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- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

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(54) Title: METHOD AND DEVICE FOR MANAGEMENT OF ACCUMULATION AND CONSUMPTION OF ENERGY

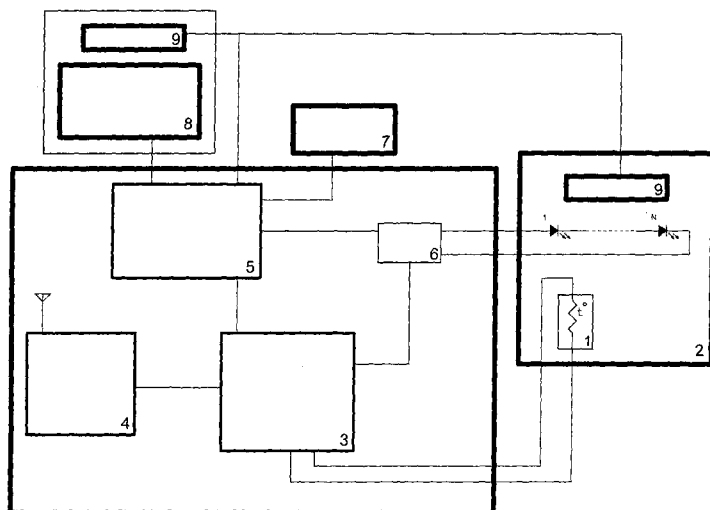


Fig. 1

(57) Abstract: The method for management of accumulation and consumption of energy has application in light sources using renewable energy sources. Charge controller (5) ruled by control unit (3) tracks the optimum power point of the energy source, powering trough power supply management unit (6) at least one light source (2) and regulating the supplied energy from battery to the light source. By thermo-electrical transformer (9), thermal energy, dissipated during the operation, is converted to electrical and collected in battery, ensuring optimal work condition for the system. The device includes at least one thermal sensor allowing thermal protection of the system.

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— *of inventorship (Rule 4.17(iv))*

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Method and device for management of accumulation and consumption of energy5 Technical Field

The method and device have application in lighting solutions for management of accumulation and consumption of energy in light sources, using renewable energy sources, like photovoltaic modules or wind turbines.

10 Background Art

It is not identified method for management of the accumulation and consumption of energy in light sources, using renewable energy sources.

Summary of the Invention

15 Task of the invention is to create method for management of the accumulation and consumption of energy in light sources, using renewable energy sources in order to optimize their working regime, to increase the efficiency and to increase their exploitation life

The solution of the task includes:

20 Accomplishment of thermal protection and management of the light source by using of known or created for this purpose method and simultaneously tracking of the optimum power point of the energy source by charge controller, which regulates the supplied energy from the source to the battery. The charging of battery is based on the method constant current - constant voltage, and by thermo-electrical transformer (Peltier element) the dissipated thermal energy during operation regime of the light source and/or during the transformation of the solar or
25 mechanical energy is converted to electrical and collected back in the battery.

30 The charge controller periodically measures the accumulated energy in the batteries and for every working cycle (from sunset to sunrise) of the light source the accumulated energy is given so that the needed minimum light flux for the entire cycle to be guaranteed. During the long periods of weak energy yield, respectively insufficient accumulated energy in the battery, for nominal working cycle of the light source a constantly proportional or under preliminarily assigned scheme illumination is guaranteed.

35 It is realized a device based on the method, comprising temperature sensor attached close to or into the lighting source and connected with control unit, measuring the working temperature. The control unit is also connected with radio unit, charge controller and light source power supply management block, which input is connected with the charge controller and its output is connected to the light source. The charge controller is connected as well to the battery, energy source and one or more thermo- electrical converters.

Advantages of the method and the device are that greater energy yield is achieved by smaller source i.e. efficiency is increased and the cost is decreased. Also the light source and battery life is increased.

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Brief Description of the Drawings

Figure 1 and 2 are show scheme of a device, accomplishing the method for management of accumulation and consumption of energy in light sources, using renewable energy sources.

Modes for carrying out the Invention

Samples of the method and device have been developed, without any limitation only to the presented examples below.

Example 1:

15 It was developed a method of thermal protection and control of the lighting source by using of known for this purpose method and simultaneously tracking of the maximum power point of the energy source - wind turbine by charge controller, which is also regulating the supplied energy from the source to the battery. The charging of the battery is based on the method constant current - constant voltage and by thermo-electrical transformer (Peltier element) the
20 dissipated thermal energy during the operation of the light source is converted to electrical and collected back in the battery.

The charge controller repeatedly reads accumulated energy in battery and for every working cycle (from sunset to sunrise) of the light source the accumulated energy is given so that the needed minimum light flux for the entire period to be guaranteed. During the long
25 periods of weak energy yield, respectively insufficient accumulated energy in battery, for nominal working cycle of the light source a constantly proportional or under preliminarily assigned scheme illumination is guaranteed.

Example 2:

30 It was developed a method, where the light source is LED lamp with implemented method for thermal protection and management of the LED lamp, developed by the authors. A photovoltaic module is used as an energy source. Simultaneously the charge controller tracks the optimum power point of the module and regulates the energy supplied from the source to the battery. The method of battery charging is based on the method constant current - constant
35 voltage. By thermo-electrical transformer (Peltier element) the dissipated thermal energy under working regime of the light source and during the transformation of the solar energy is converted to electrical and collected back in the battery.

The charge controller repeatedly reads accumulated energy in battery and for every working cycle (from sunset to sunrise) of the light source the accumulated energy is given so that the needed minimum light flux for the entire period to be guaranteed. During the long periods of weak energy yield, respectively insufficient accumulated energy in the battery, for nominal working cycle of the light source a constantly proportional or under preliminarily assigned scheme illumination is guaranteed.

Example 3:

It was created a device based on the method mentioned in example 2, which includes temperature sensor 1, mounted in the LED lamp 2 and connected with control unit 3, reading the temperature. Control unit 3 is connected with radio unit 4, charge controller 5 and the power supply of the LED lamp management unit 6. The input of the unit 6 is connected with the charge controller 5 and the output with LED lamp 2. The charge controller is connected additionally with battery 7, energy source 8 and one or more thermo-electrical transformers 9.

Industrial Applicability

The operation and usage of the device, accomplishing the invention are obvious by the nature of the method and its explanation above.

PATENT CLAIMS

Claim 1: Method for management of accumulation and consumption of energy, where by charge controller (5), controlled by microprocessor (3), is realized tracking of the optimum power point of autonomous energy source (8), powering at least one lighting source (2) through power supply management unit (6) and regulation of the supplied energy from the source (8) to an battery (7), as the charging of the battery (7) is based on the method constant current - constant voltage, and the dissipated thermal energy under working regime of the light source (2) and/or during the transformation of the solar or mechanical energy is converted to electrical and collected in the battery (7).

Claim 2: Method in accordance with claim 1, **characterized in that** simultaneously with management of accumulation of energy, also a management of energy consumption of light source (2) is accomplished.

Claim 3: Method in accordance with claim 2, **characterized in that** the charge controller (5) repeatedly reads accumulated energy in battery (7) and for every working cycle of the light source (2) the accumulated energy is given so that the needed minimum light flux for the entire cycle to be guaranteed.

Claim 4: Method in accordance with claim 3, **characterized in that** during the long periods of weak energy yield, respectively insufficient accumulated energy in the battery (7), for nominal working cycle of the light source (2) a constantly proportional or under preliminarily assigned scheme illumination is guaranteed.

Claim 5: Method in accordance with claims 1, 2, 3 or 4, **characterized in that** additionally thermal protection and management of the light source (2) is accomplished by using known or created for this purpose method.

Claim 6: Method in accordance with claim 5, **characterized in that** by at least one temperature sensor (1), positioned close to or in light source (2) and connected with control unit (3), which is measuring the operational temperature and producing regulation signal to the power supply management unit (6) and by which the magnitude of power supplied to the light source (2) is controlled/regulated.

Claim 7: A device, accomplishing the method in accordance with claims from 1 to 6, including control unit (3), connected with charge controller (5) and light source power supply management unit (6), which input is connected with the charge controller (5), and its output – with at least one light source (2), where the charge controller (5) is connected also with battery (7), energy source (8) and one or more thermo-electrical transformers (9).

Claim 8: A device in accordance with claim 7, **characterized in that** includes additionally at least one temperature sensor (1), positioned close to or in light source (2) and connected with control unit (3), reading the working temperature and creating ruling signal, which is directed to the power supply management unit of the light source (6), regulating the magnitude of power supplied to the light source (2).

Claim 9: A device in accordance with claim 7 or 8, **characterized in that** control unit (3) is connected also with radio unit (4), securing remote data transmission with parameters of the working regime and/or environment to the control centre.

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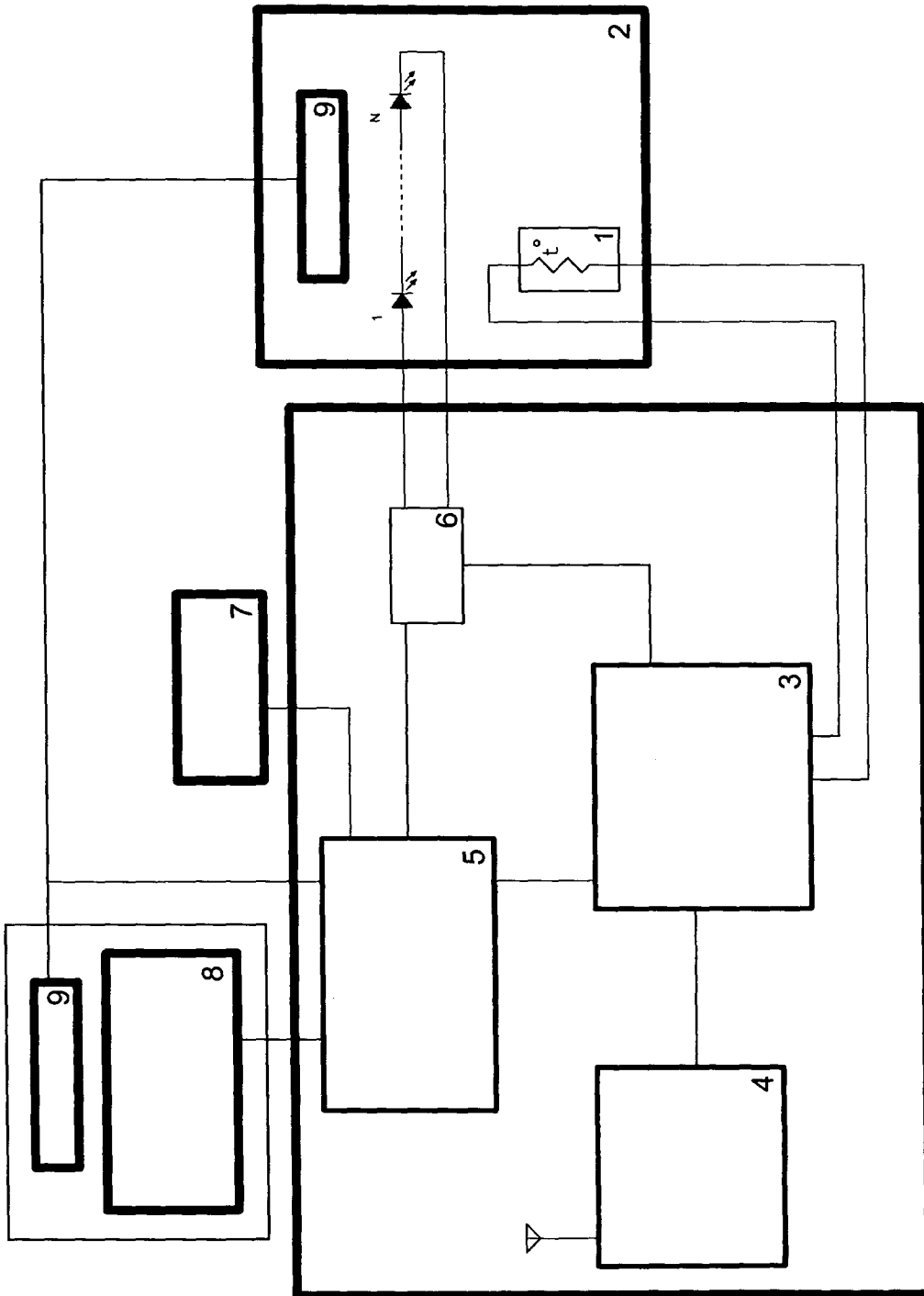


Fig. 1

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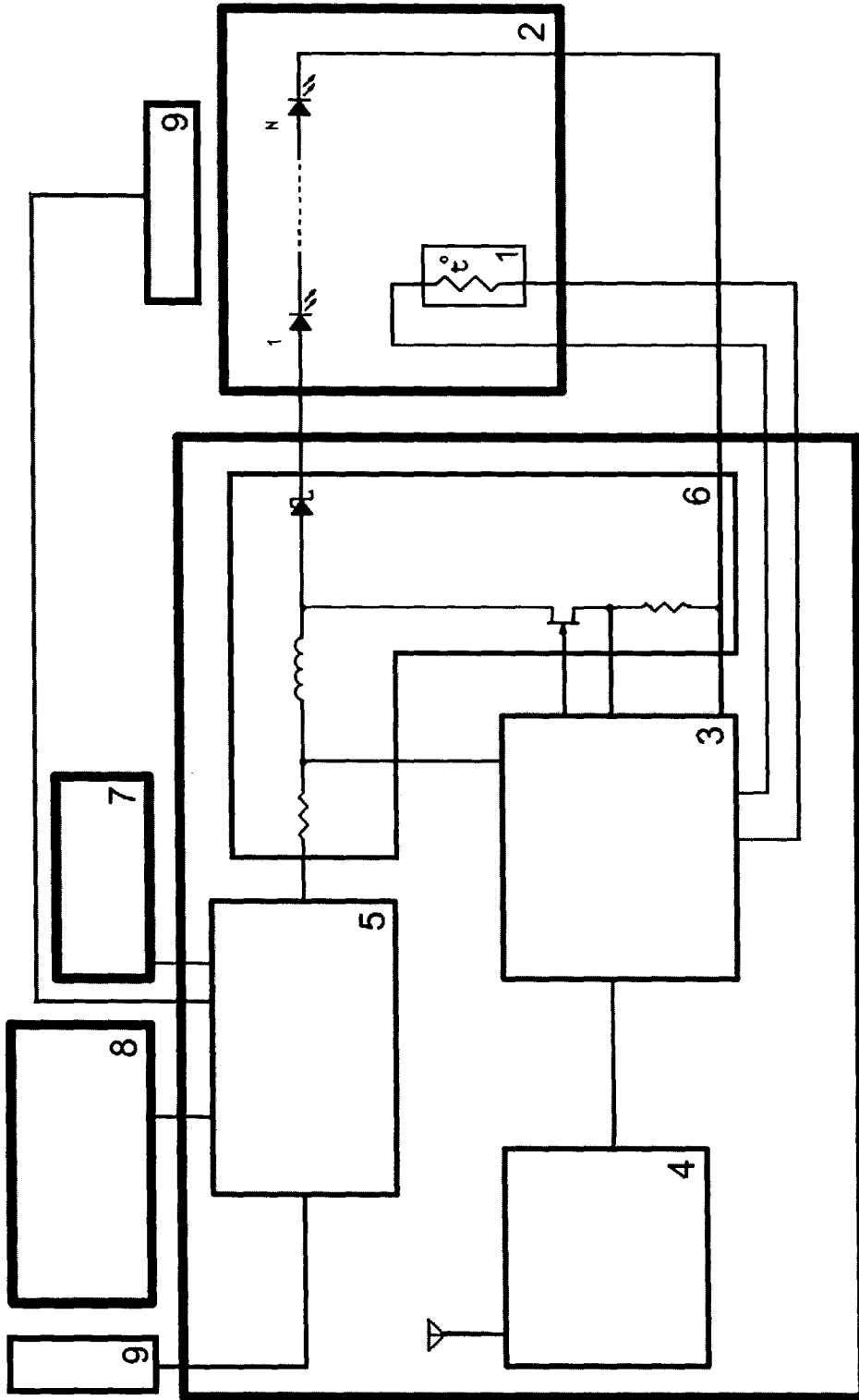


Fig. 2