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(54) Titre : APPAREIL ECONOMISEUR D'ELECTRICITE QUI COMPREND UN DISPOSITIF A SEMICONDUCTEURS APPLIQUANT L'ENERGIE D'UNE LONGUEUR D'ONDE SYNTHETIQUE DE RAYONNEMENT INFRAROUGE A UN CABLE ELECTRIQUE AU MOYEN D'UN SIGNAL IMPULSIONNEL DE SORTIE, STRUCTURE DE CARTE DE CIRCUIT ELECTRIQUE PERMETTANT DE METTRE L'APPAREIL EN SERVICE, ET METHODE ECONOMISANT L'ELECTRICITE

(54) Title: ELECTRIC POWER SAVING APPARATUS COMPRISING SEMI-CONDUCTOR DEVICE TO PASS ENERGY OF INFRARED RAY SYNTHETIC WAVELENGTH INTO ELECTRIC CABLE USING OUTPUT PULSE SIGNAL, ELECTRIC CIRCUIT BOARD STRUCTURE FOR IMPLEMENTING THE APPARATUS, AND ELECTRIC POWER SAVING METHOD

(57) Abrégé/Abstract:
The present invention relates to an electric power saving apparatus wherein light energy is irradiated to a semiconductor device, with the light energy emitted when a voltage is supplied to a transmission line, such that the wavelengths of the electrons on the transmission line, along which a load-driving current flows are elongated, and the spin motions and vibration states of the electrons are stabilized, thereby reducing the collision of electrons in order to reduce the loss of energy, and wherein the light energy irradiated to the semiconductor device is continuously supplied thereto, by the use of an infrared ray emitting diode during operation, thereby maintaining the power saving effects with stability and continuity.

ABSTRACT

The present invention relates to an electric power saving apparatus wherein light energy is irradiated to a semiconductor device, with the light energy emitted when a voltage is supplied to a transmission line, such that the wavelengths of the electrons on the transmission line, along which a load-driving current flows are elongated, and the spin motions and vibration states of the electrons are stabilized, thereby reducing the collision of electrons in order to reduce the loss of energy, and wherein the light energy irradiated to the semiconductor device is continuously supplied thereto, by the use of an infrared ray emitting diode during operation, thereby maintaining the power saving effects with stability and continuity.

ELECTRIC POWER SAVING APPARATUS COMPRISING SEMI-CONDUCTOR DEVICE TO PASS ENERGY OF INFRARED RAY SYNTHETIC WAVELENGTH INTO ELECTRIC CABLE USING OUTPUT PULSE SIGNAL, ELECTRIC CIRCUIT BOARD STRUCTURE FOR IMPLEMENTING THE APPARATUS, AND ELECTRIC POWER SAVING METHOD

TECHNICAL FIELD

The present invention relates to an electric power saving apparatus wherein the light energy of infrared ray synthetic wavelengths, passed through an optical filter, that is, of the infrared rays (light) of a specific band, and visible light, is irradiated continuously to a semiconductor device in order to supply a pulse microcurrent form of light energy waves emitted from a semiconductor device to a transmission line, connected from a power source to a load side, such that the wavelengths of electrons are lengthened along the transmission line, through which a current for driving the load flows, with the spin and vibration states of electrons, that is, the motion states of electrons that cause energy loss, stabilized to ensure that collisions among electrons are suppressed, thereby greatly reducing the loss of energy, resulting in the stable operation of an electric power supply system and an excellent electric power saving effect therefrom.

BACKGROUND ART

Various types of electric power saving apparatus have been proposed and used for an electric circuit, actuating the load of an electric motor, an electric heater, an illuminating device, or the like, by the supply of electric energy from a power source.

FIG. 1 is a circuit diagram and a pulse wave form illustrating an inverter for converting direct current power into alternating current power, as one of the conventional types of electric power saving apparatus. During the first half of a half-cycle, where thyristors 1 and 2 are triggered, the energy accumulated on a load is returned to a power source through respective diodes 3 and 4 and; in the case of an advancing power factor, during the latter half of the half cycle, conversely, diodes 3 and 4 are conductive. This is implemented by a power inverter. Thus, frequencies are converted by using the power inverter to control the revolutions per minute, thereby obtaining electric power saving effects.

FIG. 2 is a circuit diagram illustrating a conventional cyclo-converter used as a power converter conducting the frequency conversion of alternating current power, wherein

during the frequency converting process, the third and fifth harmonic waves are generated such that a precision machine may malfunction, a motor may suffer a reduced life period or a malfunction, or wave forms may be distorted. In particular, the conventional cycle-converter is not available at the high voltage of approximately 660 volts.

FIG. 3 is a diagram illustrating a series resonant circuit that uses an electronic ballast, wherein a series/parallel resonant type inverter, as embodied in conventional lamps, is adopted. As shown in FIG. 3, Capacitor 5 and Inductor 6 serve to implement the stable lighting of a load lamp, with Capacitor 7 constituting the series resonant circuit and serving to activate the load lamp.

Referring to the functions of the series resonant circuit, a plurality of lamps with properties the same as or different from one another are attached to the single electronic ballast, thereby achieving lighting on the plurality of lamps, and a self-protection function is added to respond appropriately to variations in input voltage and high temperature and moisture levels, thereby preventing the electronic ballast from being destroyed. Further, a back light function is added to provide for the further enhancement of functions. As a result, the formation of an electronic ballast enables the removal of magnetic ballast defects, providing improved electric power saving effects. This allows the size of a magnetic device to be reduced such that a small, light ballast is adopted, and with the recent development of semiconductor devices and switching technologies, a high efficiency of power conversion is made possible at the time of high frequency switching. However, conventional power conversion causes variations in input voltages of DC-DC converters to be suppressed such that, so as to reduce the load of the device, large capacitance is required. Because a relatively large quantity of energy needs to be charged during a short period of time as a result, the current flow becomes greater, and the input current to a rectifier becomes intermittent, thereby causing negative effects on the peripheral devices due to distortion of the input current and the high frequency of the input.

FIG. 4 is a circuit diagram illustrating a conventional power factor correction circuit, wherein a high efficiency of power conversion is made possible at the time of high frequency switching, and in this case, total high frequency distortion factors are lowered such that the switching power is operated like a resistive load at an input terminal of a rectifier.

Thus, the power factor correction circuit sets an input current according to the input voltage thereto, in order to make the voltage/current ratios constant, thereby achieving a power factor value of 1; however, when the voltage/current ratios are not constant,

displacement of phases or distortion of high frequencies occurs, thus decreasing the power factor value. The reactance of the input impedance of the power factor correction circuit causes the displacement of phases of input currents with respect to the input voltages, decreasing the power factor value, and the distortion of high frequencies means a degree of non-linearity of the input impedance of the power factor correction circuit. Therefore, the variation of the input impedance, as a function of input voltages, causes the distortion of input currents, resulting in a decrement of the power factor, thereby providing a relatively weak power saving effect.

There is provided a transformer type linear voltage reducing device with a capacity of 1/10 as a power saving product for complex loads, which has a first voltage coil and a second current coil, each being wound on a toroidal core. In this case, the first voltage coil is wound with the voltage regulation in five steps and, using a cooperative induction reactor where the first voltage coil and the second current coil are connected in series with each other at the ends thereof in order to provide a series reactor function, AC power is not distorted or damaged at all, controlling the appropriate voltage, current, and input/output quantity. Therefore, the conventional transformer type linear voltage reducing device adopts an improved control means, greatly enhancing the economical advantages and reliability thereof. However, this device is not available for a high capacity and for a high voltage. In addition, the wave forms are distorted by the artificial control of voltages, such that the conventional device is inadequate for precision machinery, and as large-sized machines are adopted, the installation area becomes restricted. On the other hand, in the case of an electric heater, there has not been an effective power saving apparatus until now.

Generally, the loss of energy generated on an electric motor, electric heater, or illuminating lamp operated using electric energy and the loss of energy generated on conductor resistance on a transmission line are caused by the irregular motions of electrons as a result of the application of heat or vibration.

As previously discussed, in the case of conventional types of electric power saving apparatus, there has thus far been no method proposed for controlling the irregular motions of electrons caused by heat or vibration that act as the fundamental cause of energy loss in electric motors, electric heaters, or illuminating lamps powered by electric energy, as well as the energy loss by conductor resistance on a transmission line, such that the conventional types of power saving apparatus provide only somewhat limited power saving effects.

Therefore, the inventor of this invention has provided a novel power saving apparatus and method that solves the problems of conventional types of power saving apparatus,

which is disclosed in International Patent Publication Laid-Open No. WO 03/015249 A1, as filed by the inventor of this invention. For the purpose of developing an understanding of the basic technical spirit of the prior art as filed by the inventor of this invention and of the present invention, an explanation of their basic principles will be supplied, with reference to FIGS. 5 to 9.

FIG. 5 is a plane view illustrating the charge distribution in a metal. In FIG. 5, reference numeral 1 denotes electrons that are strongly coupled to the positive charges of an atomic nucleus and to the atomic nucleus, and reference numeral 2 denotes valence electrons, or free electrons, that are moving along the outermost orbit of an atom. Free electrons 2 move freely, and are not coupled to specific atoms. According to electron gas theory, free electrons 2 in the metal collide with relatively heavy ions that are, generally, at a halted state, such that they conduct continuous movements, while changing their advancing direction; at this time, the mean distance moving between the collisions is referred to as a mean free path.

If a constant electric field E (V/m) is applied to the metal, the motions of the free electrons are accelerated, without any collision with the ions, such that as time passes, the accelerated speed is increased enormously; however, due to the collision, free electrons lose their energy and change their advancing directions. At the instant when the free electrons collide against the ions, the accelerating speed is reduced to a value of 0. During normal operation, they have a mean speed, which is referred to as a drift speed.

The energy obtained by the free electrons in the electric field is transmitted to the ions colliding with the free electrons, such that when they are moving in the metal, power consumption results. Also, as the current flows via the movements of the electrons, a number of electrons collide against each other during these movements, such that the energy of the electrons generates heat.

If photons, with the light energy of a specific wavelength range, are poured in the electrons forming the current on a metal conduction line, said electron wavelengths become long, and their spinning motions or vibrations become stable, thereby reducing the number of collisions among the electrons and eliminating the loss of energy generated by the irregular movements of the electrons, such that a system related to electricity may be stabilized, and electric power saving efficiency can be optimized, based on the prior art of this invention.

For the purposes of developing an understanding of the effects obtained by pouring the photons with the light energy into the electrons moving in to form the electric field that generates the current, an explanation of the various effects caused by the coupling of

light and electrons will be provided first. That is to say, a photoelectric effect, or a Compton effect, is to be hereby related.

As illustrated in FIG. 6, if light is irradiated to a metal, electrons are emitted from the surface of electrode A and then enter electrode B, thereby causing a current (I). This is known as the photoelectric effect, and the electrons emitted after the irradiation of light are referred to as photoelectrons. If the kinetic energy T of the photoelectrons is denoted by the function of the frequency υ of incident light, kinetic energy T has a value of 0 when the incident light has a frequency having a given limiting value or less, as outlined in the graph of FIG. 7, with its values increasing linearly in proportion to the frequencies of incident light when said incident light has a frequency of the given limiting value or more.

Furthermore, as illustrated in FIGS. 8 and 9, a phenomenon referred to as the Compton effect occurs between the electrons and the photons. The figures illustrate a phenomenon wherein as X-rays (photons) are irradiated to a material, they radiate by virtue of their colliding against halting electrons (v=0) such that the energy is partially absorbed by the electrons to cause a change to the movement of electrons, as well as a phenomenon wherein the wavelength of the waves of X-rays changes from λ to λ', based upon Einstein's corpuscular theory. Generally, the electrons of an atom occupy the positions with possibly the lowest energy level. When the electrons are arranged on such positions, the atom is at a ground state. However, if one or more electrons are moved to a higher energy level by a given cause (by the application of an electric field, for example, as outlined in the present invention), the atom is in an excited state. The photons can induce the transition between different electron energy levels. If the photons colliding with the electrons have sufficient energy levels, the electrons absorb the energy of the photons to move to a higher energy level. On the other hand, electrons in the excited state collide with the photons to move to a lower energy level, and if the electrons that form the stream of current in the electric field already applied to the transmission line of a power circuit have the light energy (photons) provided by the infrared ray synthetic wavelengths supplied from a semiconductor device, they will have substantially longer wavelengths, meaning their vibration state will be stable, an important basic principle of this invention.

However, according to the prior art of this invention, light energy having the infrared ray synthetic wavelength of a band between 780nm and 900nm is irradiated to the semiconductor device constituting the circuit board of the electric power saving apparatus while the circuit board is being assembled, such that the electrons in the valence band absorb the photons and move to the conduction band, thereby forming

holes in the valence band. Thus, at a state where the electrical state in the crystal interior of the semiconductor device is varied, the formation of the electric power saving apparatus is completed, and after that, the microcurrent, which is generated by the application of the low constant voltage rectified from alternating current power to the semiconductor device, is supplied again to the power circuit. According to the prior art of this invention, however, prior to the circuit board of the electric power saving apparatus being finished as one system, the light energy having the infrared ray synthetic wavelength of a specific band range is irradiated to the semiconductor device during the manufacturing process of the semiconductor device, such that until the apparatus is finally able to be used at the state of being connected to the power circuit by a user's manipulation, it is difficult to maintain a good energy state of the semiconductor device. Therefore, the electric power saving effect is not appropriate, and when a given period of time has elapsed, the saving effect may be reduced. Furthermore, the electric power saving apparatus according to the prior art does not recognize the reduction of the electric power saving effect well, and as there is no circuit absorbing the surge voltage contained in the alternating current power supplied from a power source, the stability of the electric power saving apparatus while it is in use cannot be ensured. As a result, the inventor of this invention provides herein a novel power saving apparatus that overcomes the problems as described with the prior art.

DETAILED DESCRIPTION OF THE INVENTION

TECHNICAL PROBLEM

Accordingly, the present invention has been developed to solve the aforementioned problems occurring in the prior art, and it is an object of the present invention to provide an electric power saving apparatus using light energy with infrared synthetic wavelengths that is configured so as to reduce the loss of energy due to the heat and high frequencies caused by friction during the motion of electrons in a transmission line, when a current is supplied from alternating current power to an electric load side, that is configured to remove iron, machine, and copper losses to make a system related to electricity permanently stable at a high power saving efficiency, that is configured to absorb surge voltages contained in the alternating current power to make the apparatus stable, and that is configured to display the current state of a circuit of this apparatus to the outside, so that checking whether the apparatus is normally operating or not can be done easily.

TECHNICAL SOLUTION

To accomplish the aforementioned objectives, according to an aspect of the present invention, there is provided an electric power saving apparatus using light energy having infrared synthetic wavelengths that is connected in parallel with a transmission line connecting alternating current power and a load, and that is provided with a semiconductor device adapted so as to transmit light energy with the infrared ray synthetic wavelengths to the transmission line as an output pulse signal, with said electric power saving apparatus comprising: a rectifying part disposed between the alternating current power and an input terminal of the semiconductor device, for rectifying the alternating current into a direct current of low voltage; a control part, having a circuit adapted so as to apply a driving voltage at the direct low voltage current of the rectifying part to the semiconductor device, and having said semiconductor device; an oscillation-limiting part disposed at a carrier circuit between the transmission line connecting the alternating current power and the load, and an output terminal of the semiconductor device, for making the output pulse signal correspond with the frequency of the alternating current power; and an infrared ray emitting diode disposed near the semiconductor device in such a manner as to be controlled by the output of the control part having the semiconductor device mounted on a circuit board constituting the electric power saving apparatus, for irradiating the infrared rays emitted thereby to the semiconductor device, such that while a circuit board constituting the electric power saving apparatus is being assembled, the light energy from the infrared synthetic wavelengths of a specific wavelength band is irradiated to the semiconductor device to excite electrons absorbing the photons to a conduction band, and to vary the electrical state in the interior of the crystal of the semiconductor device, and while the electric power saving apparatus is being operated after being connected in parallel with the transmission line connecting the alternating current power and the load, the infrared ray energy is continuously supplied to the semiconductor device.

To accomplish the above objective, according to another aspect of the present invention, there is provided a circuit board structure for use in an electric power saving apparatus, which is connected in parallel with a transmission line connecting alternating current power and a load; said electric power saving apparatus including: a control part and a semiconductor device adapted to transmit the light energy having infrared synthetic wavelengths to the transmission line as an output pulse signal; the circuit board structure, comprising an infrared ray emitting diode disposed near the semiconductor

device in such a manner as to be controlled by the output of the control part, having the semiconductor device mounted on a circuit board constituting the electric power saving apparatus, for irradiating the infrared rays emitted therefrom to the semiconductor device, such that while the circuit board for the electric power saving apparatus with the semiconductor device constituting the control part is being assembled, the light energy from the infrared ray synthetic wavelengths of a specific wavelength band is irradiated to the semiconductor device to excite electrons absorbing photons to a conduction band and to vary an electrical state in the crystal interior thereof; and, while the electric power saving apparatus is being operated after being connected in parallel with the transmission line connecting the alternating current power and the load, the infrared ray energy emitted therefrom is continuously supplied to the semiconductor device.

To accomplish the aforementioned objective, according to yet another aspect of the present invention, there is provided an electric power saving method using light energy having infrared synthetic wavelengths, the electric power saving method comprising the following steps: 1) while a circuit board constituting the electric power saving apparatus is being assembled, irradiating the light energy having the infrared synthetic wavelengths of a specific wavelength band to the semiconductor device to excite the electrons absorbing photons to a conduction band, and to vary the electrical state in the interior of the crystal of the semiconductor device; 2) in a state where the circuit board for the electric power saving apparatus is used after assembly, rectifying a high alternating current voltage flowing from alternating current power to a low constant voltage, and supplying the low constant voltage to a control part with the semiconductor device then excited by the light energy having the infrared ray synthetic wavelengths through the input terminals of the control part; 3) transmitting the pulse of microcurrents outputted from a first output terminal of the control part to a transmission line connecting the alternating current power and a load to supply electric energy; and 4) irradiating infrared rays generated from an infrared ray emitting diode operated by a control signal of a second output signal of the control part to the semiconductor device.

EFFECT OF THE INVENTION

According to the present invention, there is provided an electric power saving apparatus that is configured so that it maintains the energy state of a semiconductor device at a good state, until the apparatus is finally used at the state of being connected to the power circuit by a user's manipulation, unlike conventional apparatuses wherein prior to the circuit board of the electric power saving apparatus being finished as one system,

the infrared synthetic wavelengths of a specific range is injected once during the manufacturing process of the semiconductor device, and is configured so as to release the loss of energy caused by heat and high frequency caused due to the loss of friction generated on the motions of electrons on a transmission line when a current is supplied from alternating current power to an electric load side, that is configured to remove iron, machine, and copper losses to create a system related to electricity permanently stable at a high power saving efficiency rate, that is configured to absorb surge voltages contained in the alternating current power to make this apparatus stable, and that is configured to display the current state on a circuit of this apparatus to the outside to provide for the easy checking of whether this apparatus is operating normally or not.

DESCRIPTION OF DRAWINGS

Further objects and advantages of the invention can be more fully understood from the following detailed description, read in reference to the accompanying drawings in which:

FIG. 1 is a circuit diagram and a pulse wave form illustrating an inverter for converting direct current power into alternating current power, as one of the conventional types of electric power saving apparatus;

FIG. 2 is a circuit diagram illustrating a conventional cyclo-converter, used as a power converter, conducting the frequency conversion of alternating current power;

FIG. 3 is a diagram illustrating a series resonant circuit using an electronic ballast, wherein a series/parallel resonant type inverter, as embodied in conventional lamps, is adopted;

FIG. 4 is a circuit diagram illustrating a conventional power factor correction circuit, wherein a high efficiency of power conversion is possible at the time of high frequency switching;

FIG. 5 is a plane view illustrating the charge distribution in a metal;

FIG. 6 is a view illustrating the concept of a photoelectric effect;

FIG. 7 is a graph illustrating the relation between the kinetic energy of the photoelectrons and the frequencies of incident light;

FIGS. 8 and 9 are views illustrating the concept of a Compton effect;

FIG. 10 is a diagram illustrating a circuit constituting a power saving apparatus according to an embodiment of the present invention;

FIG. 11 is a diagram illustrating a circuit constituting a power saving apparatus according to another embodiment of the present invention;

FIG. 12 is a diagram illustrating the electric power saving apparatus of this invention connected to a single-phase power source;
FIG. 13 is a diagram illustrating the electric power saving apparatus of this invention connected to a three-phase power source;
FIG. 14 is a view illustrating an example of a circuit board constituting the electric power saving apparatus of this invention;
FIG. 15 is a view illustrating another example of the circuit board constituting the electric power saving apparatus of this invention;
FIG. 16 is a flow chart illustrating a power saving method according to the present invention;
FIGS. 17 and 18 are SEM photographs depicting the variations of physical properties prior to and after the light energy of infrared ray synthetic wavelengths is irradiated to a semiconductor device and;
FIGS. 19 and 20 are photographs depicting the voltage states on the transmission line of a conductor on a load side being measured by an oscilloscope, when the electric power saving apparatus of this invention is not adopted, and when it is adopted.

BEST MODE FOR THE INVENTION

An explanation pertaining to an electric power saving apparatus according to the preferred embodiments of the present invention will be outlined below with reference to the attached drawings. As shown in FIGS. 10 and 11, electric power saving apparatus 100, according to the present invention, which is connected in parallel with transmission line 20 connecting alternating current power 10 and load 30, includes control unit 120 having semiconductor device 121 adapted in order to transmit the light energy having infrared ray synthetic wavelengths as an output pulse signal to the transmission line 20. At this time, electric power saving apparatus 100 is connected through a header in parallel with transmission line 20, connecting alternating current power 10 and load 30, with electric power saving apparatus 100 further including a rectifying part disposed between the header and an input terminal of the control part for rectifying the alternating current supplied from alternating current power 10, to a direct current of low voltage and oscillation-limiting part 130, disposed at a carrier circuit between an output terminal of the semiconductor device and transmission line 20, for the purposes of making the output pulse signal correspond with the frequency of alternating current power 10. Furthermore, electric power saving apparatus 100, according to the present invention, includes infrared ray emitting diode 140, disposed near semiconductor device

121 in such a manner as to be controlled by the output of control part 120, having semiconductor device 121 mounted on a circuit board constituting electric power saving apparatus 100, for irradiating infrared rays IR emitted from infrared ray emitting diode 140 to semiconductor device 121, such that while the circuit board constituting electric power saving apparatus 100 is being assembled, the light energy having the infrared ray synthetic wavelengths of a specific wavelength band is irradiated to semiconductor device 121 to excite electrons absorbing photons to a conduction band, and to vary the electrical state in the crystal interior thereof; while electric power saving apparatus 100 is being operated after being connected in parallel with transmission line 20, connecting alternating current power 10 and load 30, infrared ray energy is continuously supplied to semiconductor device 121.

Also, according to electric power saving apparatus 100 of this invention, as illustrated in FIG. 11, switch S1 is connected additionally to terminals p8 and p9 of semiconductor device 121, in order to check whether semiconductor device 121 is being operated normally or not, by the application of driving voltage Vcc separately prior to the connection of the alternating current power. That is, if switch S1 is pressed to apply driving voltage Vcc to semiconductor device 121, light emitting diode L1, connected additionally to terminal p11, is set to emit a visible light for a predetermined period of time, such that it is checked whether semiconductor device 121, constituting electric power saving apparatus 100 of this invention, is being operated normally or not on an apparatus assembly line. Furthermore, as illustrated in FIG. 11, electric power saving apparatus 100, according to the present invention, preferably includes current state display part 150, having current transformer 151 for detecting and reducing the size of the current applied to electric power saving apparatus 100 from the alternating current power to a given ratio at a state where electric power saving apparatus 100 is connected to the alternating current power, and has liquid crystal display (LCD) 152 for displaying the size of the current detected by current transformer 151 to the outside of the apparatus. As a result, it is established whether, while electric power saving apparatus 100, using the light energy having the infrared ray synthetic wavelengths, is being operated, it is set in a range having a maximum saving efficiency, and whether the size of the current applied to electric power saving apparatus 100 is set in a predetermined range so as to prevent the malfunctioning of electric power saving apparatus 100.

MODE FOR THE INVENTION

On the other hand, as shown in FIGS. 10 and 11, illustrating each part of the electric

power saving apparatus according to the preferred embodiments of the present invention, rectifying part 110 is – desirably – provided with a TNR circuit disposed for absorbing a surge voltage, a noise filter NF, and a constant voltage circuit with a zener diode ZD1 thereon, and oscillation-limiting part 130 is preferably supplied with a resistor R9, a condenser C6, and a zener diode ZD2.

Referring in more detail to rectifying part 110 in the circuit diagrams as illustrated in FIGS. 10 and 11, the TNR circuit is a surge-absorbing element used to absorb the surge voltage, contained in the power to create a gentle power flow, with the noise filter NF filtering noises generated by the power. Resistor R1 interrupts the current flow to give the current an equipotential quality at power-off time, with condenser C1 serving as a power supply for the whole circuit, resistor R2 serving to protect the condenser C1, inductor L1 serving to offset the harmonic waves of power, diode 7 serving as a half-wave rectifier, and diode 8 serving as protection during half-wave rectification. Resistor R3 serves to conduct power circuit protection and voltage drop, condenser C2 serves as a harmonic wave by-pass of the smoothing circuit, resistor R4 serves to conduct power circuit protection, zener diode ZD1 generates the constant voltage of 5.6V by using the zener breakdown process, condenser C3 serves to conduct power smoothing, and driving voltage Vcc is outputted from both ends of condenser C3.

The driving voltage Vcc is applied as the control signal to semiconductor device 121; that is, to the input terminal of a programmable microcontroller, to control input terminal p16, at which the reset time is adjusted through resistor R7 and condenser C5, and to control input terminal p4, at which reset time is adjusted through resistor R5, condenser C4, and resistor R6.

If second output terminal p1 is reduced under the control program in semiconductor device 121, infrared ray emitting diode 140, to which the driving voltage Vcc is applied, emits light, and, in contrast, if second output terminal p1 is increased, the current does not flow, thereby extinguishing the infrared ray emitting diode 140. Though only one infrared ray emitting diode 140 is illustrated in FIGS. 10 and 11, a plurality of infrared ray emitting diodes may be mounted; this would partially include visible light-emitting diodes.

Furthermore, a pulse is output from first output terminal p3 in accordance with the control program of semiconductor device 121, and, desirably, it has the same frequency as the input alternating current power. Additionally, together with the light energy with infrared ray synthetic wavelengths, applied to semiconductor device 121, the pulse is applied to transmission line 20 between alternating current power 10 and load 30, as illustrated in FIG. 12 (which illustrates a connection diagram between the single-phase

power and the load), through resistor R9, condenser C6, and zener diode ZD2 of the oscillation-limiting part 130 as illustrated in FIGS. 10 and 11. FIGS.12 and 13, on the other hand, illustrate the connected structure in which electric power saving apparatus 100 of this invention is connected in parallel with transmission line 20 between alternating current power 10 and load 30, during the time alternating current power 10 is being used for the single-phase power (which is used, as outlined in FIG. 12, for home load devices, such as motors, air conditioners, electric fans, refrigerators, washing machines, television sets, computers, etc), and when alternating current power 10 is used for the three-phase power (which is used, as outlined in FIG. 13, for industrial load devices, such as many kinds of motors, coolers, blowers, compressors, air conditioners, pumps, etc). As illustrated, electric leak breaker 40 (i.e., a no fuse breaker) is disposed on transmission line 20 between alternating current power 10 and load 30, and further, electric leak breaker 50 (i.e., a no fuse breaker) is disposed at the inside or the outside of electric power saving apparatus 100, connected in parallel with load 30 through the output terminals of electric leak breaker 40.

An infrared ray with synthetic wavelength in a predetermined region, e.g., 780nm to 900nm, may be irradiated on the semiconductor device 121 before and after assembling into the electric circuit board. The infrared ray with synthetic wavelength of 780nm to 900nm is obtained through combining together visible light of 500 to 600 nm and infrared light of 1,000nm to 10,000nm obtained by adjusting light intensity using a visible light filter and an infrared filter, respectively, by generating an infrared vortex using an infrared screw.

In this case, semiconductor device 121 is formed by selecting oxide, sulfide, selenide, telluride, halide, and so on, and more preferably, semiconductor device 121 is comprised of a PLZT with a chemical equation of $(Pb_{1}\text{-}_{x}La_{x})(Zr_{1}\text{-}_{y}Ti_{y})_{1\text{-}x/4}O_{3}$, which has a significant strong light life period. To achieve improved light energy scanning effects, semiconductor device 121 is packaged with a ceramic material, and in particular, light energy is desirably irradiated to semiconductor device 121 prior to packaging.

As can be appreciated from the SEM photographs as illustrated in FIGS. 17 and 18, variations of the physical properties are designed prior to and after the light energy of the infrared ray synthetic wavelengths is irradiated to semiconductor device 121; this being due to the variations of the electrical state of the crystal interior of semiconductor device 121.

As previously mentioned, semiconductor device 121 in control part 120 of electric power saving apparatus 100, according to the present invention, is comprised of the microcontroller that is programmed to possess control functions, with the logic of

selecting the size of the current of the pulse output to transmission line 20, connecting alternating current power 10 and load 30, in addition to the logic of controlling the light-emitting timing of infrared ray emitting diode 140, such that said infrared ray emitting diode 140 may be controlled to maintain the emission of light while electric power saving apparatus 100 is in operation, while otherwise, it can be controlled to repeatedly conduct the emission and extinction of light over a given period of time.

Prior to infrared ray emitting diode 140 being assembled on the circuit board for electric power saving apparatus 100, the light energy from the infrared ray synthetic wavelengths of the specific wavelength band is irradiated to infrared ray emitting diode 140 in order to excite photon-absorbing electrons to a conduction band, and to vary the electrical state in the crystal interior of infrared ray emitting diode 140. Of course, after infrared ray emitting diode 140 is assembled on the circuit board for electric power saving apparatus 100, the light energy, having the infrared ray synthetic wavelengths of the specific wavelength band, is irradiated to infrared ray emitting diode 140, while otherwise, only after infrared ray emitting diode 140 is assembled on the circuit board for electric power saving apparatus 100 is the light energy having the infrared ray synthetic wavelengths of the specific wavelength band irradiated to infrared ray emitting diode 140 in order to excite photon-absorbing electrons to a conduction band, and to vary the electrical state in the crystal interior of infrared ray emitting diode 140. Of course, the infrared ray synthetic wavelengths irradiated to infrared ray emitting diode 140 preferably have a band between 780nm and 1100nm, and more preferably have a band between 780nm and 900nm; and in the same manner as semiconductor device 121, the infrared ray synthetic wavelengths of bands between 780nm and 900nm are obtained through combining together visible light of 500nm to 600nm and infrared light of 1,000nm to 10,000nm obtained by adjusting light intensity using a visible light filter and an infrared filter, respectively, by generating an infrared vortex using an infrared screw.

By using electric power saving apparatus 100, according to the present invention, the currents (electrons) flowing along transmission line 20, connected from alternating current power 10 to load 30, ensure a stability of spins by virtue of the supply of light energy (photons) from semiconductor device 121, such that the wavelengths of the electrons among all the currents supplied to load 30 become elongated, with the spin motions of the electrons then becoming stable, and the deviation of the electrons from their orbits is thereby prevented by inducing the correction of orbits, thereby reducing a loss of energy and frictional force caused by the collision of electrons, further generating decreases in electromagnetic waves. These effects may be appreciated by

comparing the photograph where the voltage states of the conductor transmission line at the load side are measured by means of an oscilloscope, in cases where electric power saving apparatus 100 of this invention is not adopted in the power circuit as illustrated in FIG. 19, with the photograph where the voltage states of the conductor transmission line at the load side are measured by means of an oscilloscope, in cases where electric power saving apparatus 100 of this invention is adopted in the power circuit as illustrated in FIG. 20.

As previously mentioned, FIGS. 14 and 15 illustrate examples of the circuit board structure, constituting electric power saving apparatus 100 according to the present invention, wherein the circuit board structure for use in electric power saving apparatus 100, connected in parallel with transmission line 20 and connecting alternating current power 10 and load 30, said electric power saving apparatus 100, including control part 120 and semiconductor device 121, adapted to transmit light energy, and having the infrared ray synthetic wavelengths to transmission line 20 as an output pulse signal, said circuit board structure, including infrared ray emitting diode 140 disposed near semiconductor device 121 in such a manner as to be controlled by the output of control part 120, having the semiconductor device mounted on a circuit board, constituting said electric power saving apparatus, for continuously irradiating infrared rays IR emitted therefrom to semiconductor device 121, having the light energy emitted from the infrared ray synthetic wavelengths of a specific wavelength band irradiated thereto, such that while the circuit board for electric power saving apparatus 100, having semiconductor device 121, constituting control part 120, is being assembled, the light energy from the infrared ray synthetic wavelengths of a specific wavelength band is irradiated to said semiconductor device 121, in order to excite photon-absorbing electrons to a conduction band and to vary the electrical state in the crystal interior thereof; and while electric power saving apparatus 100 is being operated after being connected in parallel with transmission line 20, connecting alternating current power 10 and load 30, the infrared ray energy emitted therefrom is continuously supplied to semiconductor device 121. In particular, as illustrated in FIG. 14, infrared ray emitting diode 140 is disposed at the side of semiconductor device 121 on the same plane as the circuit board where semiconductor device 121 is placed (in FIG. 14, infrared ray emitting diode 140 is disposed at the side of the input/output terminals of semiconductor device 121, although this arrangement may be altered), and in this case, when temperature stability of the circuit and appropriate energy efficiency are considered, infrared ray emitting diode 140 is desirably disposed at a distance of between 4mm and 10mm from the side of semiconductor device 121. Furthermore, as illustrated in FIG. 15,

infrared ray emitting diode 140 is disposed at the side of semiconductor device 121 on a different plane from the circuit board, where semiconductor device 121 is placed, and in this case, when temperature stability of the circuit and appropriate energy efficiency are considered, infrared ray emitting diode 140 is desirably disposed at a distance between 5mm and 10mm from the top surface of semiconductor device 121. On the other hand, although not shown in the diagrams, infrared ray emitting diode 140 may be disposed near one of the side or top surface of semiconductor device 121, and a visible light emitting diode may be disposed near the other. During this time, a single infrared ray emitting diode may be disposed at the side or top surface of semiconductor device 121, unlike the plurality of the infrared ray emitting diodes disposed as per FIGS. 14 and 15.

Furthermore, there is provided an electric power saving method using light energy, with infrared ray synthetic wavelengths, as illustrated in FIG. 16; the electric power saving method includes the steps of: 1) while a circuit board constituting electric power saving apparatus 100 is being assembled, irradiating the light energy with the infrared ray synthetic wavelengths of a specific wavelength band to semiconductor device 121 in order to excite photon-absorbing electrons to a conduction band and to vary the electrical state in the crystal interior thereof (at step S10); 2) in a state wherein the circuit board for the electric power saving apparatus is being utilized after assembly, rectifying a high alternating current voltage flowing from alternating current power 10 to a low constant voltage, and thereby supplying a low constant voltage to control part 120 with semiconductor device 121 excited by the light energy of the infrared ray synthetic wavelengths through the input terminals of control part 120 (at step S20); 3) transmitting the pulse of microcurrents output from first output terminal p3 of control part 120 to transmission line 20, and connecting alternating current power 10 and load 30 in order to supply electric energy (at step S30); and 4) irradiating infrared rays generated from infrared ray emitting diode 140, and operated by a control signal of second output terminal p1 of control part 120 to semiconductor device 121 (at step S40). In this case, of course, steps S30 and S40 may be conducted at the same time at step S50, and at step S40, the light-emitting timing of infrared ray emitting diode 140 is controlled by way of the control of semiconductor device 121, such that it is able to repeatedly conduct the emission and extinction of light for a given period of time, thereby preventing the temperature of semiconductor device 121 from rising excessively.

Although not shown in FIG. 9, step S20 further includes the step of reducing and detecting the size of the current applied to the electric power saving apparatus at a given ratio, and displaying the detected size of the current to the outside, which is conducted by current state display part 150 of the electric power saving apparatus, as illustrated in

FIG. 11, so that it is easily checked from the outside of electric power saving apparatus 100 whether electric power saving apparatus 100 is set in a range of a maximum saving efficiency, and whether an operational malfunction occurs on electric power saving apparatus 100.

While the present invention has been described with reference to the particular illustrative embodiments, it is not to be considered as restricted by the embodiments, but by the appended claims, and therefore, it is required to be understood that other modifications and variations may be made to this invention without departing from the substance and scope of said present invention, as those skilled in the art will readily understand. Also, although FIGS. 10 and 11 illustrate the embodiments for the circuit diagram used in single-phase power and load devices, the embodiments may be varied for three-phase power and load devices as outlined in FIG. 13 by those skilled in the art. Additionally, the invention having been disclosed, a number of variations will now become apparent to those skilled in the art. Whereas the present invention is intended to encompass foregoing preferred embodiments, as well as a reasonable range of equivalents, reference should be made to the appended claims rather than the foregoing discussion of examples in order to assess the scope of said present invention, for which which exclusive rights are claimed.

INDUSTRIAL APPLICABILITY

As previously described, there is provided an electric power saving apparatus, according to the present invention, wherein a pulse microcurrent, along which the light energy of infrared ray synthetic wavelengths is transmitted, is continuously supplied to the transmission line connecting alternating current power and load from the semiconductor device to which the light of infrared ray synthetic wavelengths is irradiated continuously from the infrared ray emitting diode, such that the wavelengths of electrons on the conductor along the transmission line may be lengthened, the spin motions of electrons may be stabilized, the joule heat level may be low, the saving efficiency may be increased, the noise and vibration may be suppressed, and the quantity of power consumption may be reduced by the decrement of electromagnetic waves. Additionally, the electric power saving apparatus of this invention may be made available to the single-phase circuit used for general office and home load devices, and to three-phase circuits used in industrial load devices.

CLAIMS

1. An electric power saving apparatus, using light energy, having infrared ray synthetic wavelengths connected in parallel with a transmission line connecting alternating current power and a load, and that is provided with a semiconductor device adapted in order to transmit light energy with infrared ray synthetic wavelengths to the transmission line as an output pulse signal; said electric power saving apparatus comprising:

a rectifying part disposed between the alternating current power, and an input terminal of the semiconductor device, for the purposes of rectifying the alternating current into a direct current of low voltage;

a control part, having a circuit adapted to apply a driving voltage at the direct low voltage current of the rectifying part to the semiconductor device, and having the semiconductor device;

an oscillation-limiting part disposed at the carrier circuit between the transmission line connecting the alternating current power and the load, and an output terminal of the semiconductor device, for the purposes of generating the output pulse signal corresponding with a frequency of the alternating current power; and

an infrared ray emitting diode, disposed near the semiconductor device in such a manner as to be controlled by the output of the control part, having the semiconductor device mounted on a circuit board constituting the electric power saving apparatus, for the purposes of irradiating the infrared rays emitted therefrom to the semiconductor device, such that while the circuit board constituting the electric power saving apparatus is being assembled, the light energy from the infrared ray synthetic wavelengths of a specific wavelength band is irradiated to the semiconductor device in order to excite photon-absorbing electrons to a conduction band, and to vary the electrical state in the interior of the crystal of the semiconductor device; and while the electric power saving apparatus is in operation after being connected in parallel with the transmission line connecting the alternating current power and the load, the infrared ray energy is continuously supplied to the semiconductor device.

2. An electric power saving apparatus, according to Claim 1, wherein the rectifying part comprises a TNR circuit, a noise filter, and a constant voltage circuit with a zener diode.

3. An electric power saving apparatus, according to Claims 1 and 2, wherein the oscillation-limiting part comprises a resistor, a condenser, and a zener diode.

4. An electric power saving apparatus, according to Claims 1 and 2, further comprising a current state display part with a current transformer for reducing and detecting the size of the current applied to the electric power saving apparatus, at a given ratio, and a liquid crystal display for displaying the size of the current detected by the current transformer.

5. An electric power saving apparatus, according to Claims 1 and 2, wherein the infrared ray synthetic wavelengths in a band between 780nm and 900nm are irradiated to the semiconductor device.

6. An electric power saving apparatus, according to Claim 5, wherein the infrared ray synthetic wavelengths are irradiated to the semiconductor device prior to the semiconductor device being packaged.

7. An electric power saving apparatus, according to Claim 5, wherein the infrared ray with synthetic wavelength of 780nm to 900nm irradiated on the semiconductor device is obtained by combining together visible light of 500nm to 600nm and infrared light of 1,000nm to 10,000nm obtained by adjusting light intensity using a visible light filter and an infrared filter, respectively, by generating an infrared vortex using an infrared screw.

8. An electric power saving apparatus, according to Claim 1, wherein the semiconductor device is developed by selecting oxide, sulfide, selenide, telluride, halide, etc.

9. An electric power saving apparatus, according to Claim 1, wherein the semiconductor device is comprised of a PLZT with a chemical equation of $(Pb_{1-x}La_x)(Zr_{1-y}Ti_y)_{1-x/4}O_3$.

10. An electric power saving apparatus, according to Claim 1, wherein the semiconductor device is packaged with a ceramic material.

11. An electric power saving apparatus, according to Claim 1, wherein the semiconductor device is comprised of a programmable microcontroller, having the logic of being able to select the size of the pulse current outputted to the transmission line connecting the alternating current power and the load, and the logic of controlling the light-emitting timing of the infrared ray emitting diode.

12. An electric power saving apparatus, according to Claim 1, wherein a switch and a light emitting diode are connected additionally to the semiconductor device, for the purposes of checking whether the semiconductor device is operating normally or not by the application of a driving voltage applied separately prior to the connection of the alternating current power.

13. An electric power saving apparatus, according to Claim 1, wherein prior to the infrared ray emitting diode being assembled on the circuit board for the electric power saving apparatus, the light energy from the infrared ray synthetic wavelengths of the specific wavelength band is irradiated to the infrared ray emitting diode in order to excite photon- absorbing electrons to a conduction band and to vary the electrical state in the crystal interior thereof.

14. An electric power saving apparatus, according to Claim 12, wherein after the infrared ray emitting diode is assembled on the circuit board for the electric power saving apparatus, the light energy from the infrared ray synthetic wavelengths of the specific wavelength band is irradiated additionally to the infrared ray emitting diode.

15. An electric power saving apparatus, according to Claim 1, wherein after the infrared ray emitting diode is assembled on the circuit board for the electric power saving apparatus, the light energy from the infrared ray synthetic wavelengths of the specific wavelength band is irradiated to the infrared ray emitting diode in order to excite photon-absorbing electrons to a conduction band and to vary the electrical state in the crystal interior thereof.

16. An electric power saving apparatus, according to any one of Claims 12 to 15, wherein the infrared ray synthetic wavelengths with bands between 780nm and 1100nm are irradiated to the infrared ray emitting diode.

17. An electric power saving apparatus, according to Claim 16, wherein the infrared ray synthetic wavelengths with bands between 780nm and 900nm are irradiated to the infrared ray emitting diode.

18. An electric power saving apparatus, according to Claims 16 and 17, wherein the infrared ray with synthetic wavelength irradiated on the infrared light-emitting device is obtained by combining together visible light of 500nm to 600nm and infrared light of

1,000nm to 10,000nm obtained by adjusting light intensity using a visible light filter and an infrared filter, respectively, by generating an infrared vortex using an infrared screw.

19. A circuit board structure for use in an electric power saving apparatus connected in parallel with a transmission line connecting an alternating current power and a load, said electric power saving apparatus including a control part and a semiconductor device adapted to transmit light energy with the infrared ray synthetic wavelengths to the transmission line as an output pulse signal, said circuit board structure comprising: an infrared ray emitting diode disposed near the semiconductor device in such a manner as to be controlled by the output of the control part having the semiconductor device mounted on a circuit board constituting said electric power saving apparatus, for the purposes of irradiating the infrared rays emitted therefrom to the semiconductor device, such that while the circuit board for the electric power saving apparatus having the semiconductor device constituting the control part is being assembled, the light energy from the infrared ray synthetic wavelengths of a specific wavelength band is irradiated to the semiconductor device in order to excite the photon-absorbing electrons to a conduction band and to vary the electrical state in the interior of the crystal of the semiconductor device; and while the electric power saving apparatus is being operated after being connected in parallel with the transmission line connecting the alternating current power and the load, the infrared ray energy emitted therefrom is continuously supplied to the semiconductor device.

20. A circuit board structure, according to Claim 19, wherein the infrared ray emitting diode is disposed at the side of the semiconductor device on the same plane as the circuit board where the semiconductor device is placed, having a distance between 4mm and 10mm from the side of said semiconductor device.

21. A circuit board structure, according to Claims 19 and 20, wherein the infrared ray emitting diode is disposed on a different plane from the circuit board where the semiconductor device is placed, having a distance between 5mm and 10mm from the top surface of the semiconductor device.

22. A circuit board structure, according to Claim 19, wherein the infrared ray emitting diode is disposed near one of the side or the top surface of the semiconductor device, with a visible light emitting diode further disposed near the other.

23. An electric power saving method using light energy emitted from the light of infrared ray synthetic wavelengths, said electric power saving method comprising the steps of:

1) while a circuit board constituting the electric power saving apparatus is being assembled, there occurs the irradiation of the light energy having the infrared ray synthetic wavelengths of a specific wavelength band to the semiconductor device in order to excite the photon-absorbing electrons to a conduction band and to vary the electrical state in the interior of the crystal of the semiconductor device;

2) in a state where the circuit board for the electric power saving apparatus is used after being assembled, rectifying a high alternating voltage current flowing from alternating current power to a low constant voltage, and supplying the low constant voltage to a control part having the semiconductor device excited by the light energy with the infrared ray synthetic wavelengths through input terminals of the control part;

3) transmitting the pulse of microcurrents output from the first output terminal of the control part, to a transmission line connecting the alternating current power and a load in order to supply electric energy and;

4) irradiating infrared rays generated from an infrared ray emitting diode, and operated by a control signal of the second output signal of the control part to the semiconductor device.

24. An electric power saving method, according to Claim 23, wherein steps 3) and 4) are conducted at the same time.

25. An electric power saving method, according to Claims 23 and 24, wherein at step 4), the light-emitting timing of the infrared ray emitting diodes is controlled by the semiconductor device.

26. An electric power saving method, according to Claims 23 and 24, wherein step 2) further comprises the step of reducing and detecting the size of the current applied to the electric power saving apparatus at a given ratio, and displaying the detected size of the current to the outside.

Application number / numéro de demande: 2575004

Figures: 17, 18, 19, 20

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FIG. 1

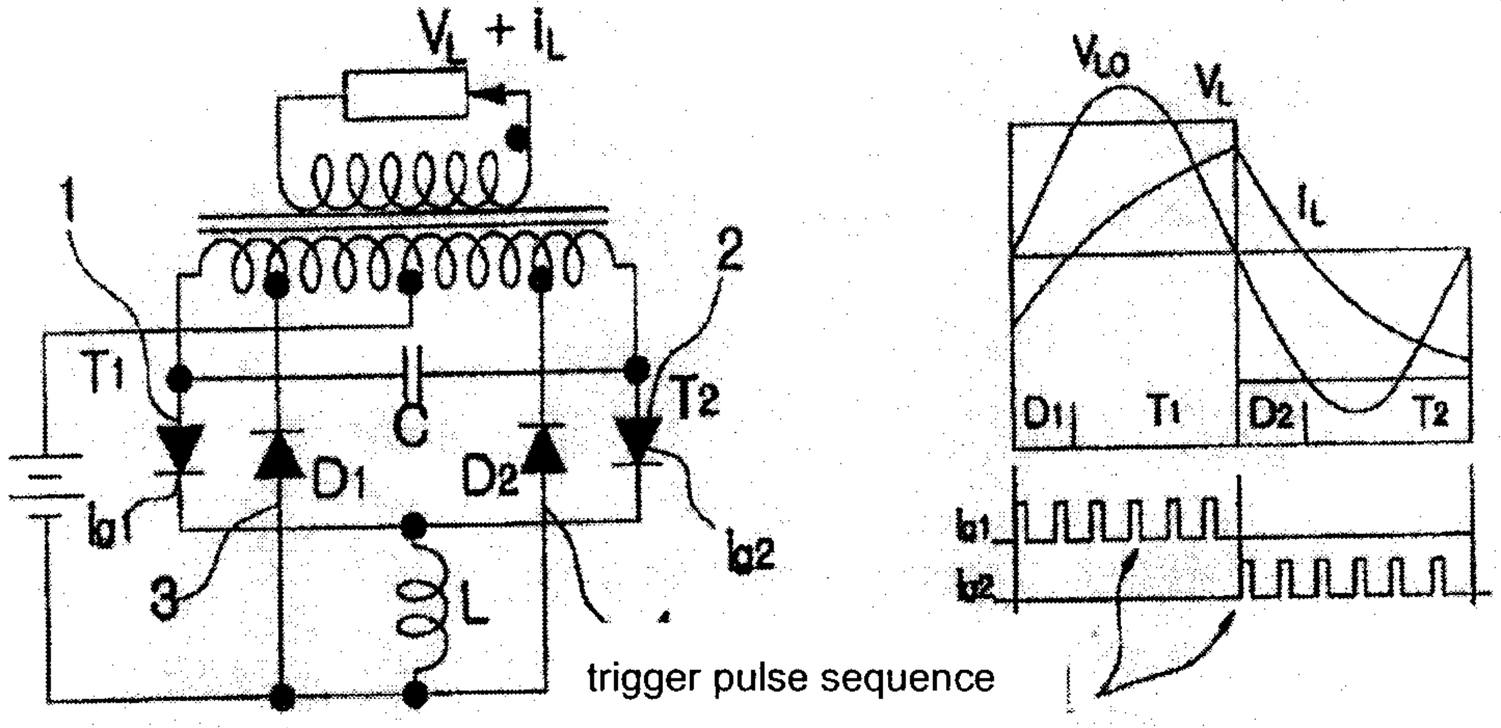
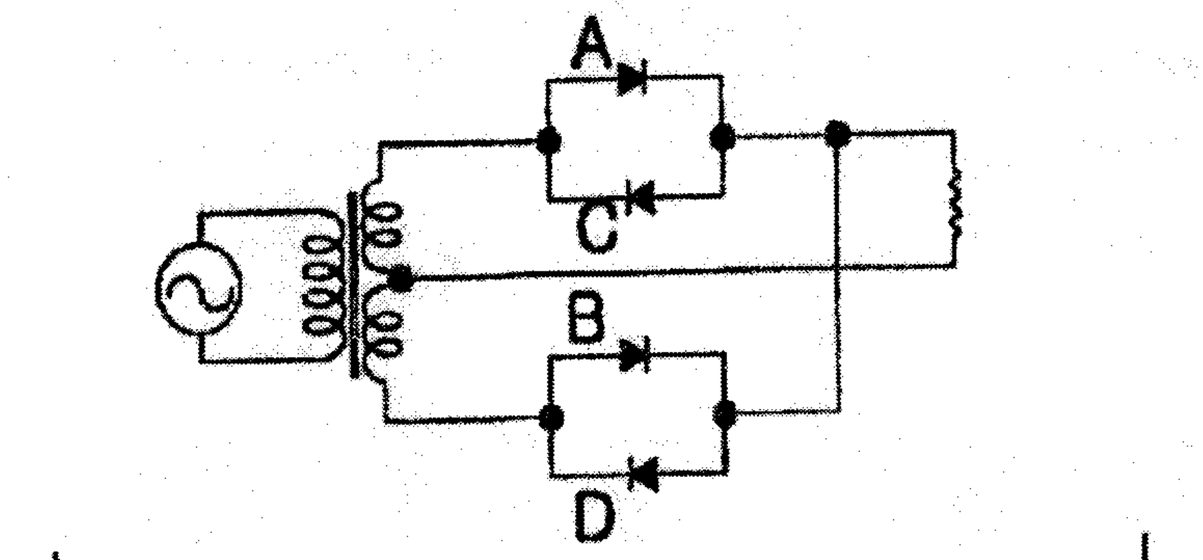
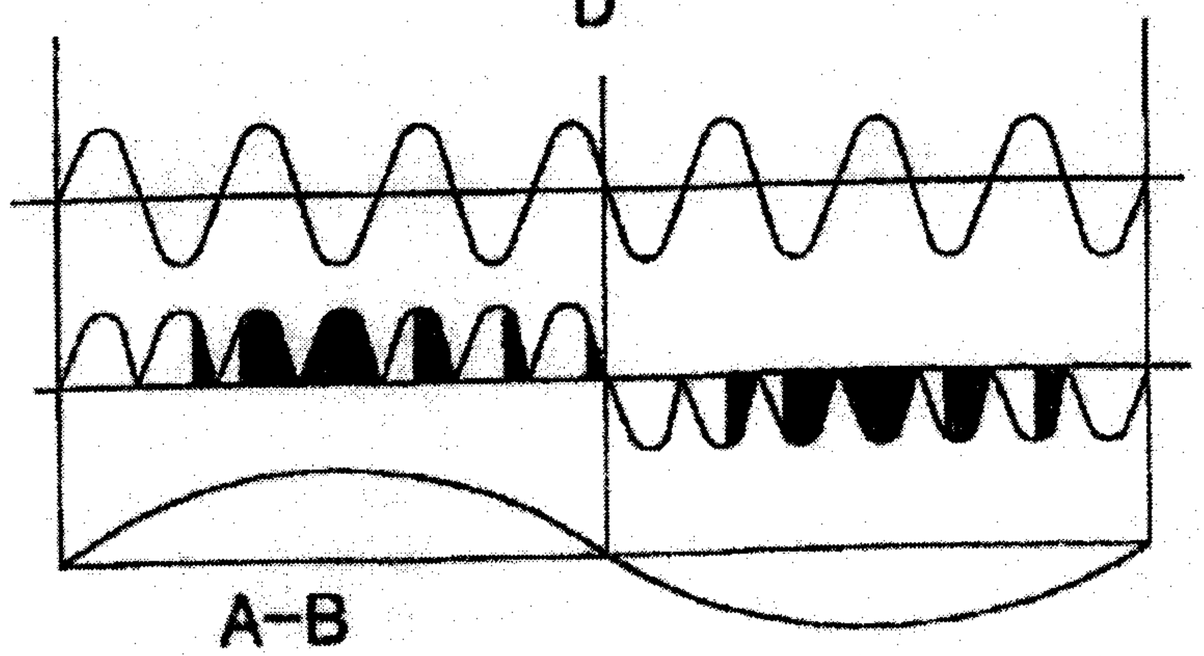

V_L + i_L
1
2
T1
T2
C
D1
D2
3
L
V_Lo
V_L
i_L
D1
T1
D2
T2
trigger pulse sequence

FIG 2


A
C
B
D


A-B


C-D

FIG 3

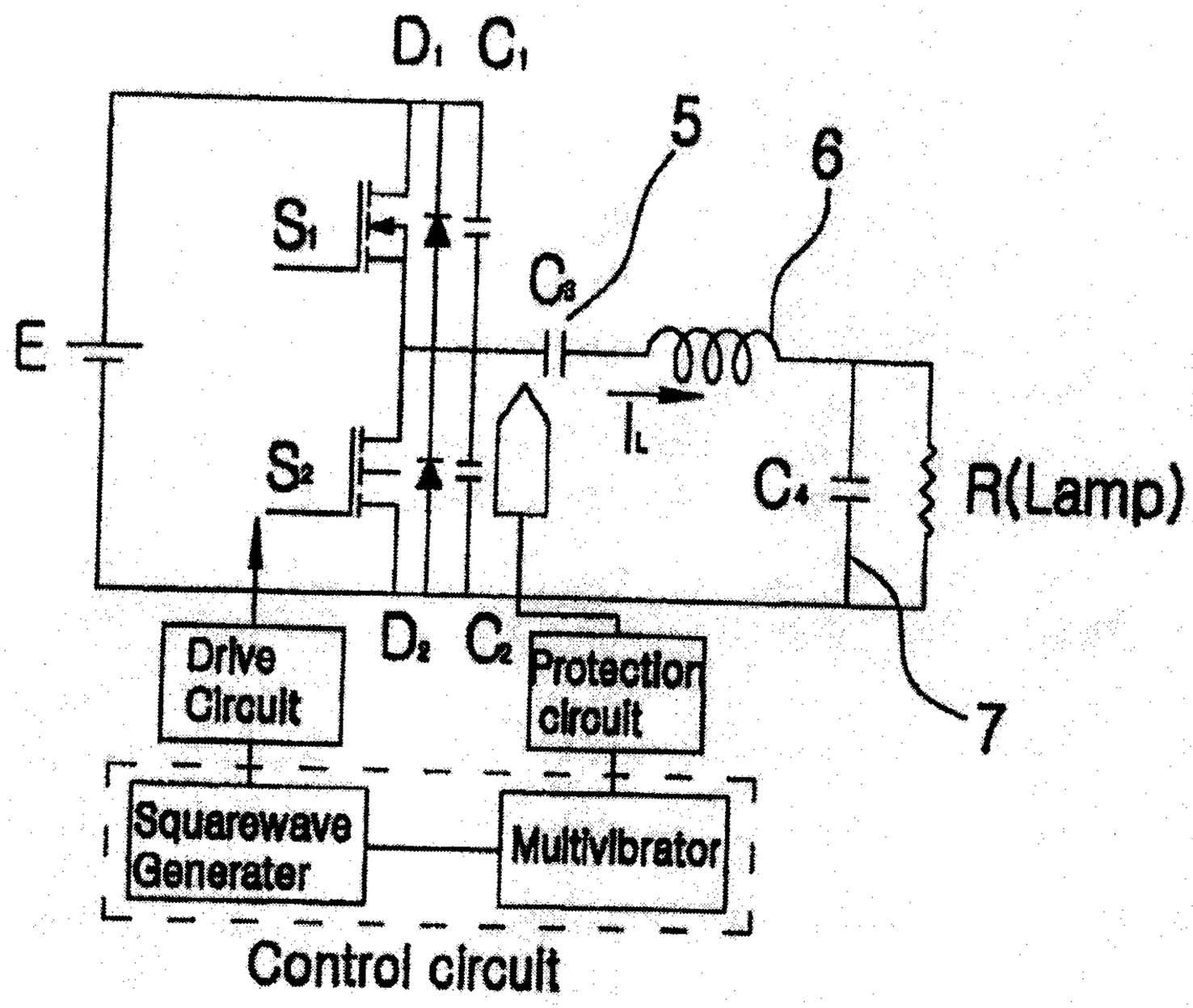

D1
C1
5
6
S1
C3
E
IL
S2
C4
R(Lamp)
D2
C2
Drive Circuit
Protection circuit
7
Squarewave Generater
Multivibrator
Control circuit

FIG 4

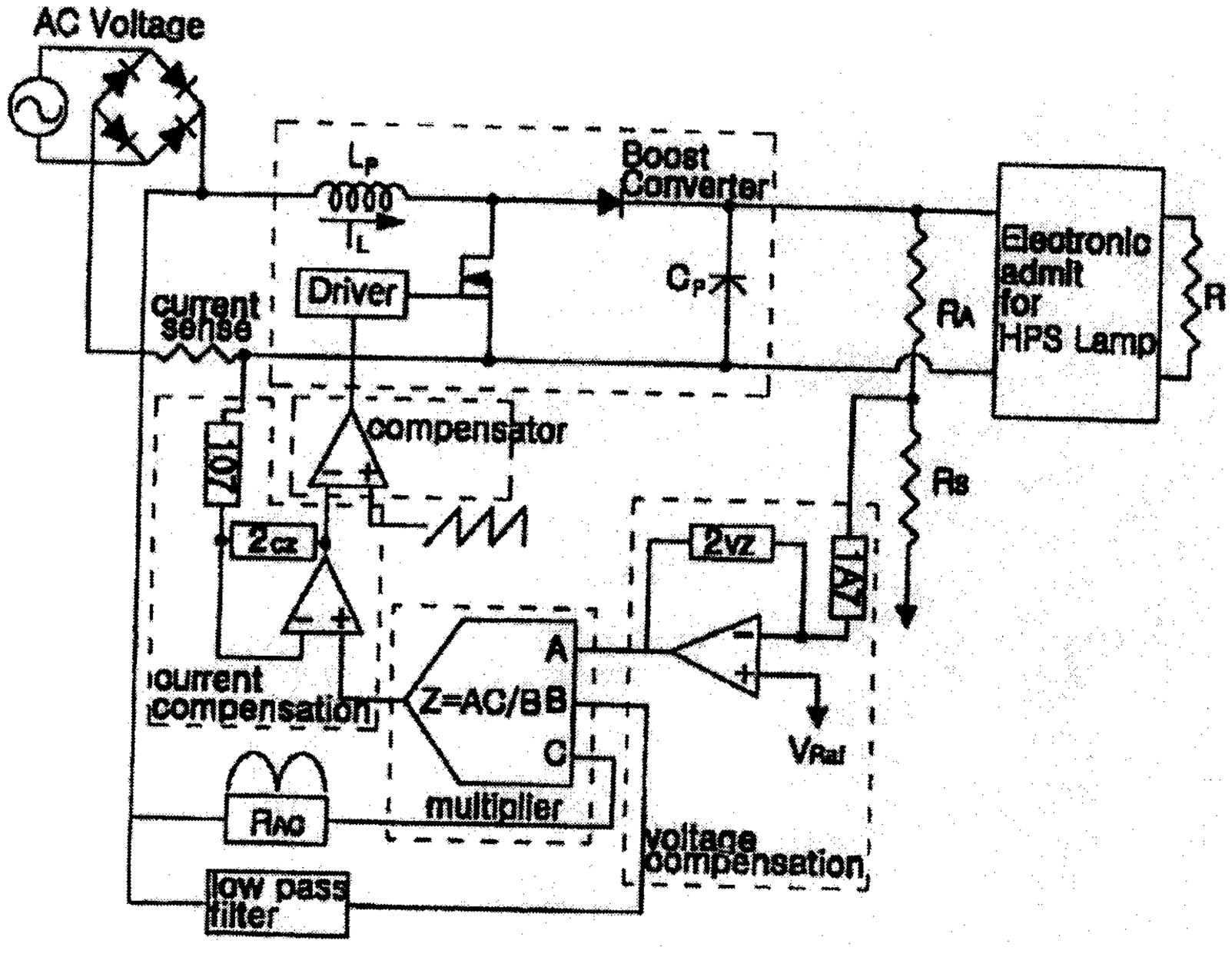

AC Voltage
L_P
Boost Converter
I_L
Driver
current sense
C_P
R_A
Electronic admit for HPS Lamp
R
compensator
10Z
2cx
2VZ
1AZ
R_S
A
Z=AC/BB
C
current compensation
multiplier
V_{Ref}
R_{MO}
voltage compensation
low pass filter

FIG. 5

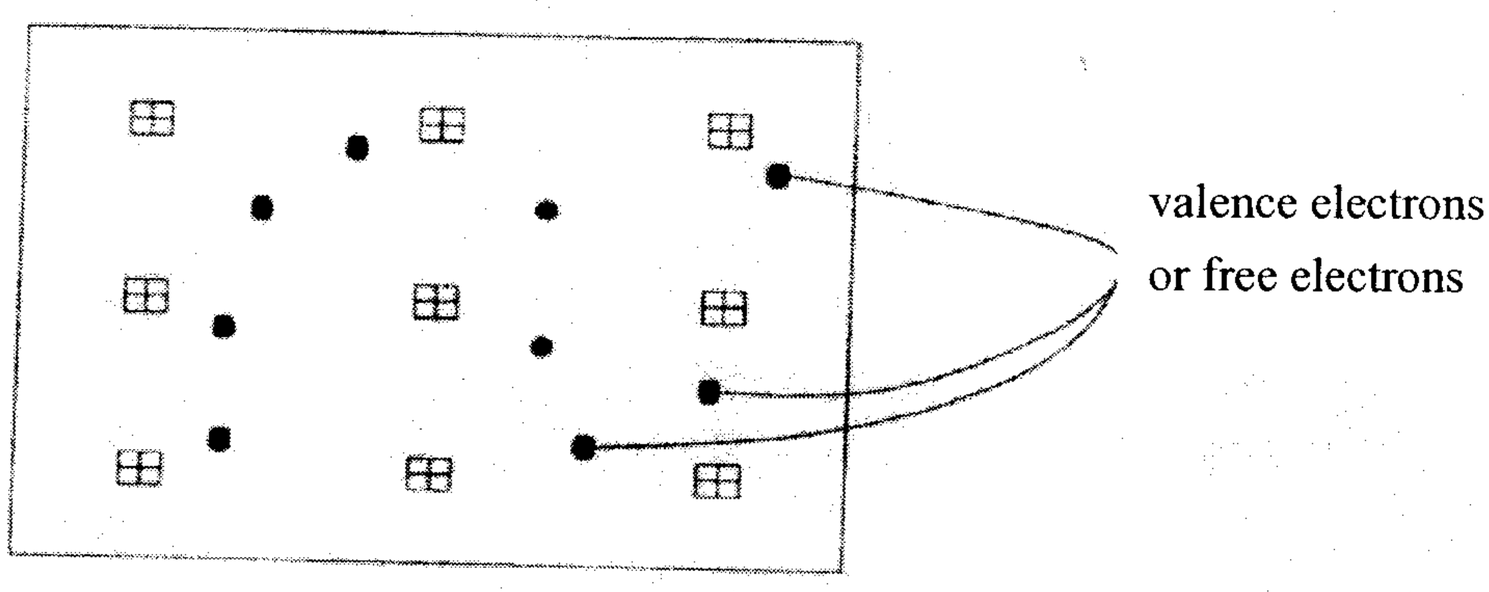

valence electrons
or free electrons

FIG.6

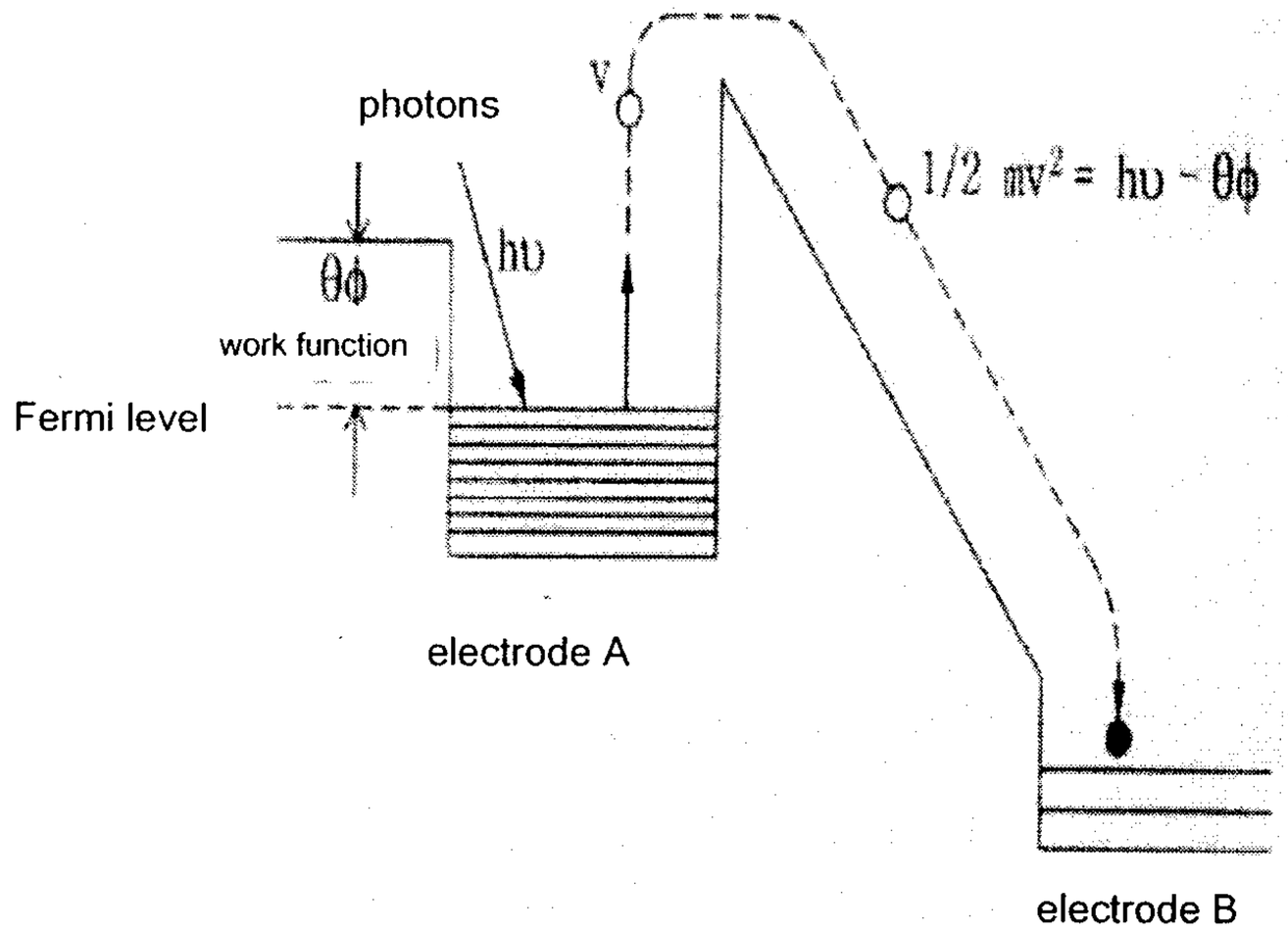

photons
hυ
θϕ
work function
Fermi level
electrode A
v
1/2 mv² = hυ - θϕ
electrode B

FIG. 7

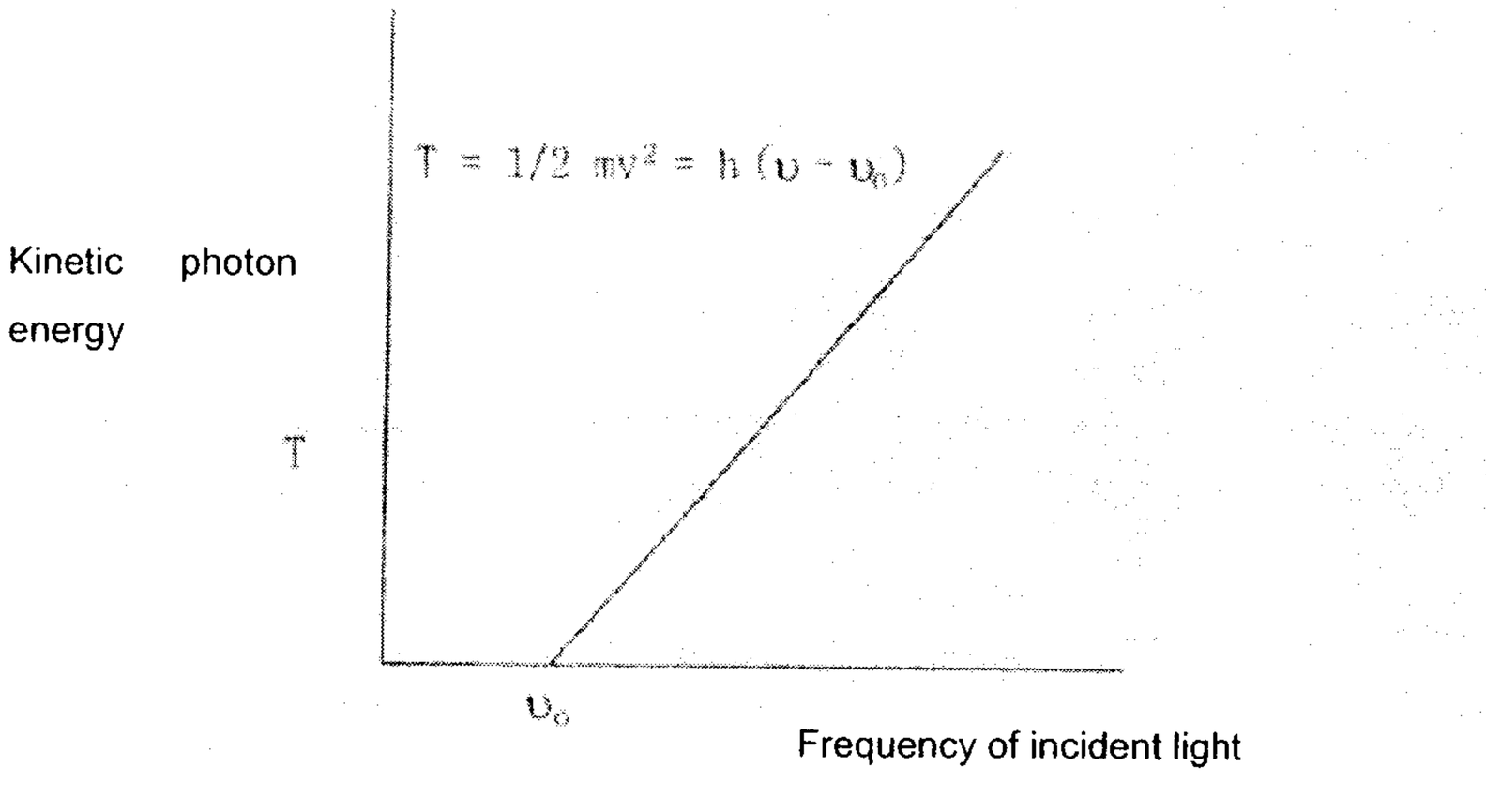

Kinetic energy
photon
T
T = 1/2 mv² = h (υ - υ₀)
υ₀
Frequency of incident light

FIG. 8

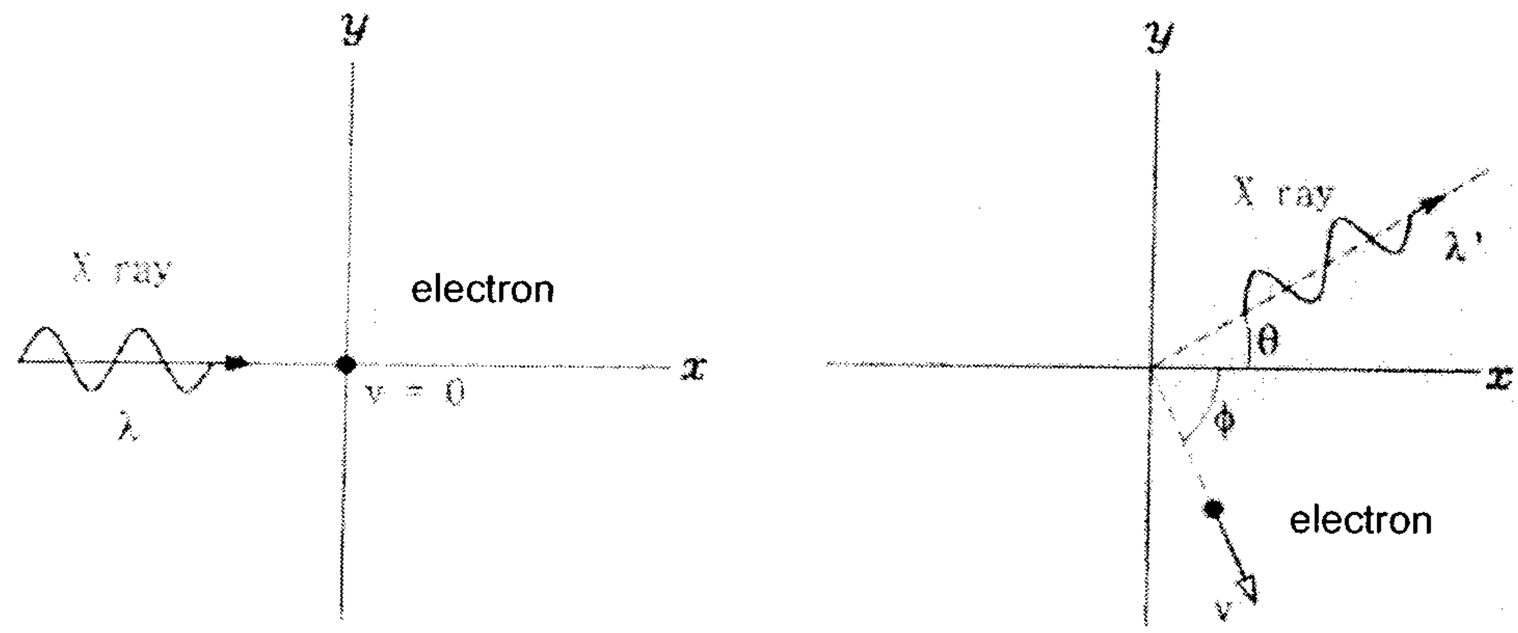

y
X ray
λ
electron
x
v = 0
Before
y
X ray
λ'
θ
x
ϕ
electron
v
After

FIG. 9

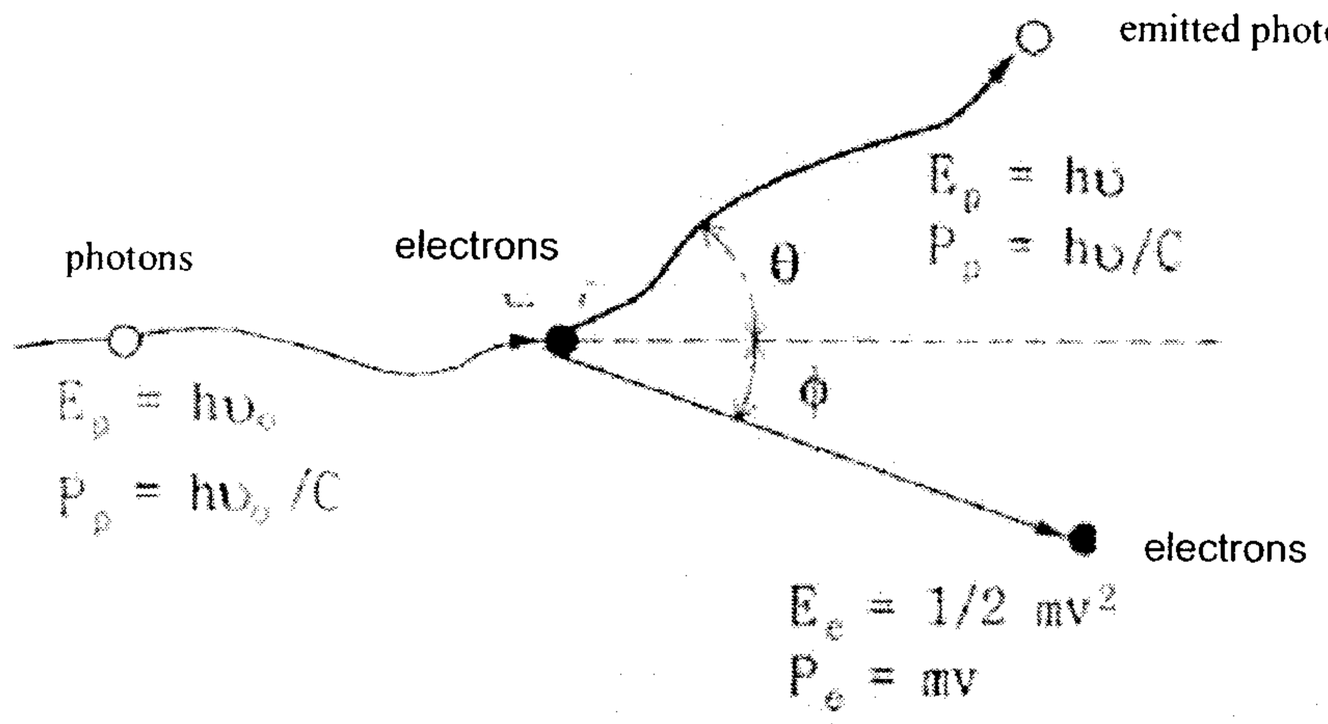

emitted photons
$E_0 = h\upsilon$
$P_0 = h\upsilon/C$
photons
electrons
θ
ϕ
$E_0 = h\upsilon_0$
$P_0 = h\upsilon_0/C$
electrons
$E_e = 1/2\ mv^2$
$P_e = mv$

FIG 10

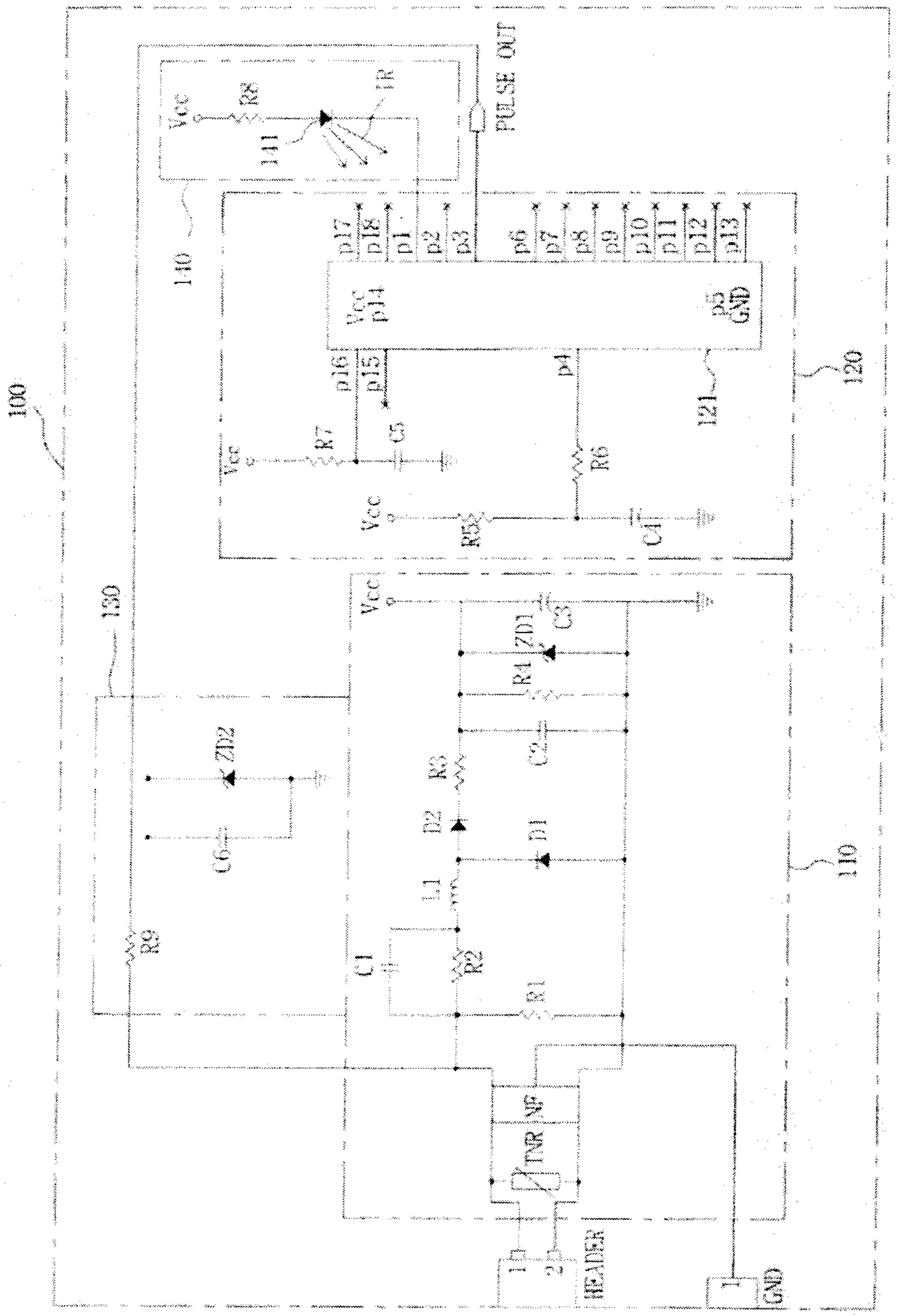
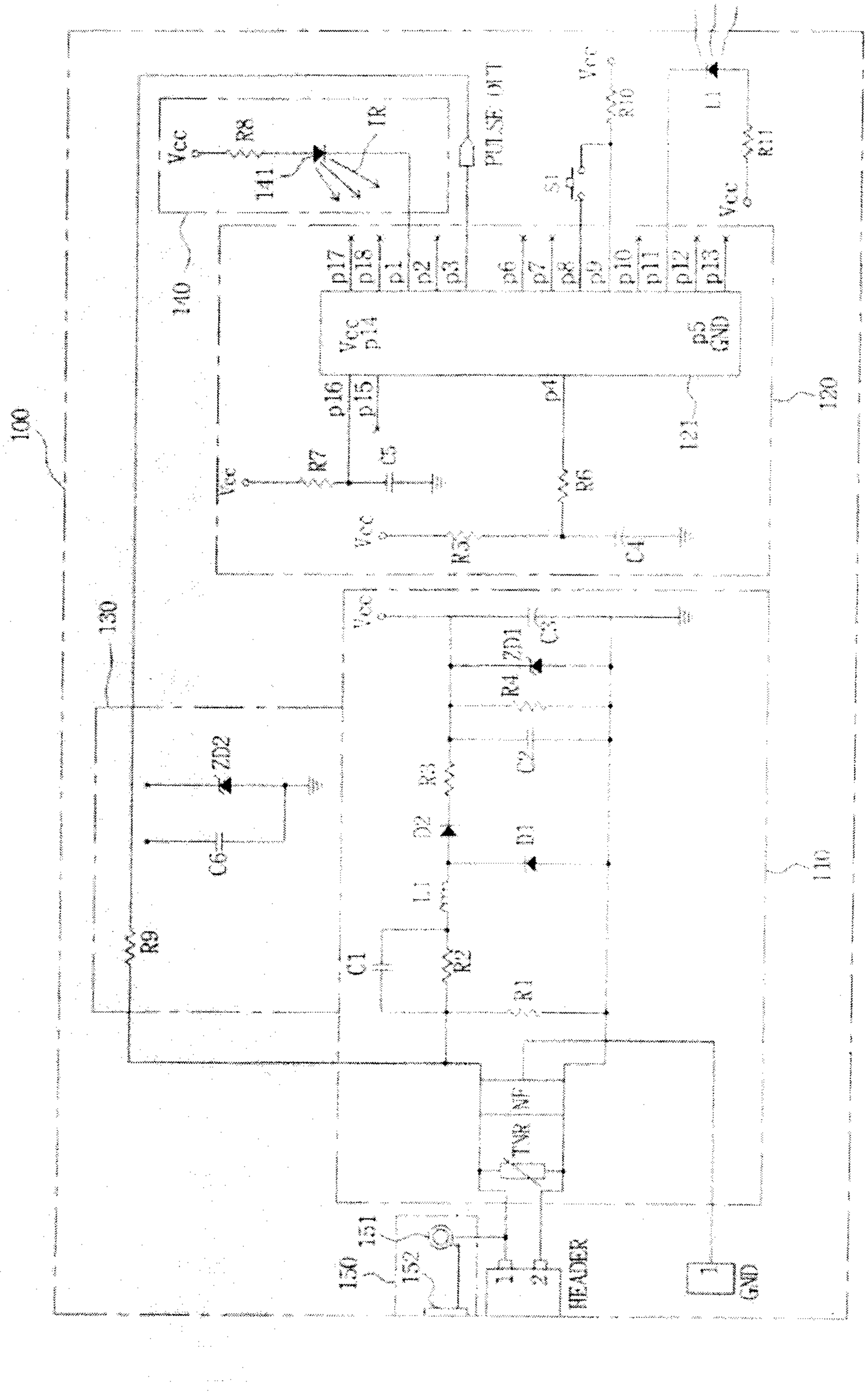
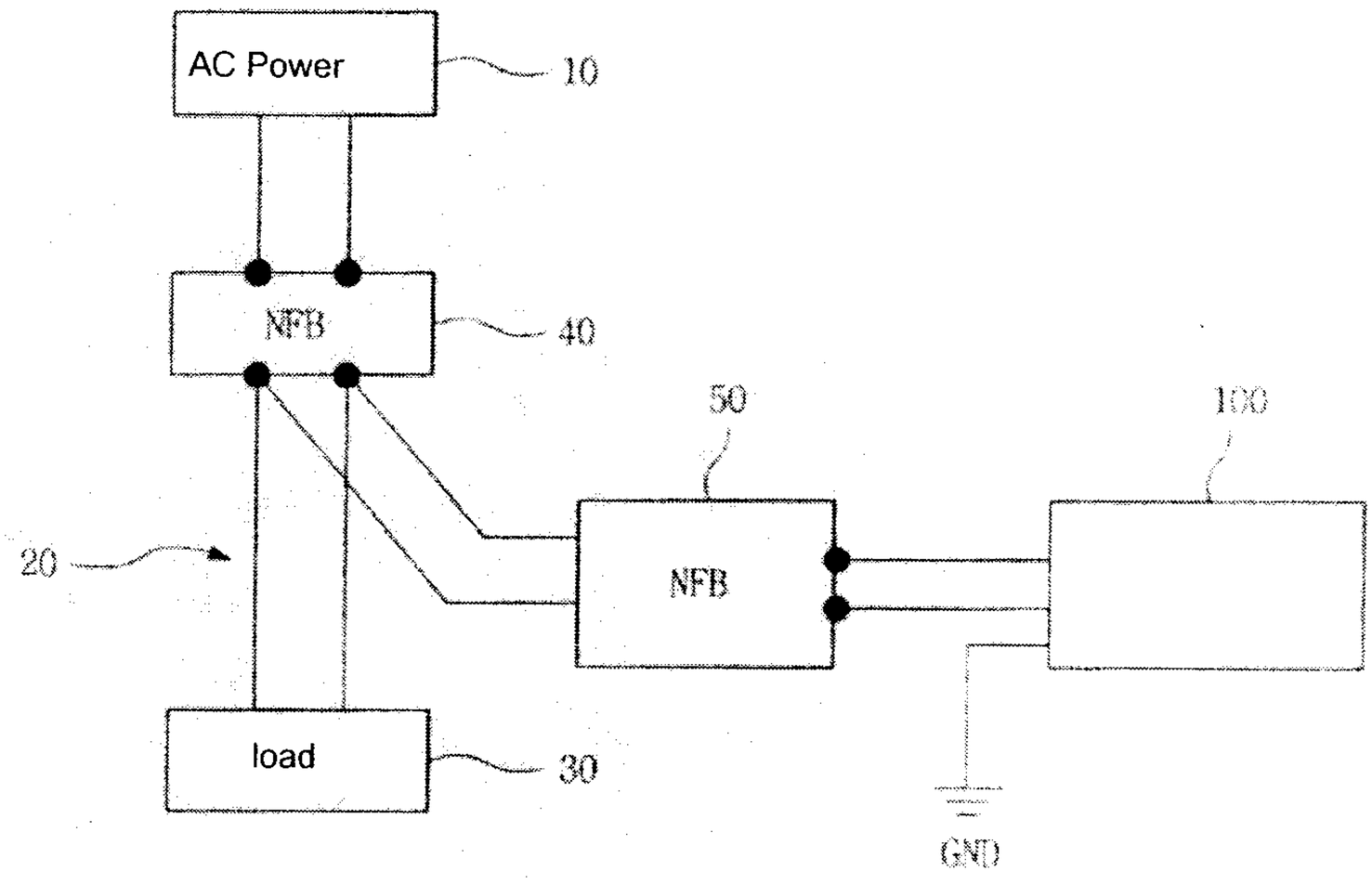

100
110
120
130
140
141
121
PULSE OUT
Vcc
R8
IR
p17
p18
p1
p2
p3
p6
p7
p8
p9
p10
p11
p12
p13
p14
p15
p16
p4
p5
GND
R7
C5
R6
R5
C4
ZD1
C3
R4
C2
R3
D2
D1
L1
C1
R2
R1
ZD2
C6
R9
TNR
VF
HEADER
1
2
GND

FIG 11


100
110
120
130
140
150
151
152
161
R8
IR
PULSE OUT
Vcc
R10
S1
L1
R11
p17
p18
p1
p2
p3
p6
p7
p8
p9
p10
p11
p12
p13
p14
p5
GND
p16
p15
p4
121
R7
C5
R6
R5
C4
C3
ZD1
R4
C2
ZD2
C6
D2
D1
L1
R3
R9
C1
R2
R1
MF
TNR
HEADER
GND

FIGS. 12



FIGS 13

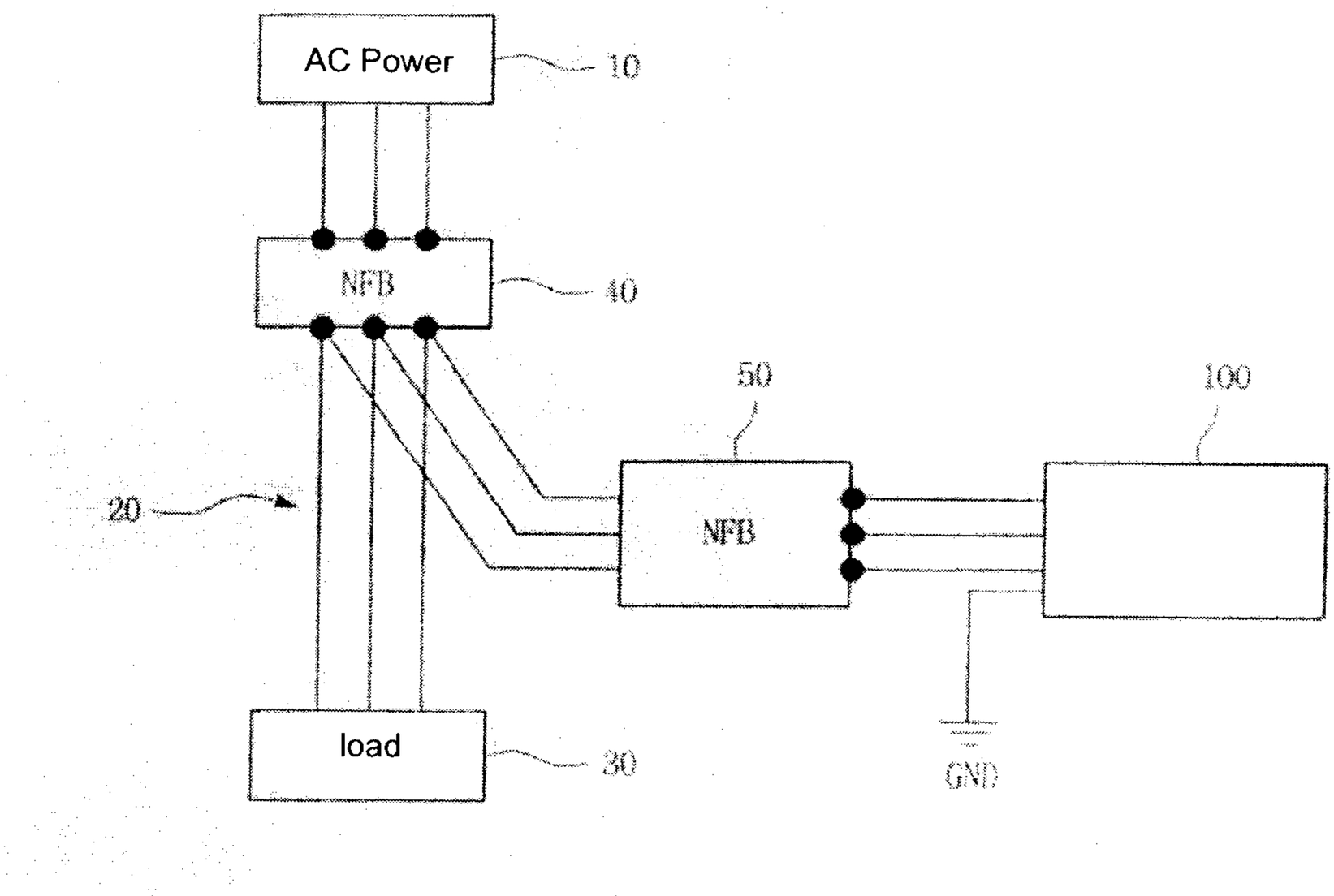


FIG 14

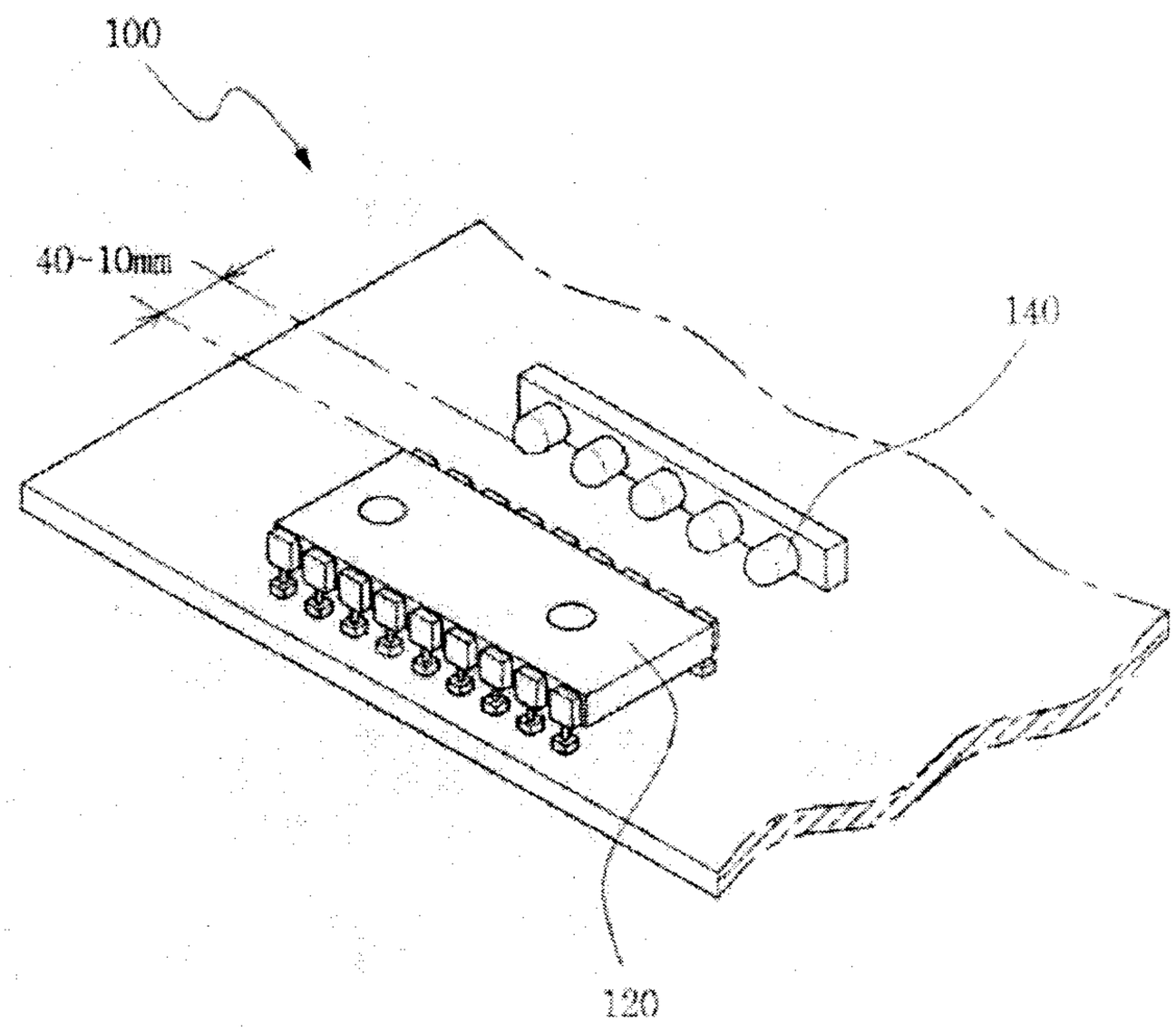


FIG 15

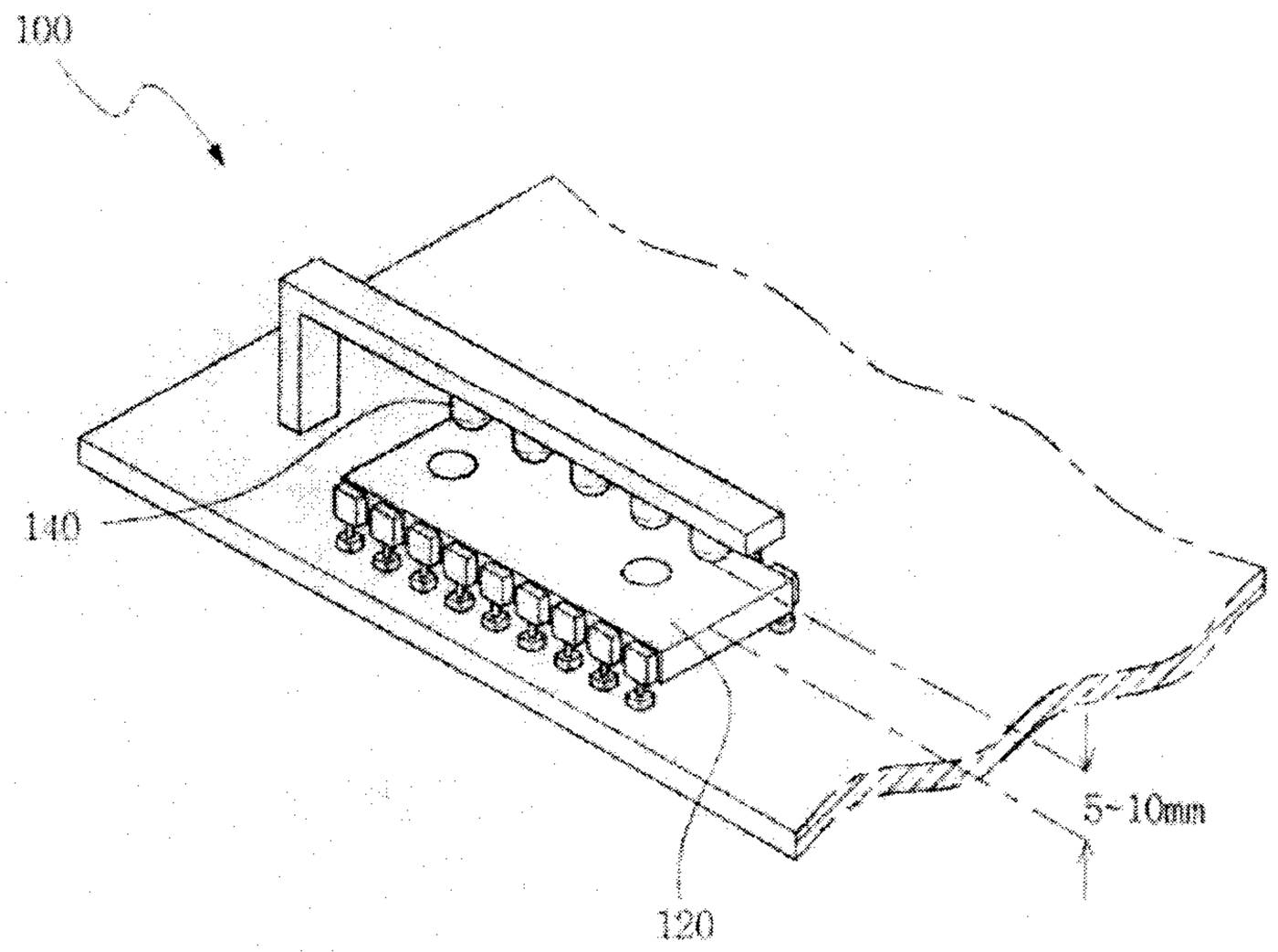
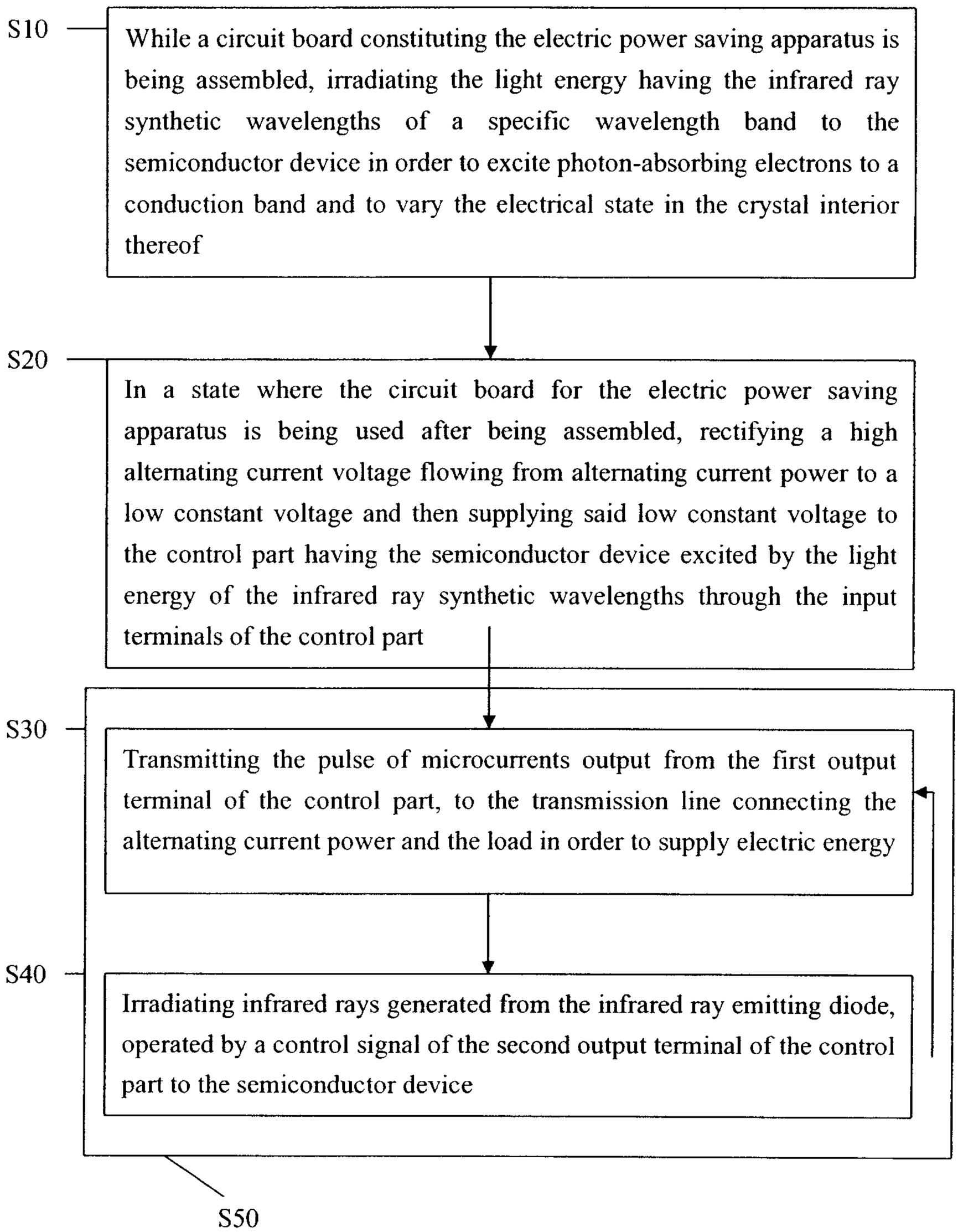


FIG. 16


S10
While a circuit board constituting the electric power saving apparatus is being assembled, irradiating the light energy having the infrared ray synthetic wavelengths of a specific wavelength band to the semiconductor device in order to excite photon-absorbing electrons to a conduction band and to vary the electrical state in the crystal interior thereof
S20
In a state where the circuit board for the electric power saving apparatus is being used after being assembled, rectifying a high alternating current voltage flowing from alternating current power to a low constant voltage and then supplying said low constant voltage to the control part having the semiconductor device excited by the light energy of the infrared ray synthetic wavelengths through the input terminals of the control part
S30
Transmitting the pulse of microcurrents output from the first output terminal of the control part, to the transmission line connecting the alternating current power and the load in order to supply electric energy
S40
Irradiating infrared rays generated from the infrared ray emitting diode, operated by a control signal of the second output terminal of the control part to the semiconductor device
S50