffer current source when the load current is larger than the predetermined critical current value.

17. The current controller (CP) of claim 15, **characterized in that**, the current compensation module comprises:

a voltage follower (51) having a first input terminal electrically coupled to an output terminal of the voltage follower (51);
an error amplifier (52) having a first input terminal electrically coupled to the output terminal of the voltage follower (51), having a second input terminal electrically coupled to the first terminal of the test resistor (RT), and having an output terminal electrically coupled to the control terminal of the buffer current source (TC); and
a voltage divider (511) having a voltage dividing terminal electrically coupled to a second input terminal of the voltage follower (51), having a ground terminal electrically coupled to ground, and having a power terminal electrically coupled to a DC voltage source (VD).

18. The current controller (CP) of claim 17, **characterized in that**, the current compensation module (50) further comprises:
a capacitor (512) having a first terminal electrically coupled to the first input terminal of the error amplifier (52), and having a second terminal electrically coupled to the ground terminal of the voltage divider (511).

Patentansprüche

1. Stabilisierungssystem (100) für einen steuerbaren Dimmer, umfassend:

eine Wechselstromversorgung (10), die dafür ausgelegt ist, eine Wechselspannung zu liefern;
eine TRIAC-Dimmerschaltung (20), die mit der Wechselstromversorgung (10) elektrisch gekoppelt ist und die dafür ausgelegt ist, eine Antriebsleistung dynamisch zu erzeugen;
eine Last-Umwandlungsschaltung (30), die mit der TRIAC-Dimmerschaltung (20) elektrisch gekoppelt ist und die dafür ausgelegt ist, Geräusche aus der Antriebsleistung auszufiltern und eine externe LED-Einheit (60) unter Verwendung der gefilterten Antriebsleistung anzutreiben; und
ein Stromsteuergerät (CP), das mit der Wechselstromversorgung (10), der TRIAC-Dimmerschaltung (20) und der Last-Umwandlungsschaltung (30) elektrisch gekoppelt ist, das dafür ausgelegt ist, eine Aktivierungsphase der Wechselspannung von der Antriebsleistung zu detektieren, während welcher die TRIAC-Dimmerschaltung (20) Leistung von der Wechselstromversorgung (10) empfängt, und das dafür ausgelegt ist, eine Summe eines Pufferstroms des Stromsteuergeräts (CP) und eines Laststroms der Last-Umwandlungsschaltung (30) zu halten, um einem vorbestimmten kritischen Stromwert nahezukommen und einen Betriebsstrom der TRIAC-Dimmerschaltung (20) in Erwiderung auf die detektierte Aktivierungsphase der Wechselspannung zu überschreiten;

worin die TRIAC-Dimmerschaltung (20) ferner dafür ausgelegt ist, die Antriebsleistung unter Verwendung der Wechselspannung und des Betriebsstroms der TRIAC-Dimmerschaltung (20) in Erwiderung auf die Aktivierungsphase der Wechselspannung dynamisch zu erzeugen; **dadurch gekennzeichnet, dass** das Stromsteuergerät (CP) umfasst:

eine Pufferstromquelle (TC), die mit der TRIAC-Dimmerschaltung (20) und mit der Last-Umwandlungsschaltung (30) elektrisch gekoppelt ist;
einen Pufferschalter (SW), der einen Drain-Anschluss aufweist, der mit der Pufferstromquelle (TC) elektrisch gekoppelt ist;
einen Prüfwiderstand (RT), der einen ersten Anschluss aufweist, der mit der Last-Umwandlungsschaltung (30) elektrisch gekoppelt ist, und der einen zweiten Anschluss aufweist, der mit der Wechselstromversorgung (10) elektrisch gekoppelt ist;
ein Phasendetektionsmodul (40), das einen ersten Anschluss aufweist, der mit der TRIAC-Dimmerschaltung (20) elektrisch gekoppelt ist, und der einen zweiten Anschluss aufweist, der mit einem Steueranschluss des Pufferschalters (SW) elektrisch gekoppelt ist, der dafür ausgelegt ist, eine Aktivierungsphase der Wechselspannung zu detektieren, die sich mit der TRIAC-Dimmerschaltung (20) synchronisiert, und der dafür ausgelegt ist, den Pufferschalter (SW) in Erwiderung auf die Aktivierungsphase der Wechselspannung zu aktivieren; und
ein Stromausgleichsmodul (50), das einen Abtastanschluss aufweist, der mit der Last-Umwandlungsschaltung (30) und mit dem ersten Anschluss des Prüfwiderstands (RT) elektrisch gekoppelt ist, und das einen Ausgleichsanschluss aufweist, der mit einem Steueranschluss der Pufferstromquelle (TC) elektrisch gekoppelt ist;
worin das Stromausgleichsmodul (50) dafür ausgelegt ist, den Laststrom von der Last-Umwandlungsschaltung (30) zu empfangen, und dafür ausgelegt ist, ein Ausgleichssteuersignal an den Steueranschluss der Pufferstromquelle (TC) zu erzeugen, um die Pufferstromquelle (TC) in einer Weise zu aktivieren oder zu deaktivieren, die die Summe des Pufferstroms und des Laststroms so hält, um dem vorbestimmten kritischen Stromwert nahezukommen und den Betriebsstrom der TRIAC-Dimmerschaltung (20) zu überschreiten.

2. Stabilisierungssystem (100) nach Anspruch 1, ferner umfassend:
einen Gleichrichter (11), der mit der TRIAC-Dimmerschaltung (20) elektrisch gekoppelt ist und dafür ausgelegt ist, die Antriebsleistung gleichzurichten.

3. Stabilisierungssystem (100) nach Anspruch 2, **dadurch gekennzeichnet, dass** der Gleichrichter (11) ferner dafür ausgelegt ist, die Antriebsleistung über Halbbrückengleichrichtung gleichzurichten.

4. Stabilisierungssystem (100) nach Anspruch 2, **dadurch gekennzeichnet, dass** der Gleichrichter (11) ferner dafür ausgelegt ist, die Antriebsleistung über Vollbrückengleichrichtung gleichzurichten.

5. Stabilisierungssystem (100) nach Anspruch 1, **dadurch gekennzeichnet, dass** die TRIAC-Dimmerschaltung (20) umfasst:

einen veränderlichen Widerstand (21), der einen ersten Anschluss aufweist, der mit der Wechselstromversorgung (10) elektrisch gekoppelt ist;
einen konstanten Widerstand (22), der einen ersten Anschluss aufweist, der mit einem zweiten Anschluss des veränderlichen Widerstands (21) elektrisch gekoppelt ist;
einen DIAC-Schalter (24), der einen ersten Anschluss aufweist, der mit einem zweiten Anschluss des konstanten Widerstands (22) elektrisch gekoppelt ist;
einen Kondensator (23), der einen ersten Anschluss aufweist, der mit einem zweiten Anschluss des DIAC-Schalters (24) elektrisch gekoppelt ist, und der einen zweiten Anschluss aufweist, der mit der Last-Umwandlungsschaltung (30) elektrisch gekoppelt ist; und
ein TRIAC-Element (25), das einen Trigger-Anschluss aufweist, der mit einem Schalteranschluss des DIAC-Schalters (24) elektrisch gekoppelt ist, einen Eingangsanschluss aufweist, der mit der Wechselstromversorgung und dem ersten Anschluss des veränderlichen Widerstands (21) elektrisch gekoppelt ist, und einen Ausgangsanschluss aufweist, der mit der Last-Umwandlungsschaltung (30) und einem zweiten Anschluss des Kondensators (23) elektrisch gekoppelt ist.

6. Stabilisierungssystem (100) nach Anspruch 5, **dadurch gekennzeichnet, dass** der DIAC-Schalter (24) dafür ausgelegt ist, das TRIAC-Element (25) zu triggern, wenn eine Querspannung des Kondensators (23) eine Aktivierungsschwelle des DIAC-Schalters (24) überschreitet; und
worin das TRIAC-Element (25) dafür ausgelegt ist, die Last-Umwandlungsschaltung (30) einzuschalten, während es vom DIAC-Schalter (24) getriggert

wird.

7. Stabilisierungssystem (100) nach Anspruch 1, **dadurch gekennzeichnet, dass** die TRIAC-Dimmerschaltung (20) unter Verwendung eines Vorwärtsphasensteuergeräts implementiert wird.

8. Stabilisierungssystem (100) nach Anspruch 1, **dadurch gekennzeichnet, dass** die TRIAC-Dimmerschaltung (20) unter Verwendung eines Rückwärtsphasensteuergeräts implementiert wird.

9. Stabilisierungssystem (100) nach Anspruch 1, **dadurch gekennzeichnet, dass** das Phasendetektionsmodul (40) dafür ausgelegt ist, die Aktivierungsphase der Wechselspannung zu detektieren, und dafür ausgelegt ist, den Pufferschalter (SW) in Erwiderung auf die Aktivierungsphase der Wechselspannung zu aktivieren.

10. Stabilisierungssystem (100) nach Anspruch 1, **dadurch gekennzeichnet, dass** das Stromausgleichsmodul (50) ferner dafür ausgelegt ist, das Ausgleichssteuersignal wiederzugeben, um die Pufferstromquelle (TC) zu deaktivieren, wenn der Laststrom größer ist als der vorbestimmte kritische Stromwert.

11. Stabilisierungssystem (100) nach Anspruch 1, **dadurch gekennzeichnet, dass** das Stromausgleichsmodul (50) umfasst:

    einen Spannungsfolger (51), der einen ersten Eingangsanschluss aufweist, der mit einem Ausgangsanschluss des Spannungsfolgers (51) elektrisch gekoppelt ist;
    einen Fehlerverstärker (52), der einen ersten Eingangsanschluss aufweist, der mit dem Ausgangsanschluss des Spannungsfolgers (51) elektrisch gekoppelt ist, einen zweiten Eingangsanschluss aufweist, der mit der Last-Umwandlungsschaltung (30) und dem ersten Anschluss des Prüfwiderstands (RT) elektrisch gekoppelt ist, und einen Ausgangsanschluss aufweist, der mit dem Steueranschluss der Pufferstromquelle (TC) elektrisch gekoppelt ist; und
    einen Spannungsteiler (511), der einen Spannungsteilungsanschluss aufweist, der mit einem zweiten Eingangsanschluss des Spannungsfolgers (51) elektrisch gekoppelt ist, einen Erdanschluss aufweist, der mit der Erde elektrisch gekoppelt ist, und einen Leistungsanschluss aufweist, der mit einer Gleichspannungsquelle (VD) elektrisch gekoppelt ist.

12. Stabilisierungssystem (100) nach Anspruch 11, **dadurch gekennzeichnet, dass** das Stromausgleichsmodul (50) ferner umfasst:
einen Kondensator (512), der einen ersten Anschluss aufweist, der mit dem ersten Eingangsanschluss des Fehlerverstärkers (52) elektrisch gekoppelt ist, und der einen zweiten Anschluss aufweist, der mit dem Erdanschluss des Spannungsteilers (511) elektrisch gekoppelt ist.

13. Stabilisierungssystem (100) nach Anspruch 11, **dadurch gekennzeichnet, dass** der Spannungsteiler (511) dafür ausgelegt ist, eine konstante geteilte Spannung zu erzeugen, die dem vorbestimmten kritischen Stromwert entspricht.

14. Stabilisierungssystem (100) nach Anspruch 1, ferner umfassend:
einen Spannungsteiler (RS), der einen ersten Anschluss aufweist, der mit der TRIAC-Dimmerschaltung (20) und der Last-Umwandlungsschaltung (30) elektrisch gekoppelt ist, einen zweiten Anschluss aufweist, der mit der Wechselstromversorgung (10) und dem zweiten Anschluss des Prüfwiderstands (RT) elektrisch gekoppelt ist, und einen Spannungsteilungsanschluss aufweist, der mit dem ersten Anschluss des Phasendetektionsmoduls (40) elektrisch gekoppelt ist.

15. Stromsteuergerät (CP) für einen steuerbaren Dimmer, umfassend:

    eine Pufferstromquelle (TC), die dafür ausgelegt ist, einen Pufferstrom in Erwiderung auf einen externen Betriebsstrom einer TRIAC-Dimmerschaltung (20) zu erzeugen;
    einen Pufferschalter (SW), der einen Drain-Anschluss aufweist, der mit der Pufferstromquelle (TC) elektrisch gekoppelt ist;
    einen Prüfwiderstand (RT), der einen ersten Anschluss aufweist, um einen Laststrom von einer externen Last-Umwandlungsschaltung (30) zu empfangen;
    ein Phasendetektionsmodul (40), das mit einem Steueranschluss des Pufferschalters (SW) elektrisch gekoppelt ist, der dafür ausgelegt ist, eine Aktivierungsphase einer Wechselspannung zu detektieren, die sich mit der TRIAC-Dimmerschaltung (20) synchronisiert, und der dafür ausgelegt ist, den Pufferschalter (SW) in Erwiderung auf die Aktivierungsphase der Wechselspannung zu aktivieren; und
    ein Stromausgleichsmodul (50), das einen Abtastanschluss aufweist, der mit dem ersten Anschluss des Prüfwiderstands (RT) elektrisch gekoppelt ist, und das einen Ausgleichsanschluss aufweist, der mit einem Steueranschluss der Pufferstromquelle (TC) elektrisch gekoppelt ist, worin das Stromausgleichsmodul (50) dafür ausgelegt ist, den Laststrom zu empfangen, und dafür ausgelegt ist, ein Ausgleichssteuersignal

an den Steueranschluss der Pufferstromquelle (TC) zu erzeugen, um die Pufferstromquelle (TC) in einer Weise zu aktivieren oder zu deaktivieren, die die Summe des Pufferstroms und des Laststroms so hält, um einem vorbestimmten kritischen Stromwert nahezukommen und den Betriebsstrom der TRIAC-Dimmerschaltung zu überschreiten.

16. Stromsteuergerät (CP) nach Anspruch 15, **dadurch gekennzeichnet, dass** das Stromausgleichsmodul (50) ferner dafür ausgelegt ist, das Ausgleichssteuersignal wiederzugeben, um die Pufferstromquelle zu deaktivieren, wenn der Laststrom größer ist als der vorbestimmte kritische Stromwert.

17. Stromsteuergerät (CP) nach Anspruch 15, **dadurch gekennzeichnet, dass** das Stromausgleichsmodul umfasst:

einen Spannungsfolger (51), der einen ersten Eingangsanschluss aufweist, der mit einem Ausgangsanschluss des Spannungsfolgers (51) elektrisch gekoppelt ist;
einen Fehlerverstärker (52), der einen ersten Eingangsanschluss aufweist, der mit dem Ausgangsanschluss des Spannungsfolgers (51) elektrisch gekoppelt ist, einen zweiten Eingangsanschluss aufweist, der mit dem ersten Anschluss des Prüfwiderstands (RT) elektrisch gekoppelt ist, und einen Ausgangsanschluss aufweist, der mit dem Steueranschluss der Pufferstromquelle (TC) elektrisch gekoppelt ist; und
einen Spannungsteiler (511), der einen Spannungsteilungsanschluss aufweist, der mit einem zweiten Eingangsanschluss des Spannungsfolgers (51) elektrisch gekoppelt ist, einen Erdanschluss aufweist, der mit der Erde elektrisch gekoppelt ist, und einen Leistungsanschluss aufweist, der mit einer Gleichspannungsquelle (VD) elektrisch gekoppelt ist.

18. Stromsteuergerät (CP) nach Anspruch 17, **dadurch gekennzeichnet, dass** das Stromausgleichsmodul (50) ferner umfasst:
einen Kondensator (512), der einen ersten Anschluss aufweist, der mit dem ersten Eingangsanschluss des Fehlerverstärkers (52) elektrisch gekoppelt ist, und der einen zweiten Anschluss aufweist, der mit dem Erdanschluss des Spannungsteilers (511) elektrisch gekoppelt ist.

Revendications

1. Système de stabilisation (100) pour un variateur réglable, comprenant :

une alimentation en courant alternatif (10) configurée pour fournir une tension alternative ;
un circuit variateur de TRIAC (20) couplé électriquement à l'alimentation en courant alternatif (10) et configuré pour générer dynamiquement une puissance d'entraînement ;
un circuit de conversion de charge (30) couplé électriquement au circuit variateur de TRIAC (20) et configuré pour filtrer les bruits hors de la puissance d'entraînement et pour entraîner une unité LED externe (60) en utilisant la puissance d'entraînement filtrée ; et
un régulateur de courant (CP) couplé électriquement à l'alimentation en courant alternatif (10), au circuit variateur de TRIAC (20) et au circuit de conversion de charge (30), configuré pour détecter une phase d'activation de la tension en courant alternatif à partir de la puissance d'entraînement, au cours de laquelle le circuit variateur de TRIAC (20) reçoit de l'énergie de l'alimentation en courant alternatif (10), et configuré pour maintenir une somme d'un courant de tampon du régulateur de courant (CP) et d'un courant de charge du circuit de conversion de charge (30) pour approcher une valeur de courant critique prédéterminée et pour dépasser un courant de fonctionnement du circuit variateur de TRIAC (20) en réponse à la phase d'activation détectée de la tension en courant alternatif ;
dans lequel le circuit variateur de TRIAC (20) est en outre configuré pour générer dynamiquement la puissance d'entraînement en utilisant la tension alternative et le courant de fonctionnement du circuit variateur de TRIAC (20) en réponse à la phase d'activation de la tension alternative ;
caractérisé en ce que le régulateur de courant (CP) comprend :

une source de courant de tampon (TC) couplée électriquement au circuit variateur de TRIAC (20) et au circuit de conversion de charge (30) ;
un commutateur de tampon (SW) ayant une borne de drain couplée électriquement à la source de courant de tampon (TC) ;
une résistance de test (RT) ayant une première borne couplée électriquement au circuit de conversion de charge (30), et ayant une seconde borne couplée électriquement à l'alimentation en courant alternatif (10) ;
un module de détection de phase (40) ayant une première borne couplée électriquement au circuit variateur de TRIAC (20), et ayant une seconde borne couplée électriquement à une borne de commande du commutateur de tampon (SW), configuré pour détecter une phase d'activation de la

tension alternative qui se synchronise avec le circuit variateur de TRIAC (20), et configuré pour activer le commutateur de tampon (SW) en réponse à la phase d'activation de la tension alternative ; et un module de compensation de courant (50), ayant une borne d'échantillonnage couplée électriquement au circuit de conversion de charge (30) et à la première borne de la résistance de test (RT), et ayant une borne de compensation couplée électriquement à une borne de commande de la source de courant de tampon (TC) ;
dans lequel le module de compensation de courant (50) est configuré pour recevoir le courant de charge provenant du circuit de conversion de charge (30), et configuré pour générer un signal de commande de compensation vers la borne de commande de la source de courant de tampon (TC) pour activer ou désactiver la source de courant de tampon (TC) d'une manière qui conserve la somme du courant de tampon et du courant de charge pour approcher la valeur de courant critique prédéterminée et pour dépasser le courant de fonctionnement du circuit variateur de TRIAC (20).

2. Système de stabilisation (100) selon la revendication 1, comprenant en outre :
un redresseur (11) couplé électriquement au circuit variateur de TRIAC (20), et configuré pour redresser la puissance d'entraînement.

3. Système de stabilisation (100) selon la revendication 2, **caractérisé en ce que** le redresseur (11) est en outre configuré pour redresser la puissance d'entraînement par l'intermédiaire d'un redressement en demi-pont.

4. Système de stabilisation (100) selon la revendication 2, **caractérisé en ce que** le redresseur (11) est en outre configuré pour redresser la puissance d'entraînement par l'intermédiaire d'un redressement en pont complet.

5. Système de stabilisation (100) selon la revendication 1, **caractérisé en ce que** le circuit variateur de TRIAC (20) comprend :

une résistance variable (21) ayant une première borne couplée électriquement à l'alimentation en courant alternatif (10) ;
une résistance constante (22) ayant une première borne couplée électriquement à une seconde borne de la résistance variable (21) ;
un commutateur DIAC (24) ayant une première borne couplée électriquement à une seconde borne de la résistance constante (22) ;
un condensateur (23) ayant une première borne couplée électriquement à une seconde borne du commutateur DIAC (24), et ayant une seconde borne couplée électriquement au circuit de conversion de charge (30) ; et
un élément TRIAC (25) ayant une borne de déclenchement couplée électriquement à une borne de commutation du commutateur DIAC (24), ayant une borne d'entrée couplée électriquement à l'alimentation en courant alternatif et à la première borne de la résistance variable (21), et ayant une borne de sortie couplée électriquement au circuit de conversion de charge (30) et à une seconde borne du condensateur (23).

6. Système de stabilisation (100) selon la revendication 5, **caractérisé en ce que** le commutateur DIAC (24) est configuré pour déclencher l'élément TRIAC (25) lorsqu'une tension croisée du condensateur (23) dépasse un seuil d'activation du commutateur DIAC (24) ; et
dans lequel l'élément TRIAC (25) est configuré pour alimenter le circuit de conversion de charge (30) tout en étant déclenché par le commutateur DIAC (24).

7. Système de stabilisation (100) selon la revendication 1, **caractérisé en ce que** le circuit variateur de TRIAC (20) est mis en oeuvre en utilisant un contrôleur de phase avant.

8. Système de stabilisation (100) selon la revendication 1, **caractérisé en ce que** le circuit variateur de TRIAC (20) est mis en oeuvre en utilisant un contrôleur de phase inverse.

9. Système de stabilisation (100) selon la revendication 1, **caractérisé en ce que** le module de détection de phase (40) est configuré pour détecter la phase d'activation de la tension alternative, et configuré pour activer le commutateur de tampon (SW) en réponse à la phase d'activation de la tension alternative.

10. Système de stabilisation (100) selon la revendication 1, **caractérisé en ce que** le module de compensation de courant (50) est en outre configuré pour rendre le signal de commande de compensation pour désactiver la source de courant de tampon (TC) lorsque le courant de charge est supérieur à la valeur de courant critique prédéterminée.

11. Système de stabilisation (100) selon la revendication 1, **caractérisé en ce que**, le module de compensation de courant (50) comprend :

un suiveur de tension (51) ayant une première borne d'entrée couplée électriquement à une borne de sortie du suiveur de tension (51) ;

un amplificateur d'erreur (52), ayant une première borne d'entrée couplée électriquement à la borne de sortie du suiveur de tension (51), ayant une seconde borne d'entrée couplée électriquement au circuit de conversion de charge (30) et à la première borne de la résistance de test (RT), et ayant une borne de sortie couplée électriquement à la borne de commande de la source de courant de tampon (TC) ; et
un diviseur de tension (511) ayant une borne de division de tension couplée électriquement à une seconde borne d'entrée du suiveur de tension (51), ayant une borne de masse couplée électriquement à la masse, et ayant une borne d'alimentation couplée électriquement à une source de tension continue (VD).

12. Système de stabilisation (100) selon la revendication 11, **caractérisé en ce que**, le module de compensation de courant (50) comprend en outre :
un condensateur (512) ayant une première borne couplée électriquement à la première borne d'entrée de l'amplificateur d'erreur (52), et ayant une seconde borne couplée électriquement à la borne de masse du diviseur de tension (511).

13. Système de stabilisation (100) selon la revendication 11, **caractérisé en ce que** le diviseur de tension (511) est configuré pour générer une tension divisée constante qui correspond à la valeur de courant critique prédéterminée.

14. Système de stabilisation (100) selon la revendication 1, comprenant en outre :
un diviseur de tension (RS) ayant une première borne couplée électriquement au circuit variateur de TRIAC (20) et au circuit de conversion de charge (30), ayant une seconde borne couplée électriquement à l'alimentation en courant alternatif (10) et à la seconde borne de la résistance de test (RT), et ayant une borne de division de tension couplée électriquement à la première borne du module de détection de phase (40).

15. Régulateur de courant (CP) pour un variateur réglable, comprenant :

une source de courant de tampon (TC) configurée pour générer un courant de tampon en réponse à un courant de fonctionnement externe d'un circuit variateur de TRIAC (20) ;
un commutateur de tampon (SW) ayant une borne de drain couplée électriquement à la source de courant de tampon (TC) ;
une résistance de test (RT) ayant une première borne pour recevoir un courant de charge d'un circuit de conversion de charge externe (30) ;
un module de détection de phase (40) couplé électriquement à une borne de commande du commutateur de tampon (SW), configuré pour détecter une phase d'activation d'une tension alternative qui se synchronise avec le circuit variateur de TRIAC (20), et configuré pour activer le commutateur de tampon (SW) en réponse à la phase d'activation de la tension alternative ; et
un module de compensation de courant (50) ayant une borne d'échantillonnage couplée électriquement à la première borne de la résistance de test (RT), et ayant une borne de compensation couplée électriquement à une borne de commande de la source de courant de tampon (TC), dans lequel le module de compensation de courant (50) est configuré pour recevoir le courant de charge, et est configuré pour générer un signal de commande de compensation à la borne de commande de la source de courant de tampon (TC) pour activer ou désactiver la source de courant de tampon (TC) d'une manière qui conserve la somme du courant de tampon et du courant de charge pour approcher une valeur de courant critique prédéterminée et pour dépasser le courant de fonctionnement du circuit variateur de TRIAC.

16. Régulateur de courant (CP) selon la revendication 15, **caractérisé en ce que** le module de compensation de courant (50) est en outre configuré pour rendre le signal de commande de compensation pour désactiver la source de courant de tampon lorsque le courant de charge est supérieur à la valeur de courant critique prédéterminée.

17. Régulateur de courant (CP) selon la revendication 15, **caractérisé en ce que**, le module de compensation de courant comprend :

un suiveur de tension (51) ayant une première borne d'entrée couplée électriquement à une borne de sortie du suiveur de tension (51) ;
un amplificateur d'erreur (52) ayant une première borne d'entrée couplée électriquement à la borne de sortie du suiveur de tension (51), ayant une seconde borne d'entrée couplée électriquement à la première borne de la résistance de test (RT), et ayant une borne de sortie couplée électriquement à la borne de commande de la source de courant de tampon (TC) ; et
un diviseur de tension (511) ayant une borne de division de tension couplée électriquement à une seconde borne d'entrée du suiveur de tension (51), ayant une borne de masse couplée électriquement à la masse, et ayant une borne d'alimentation couplée électriquement à une source de tension continue (VD).

18. Régulateur de courant (CP) selon la revendication

17, **caractérisé en ce que**, le module de compensation de courant (50) comprend en outre :
un condensateur (512) ayant une première borne couplée électriquement à la première borne d'entrée de l'amplificateur d'erreur (52), et ayant une seconde borne couplée électriquement à la borne de masse du diviseur de tension (511).

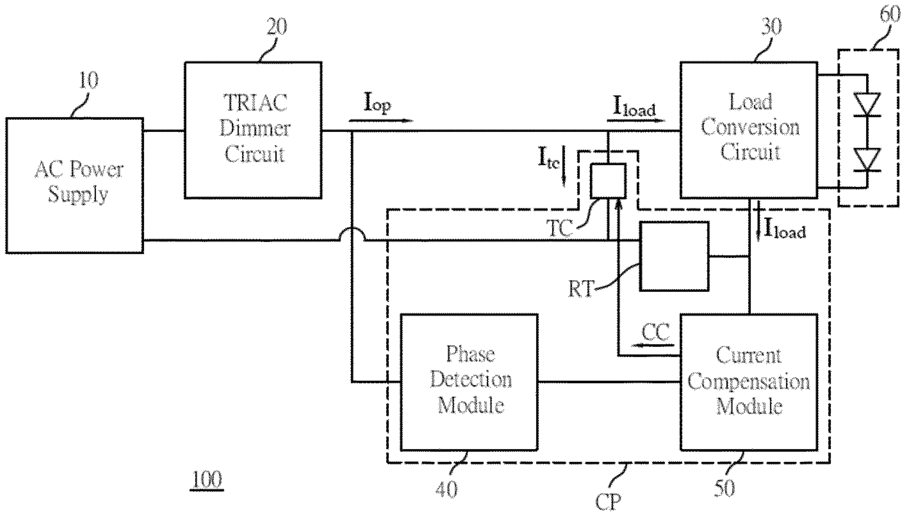
10
AC Power Supply
20
TRIAC Dimmer Circuit
I_{op}
I_{load}
30
Load Conversion Circuit
60
I_{tc}
TC
I_{load}
RT
CC
Phase Detection Module
Current Compensation Module
100
40
CP
50

FIG. 1

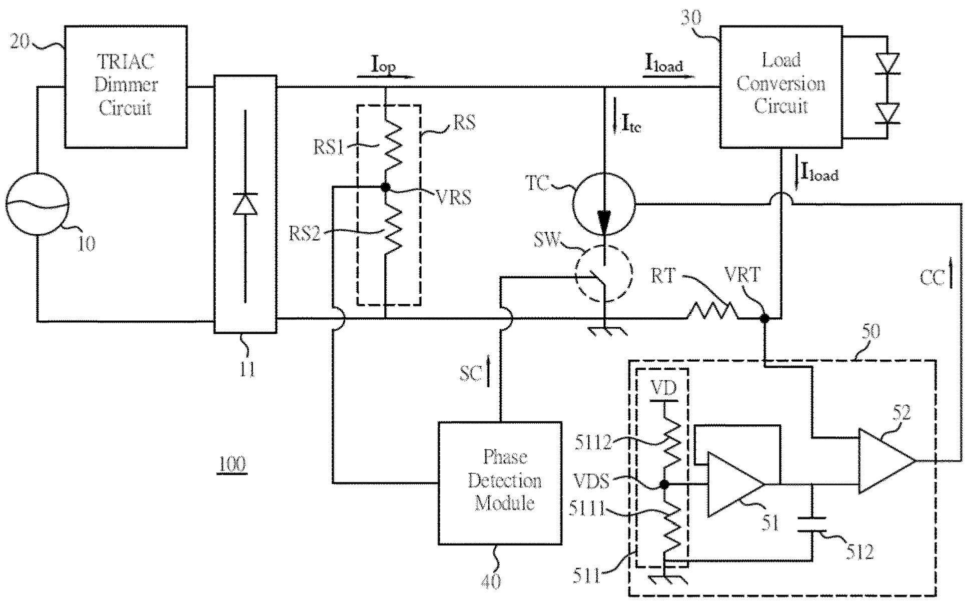
20
TRIAC Dimmer Circuit
10
11
I_{op}
RS1
RS
VRS
RS2
I_{load}
30
Load Conversion Circuit
I_{tc}
I_{load}
TC
SW
RT
VRT
CC
SC
100
50
VD
5112
VDS
5111
511
51
512
52
Phase Detection Module
40

FIG. 2

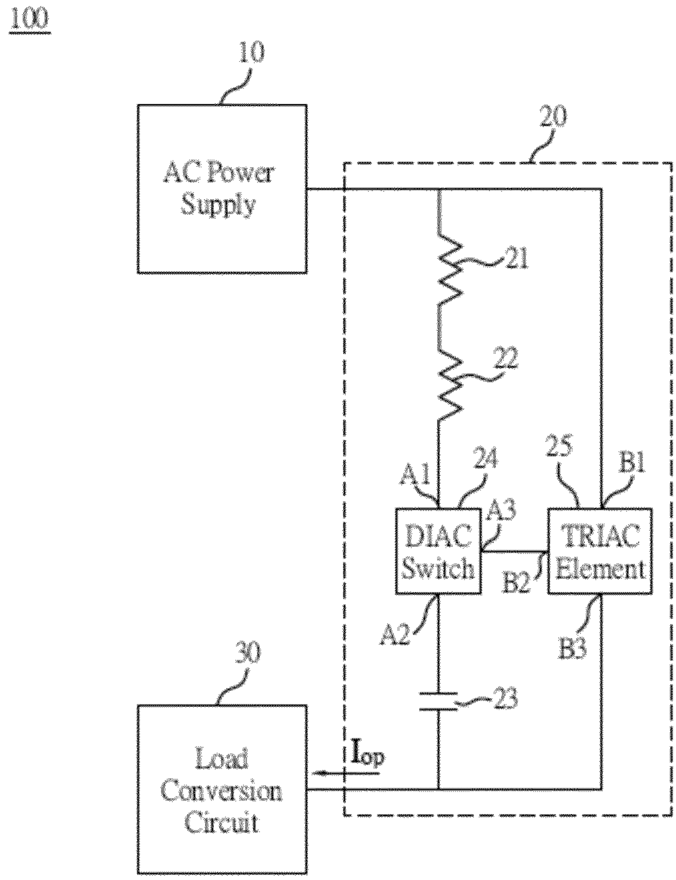
100
10
AC Power Supply
20
21
22
A1
24
A3
25
B1
DIAC Switch
TRIAC Element
B2
A2
B3
30
23
Load Conversion Circuit
Iop

FIG. 3

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 2373124 A1 **[0005]**