(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 128 371 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
25.09.2019 Bulletin 2019/39

(51) Int Cl.:
G03G 15/00 *(2006.01)*

(21) Application number: **15179994.7**

(22) Date of filing: **06.08.2015**

(54) **ELECTRONIC DEVICE, IMAGE FORMING APPARATUS AND POWER SUPPLY CONTROL METHOD FOR ELECTRONIC DEVICE**

ELEKTRONISCHE VORRICHTUNG, BILDERZEUGUNGSVORRICHTUNG UND STROMVERSORGUNGSSTEUERUNGSVERFAHREN FÜR ELEKTRONISCHE VORRICHTUNG

DISPOSITIF ÉLECTRONIQUE, APPAREIL DE FORMATION D'IMAGE ET PROCÉDÉ DE COMMANDE D'ALIMENTATION POUR UN DISPOSITIF ÉLECTRONIQUE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(43) Date of publication of application:
08.02.2017 Bulletin 2017/06

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EP 3 128 371 B1

Printed by Jouve, 75001 PARIS (FR)

Description

FIELD

[0001] Embodiments described herein relate to an electronic device such as an image forming apparatus and a power supply control method for reducing the power consumption of the electronic device acting in a power saving mode.

BACKGROUND

[0002] A scanner unit and a printer unit are arranged in an electronic device such as an image forming apparatus, the scanner unit reads an original, the image data of the read original is processed by an image processing unit, and then the processed image data is printed by the printer unit. In recent years, a digital multi-function peripheral is also provided with a public-line based FAX function in addition to a copy or scan function. The digital multi-function peripheral also has a plurality of functions, including a function of inputting print data from an external PC and printing and outputting the print data through the connection with a network and the cooperation with an external information processing apparatus (e.g. PC (Personal Computer)).

[0003] Various measures are taken to reduce the power consumption of such an image forming apparatus. On the other hand, it is a trend that the standards (e.g. international Energy Star standard) related to power consumption are becoming increasingly stricter, thus, a more effective power saving technology is needed for an image forming apparatus. Generally, an image forming apparatus which is enabled to act in a common action mode and a power saving mode acts in the power saving mode when not required to form an image.

[0004] In the image forming apparatus, the power-supply efficiency of a low-voltage power supply unit for converting a commercial power supply into a DC electrical source is increased to try to save power. To increase the efficiency of the low-voltage power supply unit, the voltage for use in the power saving mode is obtained by a special power transformer.

[0005] That is, in the conventional image forming apparatus, each load is powered by an AC/DC circuit in a common action mode and the power supplied to a specific load is obtained by a power transformer in a power saving mode. However, the AC/DC circuit is required to supply the maximum power in the common action mode and is therefore designed matching with the power required for the common action mode. Further, the power-supply efficiency characteristic of a low-voltage power supply unit using a power transformer shows that the power-supply efficiency of the primary side is likely to drop when the power consumption of the secondary side is reduced, thus causing a problem that it is impossible to increase power-supply efficiency in the power saving mode.

[0006] Patent application US 2013 0188979 describes a power source with a first voltage generating unit and a second voltage generating unit. The second voltage generating unit is tailored to supply voltage to only part of a group of operating units of an image forming apparatus during sleep mode. The first voltage generating unit is switched apart from all operating units during sleep mode. As the image forming apparatus comprises a mechanical unit, at least one switch connected to the first voltage generating unit must then be tailored for the amperage corresponding to the mechanical unit.

DESCRIPTION OF THE DRAWINGS

[0007]

Fig. 1 is a block diagram illustrating an electronic device (image forming apparatus) involved in an embodiment;
Fig. 2 is a block diagram illustrating the structures of a power supply unit and a control substrate according to an embodiment;
Fig. 3 is a diagram illustrating the characteristic of the power-supply efficiency of a low-voltage power supply;
Fig. 4 is a flowchart illustrating a mode control method according to an embodiment; and
Fig. 5 is a block diagram illustrating the structures of a power supply unit and a control substrate according to a second embodiment.

DETAILED DESCRIPTION

[0008] In accordance with appended claim 1, an electronic device capable of acting in a common action mode and a power saving mode is provided.

[0009] Preferably, the second AC/DC circuit is formed to have the maximum power-supply efficiency matching with the load of the specific unit.

[0010] Preferably, if the number of the specific units which act in the power saving mode is more than two, then a plurality of second AC/DC circuits are separately arranged corresponding to the specific units.

[0011] The present invention also relates to an image forming apparatus in accordance with appended claim 4.

[0012] Preferably, the second AC/DC circuit is formed to have the maximum power-supply efficiency matching with the load of the specific unit.

[0013] Preferably, if the number of the specific units which act in the power saving mode is more than two, then a plurality of second AC/DC circuits are separately arranged corresponding to the specific units.

[0014] Preferably, the control unit carries out a control to recover the common action mode from the power saving mode in response to the operation on the control panel.

[0015] Preferably, the specific units are a part of a CPU constituting the control unit and a drive unit for controlling

the actions of the control panel.

[0016] The present invention further relates to a power supply control method for an electronic device capable of acting in a common action mode and a power saving mode in accordance with appended claim 9.

[0017] Preferably, the second AC/DC circuit is formed to have the maximum power-supply efficiency matching with the load of the specific unit.Embodiments of the present invention are described below with reference to accompanying drawings in which the same parts are denoted by the same reference signs.

(First Embodiment)

[0018] Fig. 1 is a block diagram illustrating an electronic device (image forming apparatus) involved in the first embodiment. In Fig. 1, an image forming apparatus is shown as an example of an electronic device. The image forming apparatus shown in Fig. 1 functions as, for example, a Multi-Function Peripheral (MFP) serving as digital combined apparatus.

[0019] In Fig. 1, an MFP 10 comprises a control unit 11, a scanner unit 12, a printer unit 13, a control panel 14, a FAX unit 15 and a hard disk drive (HDD) 16 serving as a memory unit. The MFP 10 further comprises a power supply unit 20 for supplying a supply voltage for each other unit of the MFP 10.

[0020] The control unit 11 comprises a CPU 101, an ROM 102, an RAM 103 and a communication interface (I/F) 104 connected with a network 300. The CPU 101 controls the whole actions of the MFP 10. The control program of the CPU 101 is stored in the ROM 102. The RAM 103 provides a temporary work area for the CPU 101. Further, a monitoring unit 111 which acts in the power saving mode is arranged in the CPU 101.

[0021] The communication interface (I/F) 104 is connected with an external device such as a PC via the network 300 to receive the image data sent from the PC. Further, the control unit 11 is connected with the scanner unit 12, the printer unit 13, the control panel 14, the FAX unit 15 and the HDD 16.

[0022] The control unit 11 compresses the image data read by the scanner unit 12 and stores the compressed image data in the HDD 16. Further, the image data received from the external device such as a PC is compressed and stored in the HDD 16. The control unit 11 reads the image data stored in the HDD 16, carries out an extension processing for the image data and then a specified image processing (e.g. gradation reproduction) and outputs the processed image data to the printer unit 13. The storage of image data in the HDD 16 and the reading of image data from the HDD 16 are both implemented under the control of the CPU 101.

[0023] The control panel 14 comprises a drive section 141, various operation keys 142, a display 143 composed of liquid crystal and the like, a backlight 144 for liquid crystal and a touch panel 145 integrated with the display 143. The drive section 141 drives the display 143 to display various contents thereon. Further, the drive section 141 controls the backlight 144 to control the brightness of the display 143. The operation keys 142 input various instructions such as 'print copies'.

[0024] The scanner unit 12 reads an original placed on an original table. The printer unit 13 including a photoconductive drum and a laser source scans and exposes the surface of the photoconductive drum with laser beams emitted from the laser source to generate an electrostatic latent image on the photoconductive drum. A charger, a developer and a transfer device are arranged around the photoconductive drum, and the electrostatic latent image on the photoconductive drum is developed by the developer to form a toner image on the photoconductive drum. The toner image is transferred onto a sheet by the transfer device.

[0025] A fixer 17 is also arranged in the printer unit 13. A sheet on which a toner image is transferred is conveyed towards the fixer 17. The fixer 17, in which a heat roller and a press roller are arranged opposite to each other, fixes the toner image formed on a sheet on the sheet by causing the sheet to pass through a space between the heat roller and the press roller.

[0026] The scanner unit 12 and the printer unit 13 which form an image on a sheet in response to an operation on the control panel 14 constitute an image forming unit. Further, the printer unit 13 may be of various other known structures, but not limited to the foregoing example. The FAX unit 15 which sends and receives data via a line 200 includes a FAX control unit 151 and a Network Control Unit (NCU) 152.

[0027] Further, the power supply unit 20 supplies various supply voltages for the other units of the MFP 10. The power supply unit 20 outputs a first output voltage V1 and a second output voltage V2 according to the common action mode and the power saving mode and supplies a supply voltage to a circuit in need of the supply voltage.

[0028] The image forming apparatus 10 carries out a control to supply a supply voltage to each unit in the common action mode (hereinafter referred to as a normal mode) to cause the units to act normally. Further, in the power saving mode (hereinafter referred to as a sleep mode), only the minimum required units are supplied with a supply voltage.

[0029] In the normal mode, the output voltage V1 from the power supply unit 20 is supplied to the control unit 11, the scanner unit 12, the printer unit 13, the control panel 14 and the FAX unit 15. Further, the output voltage V1 is also supplied for a mechanical system for conveying a sheet.

[0030] Further, in the sleep mode, the CPU 101 of the control unit 11 is in a sleep state, and only the monitoring unit 111 is in an action state. That is, in order that the condition of the access from the network 300 and the reception of a FAX by the FAX unit 15 are monitored even in the sleep mode, the monitoring unit 111 is in an action state in the sleep mode.

[0031] The CPU 101 further comprises an internal timer. Moreover, the normal mode is switched to the sleep mode if no operation is carried out by the control panel 14 within a preset period of time in the normal mode.

[0032] In the sleep mode, only the backlight 144 of the control panel 14 is OFF while the drive section 141 and the other units are in an action state. That is, if the user operates the control panel 14 when the MFP 10 is in the sleep mode, then the normal mode can be recovered according to the operation of the user.

[0033] The control panel 14 functions as a User Interface (UI) . The control panel 14 informs, via the control unit 11, the power supply unit 20 of the transfer to the sleep mode or a trigger for the recovery of the normal mode from the sleep mode.

[0034] In this way, the action mode of each of the control unit 11, the scanner unit 12, the printer unit 13, the control panel 14 and the FAX unit 15 can be optionally set by controlling the 'on/off' state of each of the units.

[0035] Fig. 2 is a block diagram illustrating the structure of the power supply unit 20 and the structure of the control substrate 30 for controlling the supply of a supply voltage to each unit. Further, for the sake of convenience of description, the units in the control substrate 30 are represented by signs A-G.

[0036] For example, the unit A is the CPU 101, the unit B is the monitoring unit 111 in the CPU 101. Further, the unit C is the FAX unit 15, and the unit D is the drive section 141 of the control unit 14.The unit E is the scanner unit 12, the unit F is the printer unit 13. The unit G is the mechanical system for conveying a sheet. Not limited to the units A-G, the image forming apparatus 10 may comprise other units the detailed structure of which is not described herein.

[0037] As shown in Fig. 2, in the power supply unit 20, a main power switch 22, a low-voltage power supply 23 and an AC power supply 21 are connected in series . The voltage of the AC power supply 21 is supplied to the low-voltage power supply 23 by switching on the main power switch 22.

[0038] The low-voltage power supply 23 comprises a filter unit 24, a first AC/DC circuit 25 and a second AC/DC circuit 26. The filter unit 24 removes unneeded noises. The first AC/DC circuit 25 and the second AC/DC circuit 26 convert an alternating voltage into a direct voltage. A direct voltage V1 is obtained from the first AC/DC circuit 25 and supplied to a first input terminal IN1 of the control substrate 30 as a first output voltage V1. A direct voltage V2 is obtained from the second AC/DC circuit 26 and supplied to a second input terminal IN2 of the control substrate 30 as a second output voltage V2.

[0039] The first input terminal IN1 is connected with a first switch 311 of a switching circuit 31. Further, the second input terminal IN2 is connected with a second switch 312 of the switching circuit 31. The first input terminal IN1 and the second input terminal IN2 are selectively connected with a first output terminal P1 and a second output terminal P2 by switching on/off the first switch 311 and the second switch 312. Consequentially, the output voltage V1 and the output voltage V2 are selectively supplied to the output terminal P1 and the output terminal P2.

[0040] The output terminal P1 of the switching circuit 31 is connected with the units A-F. The output terminal P2 is connected with the units B and D. That is, in the normal mode, the switch 311 of the switching circuit 31 is 'ON' so that the output voltage V1 from the first AC/DC circuit 25 is supplied to the units A-F via the switch 311. Further, the output voltage V1 is only supplied to the mechanical system G when the first AC/DC circuit 25 acts.

[0041] In the sleep mode, the switch 312 of the switching circuit 31 is 'ON' so that the output voltage V2 from the second AC/DC circuit 26 is supplied to the units B and D via the switch 312.

[0042] Further, as a UI functioning under the control of the CPU 101, the control panel 14 generates a control signal 140 in response to an operation of the user or the action of a timer. The control signal 140 is supplied to the first AC/DC circuit 25 and the switching unit 31. The control signal 140 becomes a trigger for the transfer from the normal mode to the sleep mode and the transfer from the sleep mode to the normal mode.

[0043] According to the control signal 140, in the normal mode, the first AC/DC circuit 25 acts, the switch 311 is switched on, and the switch 312 is switched off. According to the control signal 140, in the sleep mode, the second AC/DC circuit 26 acts, the switch 312 is switched on, and the switch 311 is switched off.

[0044] The switching circuit 31 may be a mechanical switch such as a relay or an electronic switch such as a semiconductor element.

[0045] In the image forming apparatus involved in the embodiment, in the normal mode, the output voltage V1 from the first AC/DC circuit 25 is supplied to the mechanical system G and the units A-F comprising a system and the image forming unit via the switching circuit 31, and in the sleep mode, the output voltage V2 from the second AC/DC circuit 26 is only supplied to the units B and D related to the control on the sleep mode via the switching circuit 31.

[0046] Thus, it can be assumed that the second AC/DC circuit 26 special for the units B and D related to the control on the sleep mode is characterized in specialization of the loads of the units B and D. In the sleep mode, the units B and D are unchanged or slightly changed in load. Thus, the AC/DC circuit 26 is designed to be a high-efficiency AC/DC circuit having the maximum power-supply efficiency, matching with the units B and D serving as loads.

[0047] In the conventional ordinary power supply unit, the AC/DC circuit supplies power for the loads (A-F) in the normal mode. Further, in the sleep mode, the power of the loads (B, D) is obtained by a power transformer. Thus, in the sleep mode, the AC/DC circuit works to supply power for the loads B and D. However, the performance of the AC/DC circuit requires the AC/DC circuit to be capable of supplying power for the loads (units A-F)

in the normal mode.

[0048] Further, the power-supply efficiency characteristic of the AC/DC circuit shows that the power-supply efficiency of the AC/DC circuit is likely to drop when the power consumption of the load is reduced. The power-supply efficiency is described below with reference to Fig. 3.

[0049] Fig. 3 is a diagram illustrating the characteristic of the power-supply efficiency of a low-voltage power supply. In Fig. 3, the horizontal axis represents the load of a secondary side, and the vertical axis represents power-supply efficiency (0-80%). In the conventional low-voltage power supply, if it is assumed that the load is Z1 in the normal mode and Z2 (Z1>Z2) in the sleep mode, then in the sleep mode, the power-supply efficiency of the low-voltage power supply is reduced by the amount indicated by the arrow Y1, compared with that of the low-voltage power supply in the normal mode.

[0050] On the other hand, in an embodiment, the second AC/DC circuit 26 is designed to have the maximum power-supply efficiency matching with the units the load change of which is small. Thus, the power-supply efficiency in the sleep mode is improved.

[0051] That is, in the sleep mode, the output voltage V2 is output to the monitoring unit 111 of the CPU 101 and the drive section 141 of the control panel 14. In the sleep mode, the load of the monitoring unit 111 or the drive section 141 is reduced and slightly changed. Thus, the second AC/DC circuit 26 is designed to have the maximum power-supply efficiency matching with the loads in the sleep mode.

[0052] Further, although arranged at the side of the control substrate 30 in the embodiment shown in Fig. 2, the switching circuit 31 may also be arranged at the side of the low-voltage power supply 23.

[0053] Fig. 4 is a flowchart illustrating a mode control method according to an embodiment. Fig. 4 shows an example of the supply of the power from the power supply unit 20 under the control of the CPU 101.

[0054] In Fig. 4, in Act 1, the CPU 101 causes the image forming apparatus 10 to act in the normal mode. At this time, the output voltage V1 from the first AC/DC circuit 25 is supplied to the loads (units A-G).

[0055] In Act 2, the CPU 101 determines whether or not to transfer to the sleep mode. For example, the CPU 101 tries to transfer to the sleep mode if no operation is carried out within a preset period of time after an operation is carried out on the control panel 14.

[0056] If the determination result of Act 2 is 'Yes', then the CPU 101 stops the units A, C, E, F and G in Act 3 (OFF) . In Act 4, the CPU 101 supplies the output voltage V2 to loads (units B and D) to control the switching circuit 31 and carries out a switching to connect the switch 312 with the second output terminal P2. In this case, the switch 311 carries out a switching to disconnect the first input terminal IN1 from the first output terminal P1.

[0057] In Act 5, the CPU 101 switches off the first AC/DC circuit 25 and switches on the second AC/DC circuit 26. In Act 6, the CPU 101 switches to the sleep mode in which the output voltage V2 is supplied from the second AC/DC circuit 26 to the units B and D via the switch 312 so that the units B and D act in the sleep mode.

[0058] Further, in the sleep mode, only the monitoring unit 111 of the CPU 101 is in an action state. Even in the sleep mode, the condition of the access from the network 300 and the reception of a FAX by the FAX unit 15 are monitored by the monitoring unit 111.

[0059] Sequentially, in Act 11, the CPU 101 determines whether or not to recover to the normal mode. For example, if the control panel 14 is operated in the sleep mode, then the normal mode is recovered according to the operation of the user. Further, the normal mode is recovered when the image forming apparatus is accessed from an external PC via the network 300.

[0060] If the determination result of Act 11 is 'Yes', then the CPU 101 switches on the first AC/DC circuit 25 in Act 12. The CPU 101 also switches off the second AC/DC circuit 26. In Act 13, the switching circuit 31 is controlled to connect the switch 311 with the first output terminal P1 and supply the output voltage V1 to loads (units A-F and G) . Moreover, the switch 312 is switched to disconnect the second input terminal IN2 from the second output terminal P2.

[0061] In Act 14, the CPU 101 switches on the units A, C, E, F and G. In Act 15, the image forming apparatus 10 recovers to the normal mode. After the Act 15, the flow returns to Act 1 to repeat the subsequent actions.

[0062] In the foregoing embodiments, the high efficiency of the low-voltage power supply 23 in the sleep mode can be sought to reduce power consumption.

(Second Embodiment)

[0063] Fig. 5 is a block diagram illustrating the structures of the power supply unit 20 and the control substrate 30 of an electronic device (image forming apparatus) involved in the second embodiment. In the second embodiment, a plurality of AC/DC circuits are configured which act in the sleep mode.

[0064] In Fig. 5, apart from the units B and D, the unit C for which a special AC/DC circuit 27 is arranged also acts in the sleep mode. The low-voltage power supply 23 comprises a first AC/DC circuit 25, a second AC/DC circuit 26 and a third AC/DC circuit 27. The output voltage V1 is obtained from the first AC/DC circuit 25, and the output voltage V2 is obtained from the second AC/DC circuit 26. An output voltage V3 is obtained from the third AC/DC circuit 27.

[0065] The switching circuit 31 further comprises a third input terminal IN3 and a third output terminal P3. The second input terminal IN2 and the third input terminal IN3 are connected with the second switch 312 and the third switch 313 which are linked with each other. The output voltage V2 and the output voltage V3 can be selectively supplied to the second output terminal P2 and the third output terminal P3 by switching on or off the

second and the third switch 312 and 313. Further, as shown in Fig. 2, the first switch 311 switches the state of the connection of the first input terminal IN1 with the output terminal P1.

[0066] The output terminal P1 of the switching circuit 31 is connected with the units A-F. The output terminal P2 is connected with the units B and D, and the output terminal P3 is connected with the unit C. That is, in the normal mode, the switch 311 of the switching circuit 31 is 'ON' so that the output voltage V1 from the first AC/DC circuit 25 is supplied to the units A-F via the switch 311. Further, the output voltage V1 is only supplied to the mechanical system G when the first AC/DC circuit 25 acts.

[0067] Further, in the sleep mode, the switches 312 and 313 of the switching circuit 31 are 'ON' so that the output voltage V2 from the second AC/DC circuit 26 is supplied to the units B and D via the switch 312. Moreover, the output voltage V3 from the third AC/DC circuit 27 is supplied to the unit C via the switch 313.

[0068] Further, as a UI functioning under the control of the CPU 101, the control panel 14 generates a control signal 140 in response to an operation of the user or the action of a timer. The control signal 140 is supplied to the switching unit 31. According to the control signal 140, in the normal mode, the first AC/DC circuit 25 acts, the switch 311 is 'ON', and the switches 312 and 313 are 'OFF'. According to the control signal 140, in the sleep mode, the second and the third AC/DC circuit 26 and 27 act, the switches 312 and 313 are 'ON', and the switch 311 is 'OFF'.

[0069] In the second embodiment, in the sleep mode, the output voltage V2 from the second AC/DC circuit 26 is supplied to the units B and D via the switch 312, and the output voltage V3 from the third AC/DC circuit 27 is supplied to the unit C via the switch 313.

[0070] Thus, the second AC/DC circuit 26 for the units B and D related to the control on the sleep mode can be characterized in specialization of the loads of the units B and D. The third AC/DC circuit 27 for the unit C related to the control on the sleep mode can be characterized in specialization of the loads of the unit C. As unchanged in load or slightly changed in lode in the sleep mode, the units B, D and C are designed as high-efficiency AC/DC circuits 26 and 27 having the maximum power-supply efficiency matching with the loads.

[0071] According to the foregoing second embodiment, the high efficiency of the low-voltage power supply in the sleep mode can be sought to reduce power consumption.

[0072] Further, in the example shown in Fig. 5, a third AC/DC circuit 27 is arranged for the unit C. However, the unit C may also be activated by the AC/DC circuit 25 like the other units A, E and F and switched off in the sleep mode. In this case, a special second AC/DC circuit 26 may be arranged for the unit B, and a special third AC/DC circuit 27 may be arranged for the unit D.

[0073] Moreover, the present invention may have various applications, but not limited to the foregoing embodiments. For example, not limited to be applied to an image forming apparatus, the foregoing power supply unit 20 or control substrate 30 may be applied to other electronic devices which function in a normal mode and a sleep mode.

[0074] Further, in the foregoing embodiments, the units B and D (or C) act in the sleep mode, however, other units may also act in the sleep mode. That is, the units acting in the sleep mode are determined matching with the actual circuits of an electronic device, and AC/DC circuits are arranged matching with the units.

[0075] While certain embodiments have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the invention which is defined in the appended claims.

Claims

1. An electronic device (10) for an image forming apparatus, the electronic device being capable of acting in a common action mode and a power saving mode, comprising:

   a plurality of units configured to act in the common action mode (A, B, C, D, E, F);
   a first AC/DC circuit (25) configured to supply a first direct voltage (V1) to the plurality of units (A, B, C, D, E, F) ;
   a second AC/DC circuit (26) configured to supply a second direct voltage (V2) to a specific one (B, D) of the units which acts in the power saving mode;
   a switching circuit (31) configured to make a switching so that the first direct voltage is supplied to the plurality of units in the common action mode and the second direct voltage is supplied to specific unit in the power saving mode;
   a mechanical system (G) for conveying a sheet configured to receive, independently of said switching circuit (31), the first direct voltage (V1) whenever the first AC/DC circuit (25) acts, and
   a control unit (101) configured to distinguish between the common action mode and the power saving mode and control the switching circuit,
   wherein the mechanical system (G) is configured to receive the first direct voltage (V1) whenever the first AC/DC circuit (25) delivers the first direct voltage.

2. The electronic device according to claim 1, wherein the second AC/DC circuit is formed to have the maximum power-supply efficiency matching with the load of the specific unit.

3. The electronic device according to claim 1 or 2, wherein

if the number of the specific units which act in the power saving mode is more than two, then a plurality of second AC/DC circuits are separately arranged corresponding to the specific units.

4. An image forming apparatus, comprising:

a user-operable control panel;
an electronic device according to claim 1 wherein the plurality of units configured to act in the common action mode, includes an image forming unit for forming an image on a sheet.

5. The image forming apparatus according to claim 4, wherein
the second AC/DC circuit is formed to have the maximum power-supply efficiency matching with the load of the specific unit.

6. The image forming apparatus according to claim 4 or 5, wherein
if the number of the specific units which act in the power saving mode is more than two, then a plurality of second AC/DC circuits are separately arranged corresponding to the specific units.

7. The image forming apparatus according to any one of claims 4 to 6, wherein
the control unit is configured to carry out a control to recover the common action mode from the power saving mode in response to the operation on the control panel.

8. The image forming apparatus according to any one of claims 4 to 7, wherein
the specific units are a part of a CPU constituting the control unit and a drive unit for controlling the actions of the control panel.

9. A power supply control method for an electronic device (10) for an image forming apparatus, the electronic device being capable of acting in a common action mode and a power saving mode, comprising:

generating, by a first AC/DC circuit (25), a first direct voltage (V1) for a plurality of units (A, B, C, D, E, F) which act in the common action mode;
generating, by a second AC/DC circuit (26), a second direct voltage (V2) for the specific one (B, D)of the plurality of units which acts in the power saving mode;
distinguishing, by a control unit (101), between the common action mode and the power saving mode; and
switching, by the control unit (101), a switching circuit so that the first direct voltage (V1) is supplied to the plurality of units in the common action mode and the second direct voltage (V2) is supplied to the specific unit in the power saving mode,
Wherein a mechanical system (G) for conveying a sheet belonging to the electronic device is configured to receive, independently of said switching circuit (31), the first direct voltage (V1) whenever the first AC/DC circuit (25) delivers the first direct voltage.

10. The power supply control method according to claim 9, wherein
the second AC/DC circuit is formed to have the maximum power-supply efficiency matching with the load of the specific unit

Patentansprüche

1. Elektronische Vorrichtung (10) für ein Bilderzeugungsgerät, wobei die elektronische Vorrichtung in der Lage ist, in einem Gemeinsame-Aktion-Modus bzw. Gleichtaktaktionsmodus und einem Energiesparmodus zu arbeiten, umfassend:

eine Mehrzahl von Einheiten, die konfiguriert sind, in dem Gleichtaktaktionsmodus (A, B, C, D, E, F) zu arbeiten;
eine erste AC/DC-Schaltung (25), die konfiguriert ist, eine erste Gleichspannung (V1) der Mehrzahl von Einheiten (A, B, C, D, E, F) zuzuführen;
eine zweite AC/DC-Schaltung (26), die konfiguriert ist, eine zweite Gleichspannung (V2) einer bestimmten (B, D) der Einheiten zuzuführen, die in dem Energiesparmodus arbeitet;
eine Umschaltschaltung (31), die konfiguriert ist, ein Umschalten durchzuführen, so dass die erste Gleichspannung der Mehrzahl von Einheiten in dem Gleichtaktaktionsmodus zugeführt wird und die zweite Gleichspannung einer bestimmten Einheit in dem Energiesparmodus zugeführt wird;
ein mechanisches System (G) zum Befördern eines Blatts, das konfiguriert ist, unabhängig von der Umschaltschaltung (31) die erste Gleichspannung (V1) aufzunehmen, immer wenn die erste AC/DC-Schaltung (25) arbeitet, und
eine Steuer- bzw. Regeleinheit (101), die konfiguriert ist, zwischen dem Gleichtaktaktionsmodus und dem Energiesparmodus zu unterscheiden und den Schaltkreis zu steuern bzw. zu regeln,
wobei das mechanische System (G) konfiguriert ist, die erste Gleichspannung (V1) aufzunehmen, immer wenn die erste AC/DC-Schaltung (25) die erste Gleichspannung liefert.

2. Elektronische Vorrichtung nach Anspruch 1, wobei die zweite AC/DC-Schaltung so ausgebildet ist, dass die maximale Leistungsversorgungseffizienz mit der Last der spezifischen Einheit übereinstimmt.

3. Elektronische Vorrichtung nach Anspruch 1 oder 2, wobei, wenn die Anzahl der spezifischen Einheiten, die in dem Energiesparmodus arbeiten, mehr als zwei beträgt, eine Mehrzahl zweiter AC/DC-Schaltungen separat entsprechend den spezifischen Einheiten angeordnet ist.

4. Bilderzeugungsgerät, umfassend:

ein vom Benutzer bedienbares Bedienfeld;
eine elektronische Vorrichtung nach Anspruch 1, wobei die Mehrzahl von Einheiten, die konfiguriert sind, in dem Gleichtaktaktionsmodus zu arbeiten, eine Bilderzeugungseinheit zum Erzeugen eines Bildes auf einem Blatt enthält.

5. Bilderzeugungsgerät nach Anspruch 4, wobei die zweite AC/DC-Schaltung so ausgebildet ist, dass die maximale Leistungsversorgungseffizienz mit der Last der spezifischen Einheit übereinstimmt.

6. Bilderzeugungsgerät nach Anspruch 4 oder 5, wobei, wenn die Anzahl der spezifischen Einheiten, die in dem Energiesparmodus arbeiten, mehr als zwei beträgt, eine Mehrzahl zweiter AC/DC-Schaltungen separat entsprechend den spezifischen Einheiten angeordnet ist.

7. Bilderzeugungsgerät nach einem der Ansprüche 4 bis 6, wobei die Steuer- bzw. Regeleinheit konfiguriert ist, eine Steuerung bzw. Regelung auszuführen, um den Gleichtaktaktionsmodus aus dem Energiesparmodus ansprechend auf die Bedienung auf dem Bedienfeld wiederherzustellen.

8. Bilderzeugungsgerät nach einem der Ansprüche 4 bis 7, wobei die spezifischen Einheiten Teil einer CPU sind, welche die Steuer- bzw. Regeleinheit und eine Antriebseinheit zum Steuern bzw. Regeln der Aktionen des Bedienfelds bildet.

9. Leistungsversorgungssteuer- bzw. -regelverfahren für eine elektronische Vorrichtung (10) für ein Bilderzeugungsgerät, wobei die elektronische Vorrichtung in der Lage ist, in einem Gemeinsame-Aktion-Modus bzw. Gleichtaktaktionsmodus und einem Energiesparmodus zu arbeiten, umfassend:

Erzeugen, durch eine erste AC/DC-Schaltung (25), einer ersten Gleichspannung (V1) für eine Mehrzahl von Einheiten (A, B, C, D, E, F), die in dem Gleichtaktaktionsmodus arbeiten;
Erzeugen, durch eine zweite AC/DC-Schaltung (26), einer zweiten Gleichspannung (V2) für die bestimmte (B, D) der Mehrzahl von Einheiten, die in dem Energiesparmodus arbeitet;
Unterscheiden, durch eine Steuer- bzw. Regeleinheit (101), zwischen dem Gleichtaktaktionsmodus und dem Energiesparmodus; und
Schalten, durch die Steuer- bzw. Regeleinheit (101), eines Schaltkreises, so dass die erste Gleichspannung (V1) der Mehrzahl von Einheiten in dem Gleichtaktmodus zugeführt wird und die zweite Gleichspannung (V2) der spezifischen Einheit in dem Energiesparmodus zugeführt wird,
wobei ein mechanisches System (G) zum Befördern eines Blatts, das zu der elektronischen Vorrichtung gehört, konfiguriert ist, unabhängig von der Umschaltschaltung (31) die erste Gleichspannung (V1) aufzunehmen, immer wenn die erste AC/DC-Schaltung (25) die erste Gleichspannung liefert.

10. Leistungsversorgungssteuer- bzw. -regelverfahren nach Anspruch 9, wobei die zweite AC/DC-Schaltung so ausgebildet ist, dass die maximale Leistungsversorgungseffizienz mit der Last der spezifischen Einheit übereinstimmt.

Revendications

1. Dispositif électronique (10) destiné à un dispositif de formation d'image, le dispositif électronique pouvant fonctionner dans un mode d'action courant et mode d'économie d'énergie, comprenant :

une pluralité d'unités configurées de manière à fonctionner dans le mode d'action courant (A, B, C, D, E, F) ;
un premier circuit convertisseur alternatif/continu (25) configuré de manière à délivrer une première tension continue (V1) à la pluralité d'unités (A, B, C, D, E, F) ;
un second circuit convertisseur alternatif/continu (26) configuré de manière à délivrer une deuxième tension continue (V2) à certaines unités spécifiques (B, D) parmi les unités qui fonctionnent dans le mode d'économie d'énergie ;
un circuit de commutation (31) configuré de manière à assurer une commutation de telle sorte que la première tension continue soit délivrée à la pluralité d'unités dans le mode d'action courant et la deuxième tension continue soit délivrée à une unité spécifique dans le mode d'économie d'énergie ;
un dispositif mécanique (G) destiné à transporter une feuille, configuré de manière à recevoir, indépendamment dudit circuit de commutation (31), la première tension continue (V1) dans le

cas où le premier circuit convertisseur alternatif/continu (25) est actif, et
une unité de commande (101) configurée de manière à faire la distinction entre le mode d'action courant et le mode d'économie d'énergie et à commander le circuit de commutation,
dans lequel le dispositif mécanique (G) est configuré de manière à recevoir la première tension continue (V1) dans le cas où le premier circuit convertisseur alternatif/continu (25) délivre la première tension continue.

2. Dispositif électronique selon la revendication 1, dans lequel
le second circuit convertisseur alternatif/continu est formé de manière à présenter une efficacité d'alimentation en énergie maximum adaptée à la charge de l'unité spécifique.

3. Dispositif électronique selon la revendication 1 ou 2, dans lequel
si le nombre des unités spécifiques qui agissent dans le mode d'économie d'énergie est supérieur à deux, alors des circuits d'une pluralité de seconds circuits convertisseurs alternatif/continu sont agencés séparément afin de correspondre aux unités spécifiques.

4. Dispositif de formation d'image, comprenant :

un panneau de commande pouvant être commandé par l'utilisateur ;
un dispositif électronique selon la revendication 1, dans lequel la pluralité d'unités configurées de manière à agir dans le mode d'action courant, comporte une unité de formation d'image destinée à former une image sur une feuille.

5. Dispositif de formation d'image selon la revendication 4, dans lequel
le second circuit convertisseur alternatif/continu est formé de manière à présenter une efficacité d'alimentation en énergie maximum adaptée à la charge de l'unité spécifique.

6. Dispositif de formation d'image selon la revendication 4 ou 5, dans lequel
si le nombre des unités spécifiques qui agissent dans le mode d'économie d'énergie est supérieur à deux, alors des circuits d'une pluralité de seconds circuits convertisseurs alternatif/continu sont agencés séparément afin de correspondre aux unités spécifiques.

7. Dispositif de formation d'image selon l'une quelconque des revendications 4 à 6, dans lequel
l'unité de commande est configurée de manière à mettre en oeuvre une commande de reprise du mode d'action courant à partir du mode d'économie d'énergie en réponse à la commande sur le panneau de commande.

8. Dispositif de formation d'image selon l'une quelconque des revendications 4 à 7, dans lequel
les unités spécifiques sont une partie d'une unité centrale de traitement constituant l'unité de commande et d'une unité d'attaque destinée à commander les actions du panneau de commande.

9. Procédé de contrôle d'alimentation en énergie destiné à un dispositif électronique (10) d'un dispositif de formation d'image, le dispositif électronique pouvant agir dans un mode action courant et un mode d'économie d'énergie, comprenant :

la production, par un premier circuit convertisseur alternatif/continu (25), d'une première tension continue (V1) pour une pluralité d'unités (A, B, C, D, E, F) qui fonctionnent dans le mode d'action courant ;
la production, par un second circuit convertisseur alternatif/continu (26), d'une deuxième tension continue (V2) pour certaines unités spécifique (B, D) de la pluralité d'unités qui fonctionnent dans le mode d'économie d'énergie ;
l'établissement d'une distinction, par une unité de commande (101), entre le mode d'action courant et le mode d'économie d'énergie ; et
la commutation, par l'unité de commande (101), d'un circuit de commutation de telle sorte que la première tension continue (V1) soit délivrée à la pluralité d'unités dans le mode d'action courant et la deuxième tension continue (V2) soit délivrée à l'unité spécifique dans le mode d'économie d'énergie,
dans lequel un dispositif mécanique (G) destiné à transporter une feuille appartenant au dispositif électronique est configuré de manière à recevoir, indépendamment dudit circuit de commutation (31), la première tension continue (V1) dans le cas où le premier circuit convertisseur alternatif/continu (25) délivre la première tension continue.

10. Procédé de contrôle d'alimentation en énergie selon la revendication 9, dans lequel
le second circuit convertisseur alternatif/continu est formé de manière à présenter une efficacité d'alimentation en énergie maximum adaptée à la charge de l'unité spécifique.

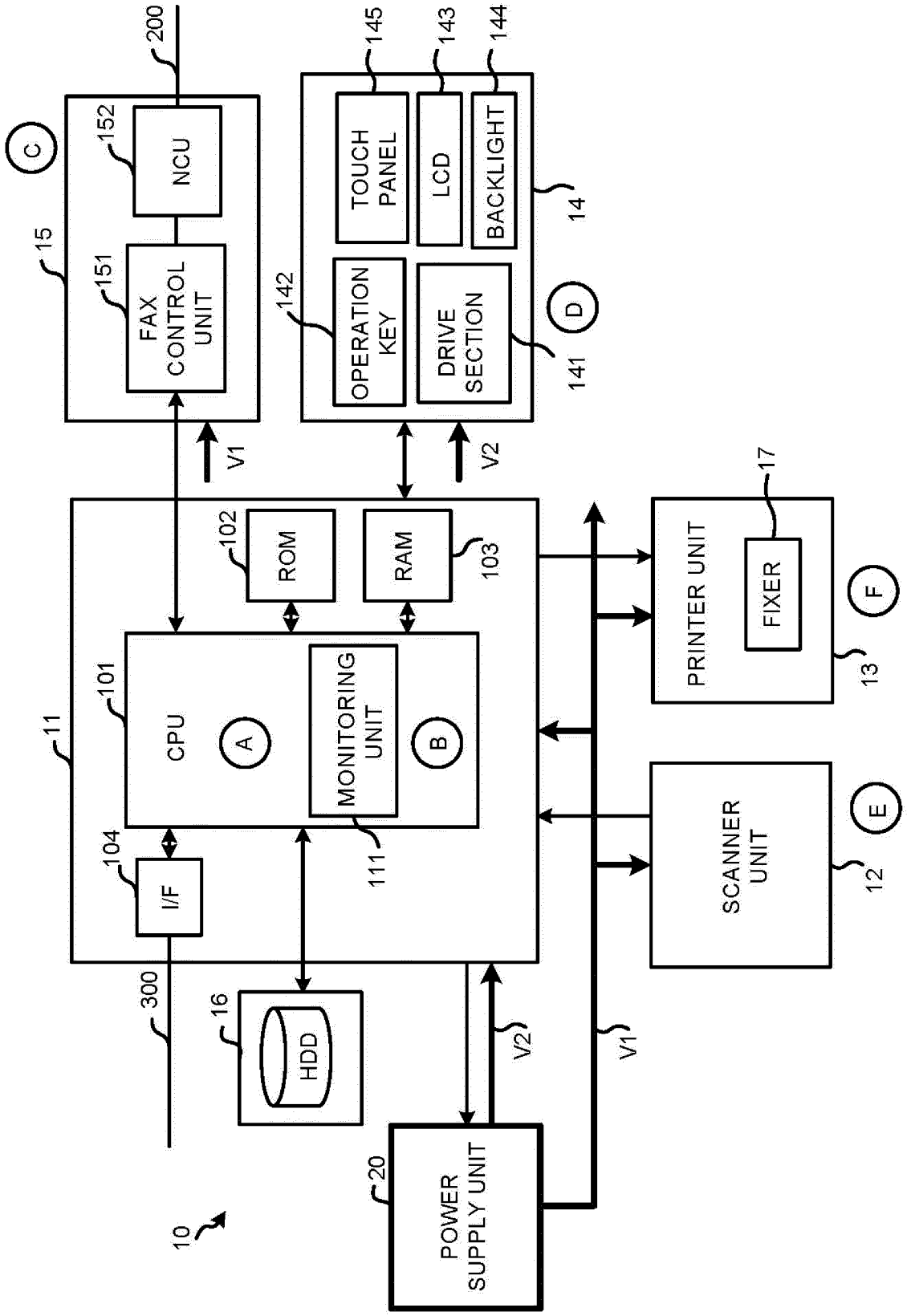

200
152
NCU
C
15
151
FAX CONTROL UNIT
145
143
144
TOUCH PANEL
LCD
BACKLIGHT
14
142
OPERATION KEY
DRIVE SECTION
D
141
V1
V2
102
ROM
RAM
103
11
101
CPU
A
MONITORING UNIT
B
111
104
I/F
300
16
HDD
V2
V1
20
POWER SUPPLY UNIT
10
17
PRINTER UNIT
FIXER
F
13
SCANNER UNIT
E
12

FIG.1

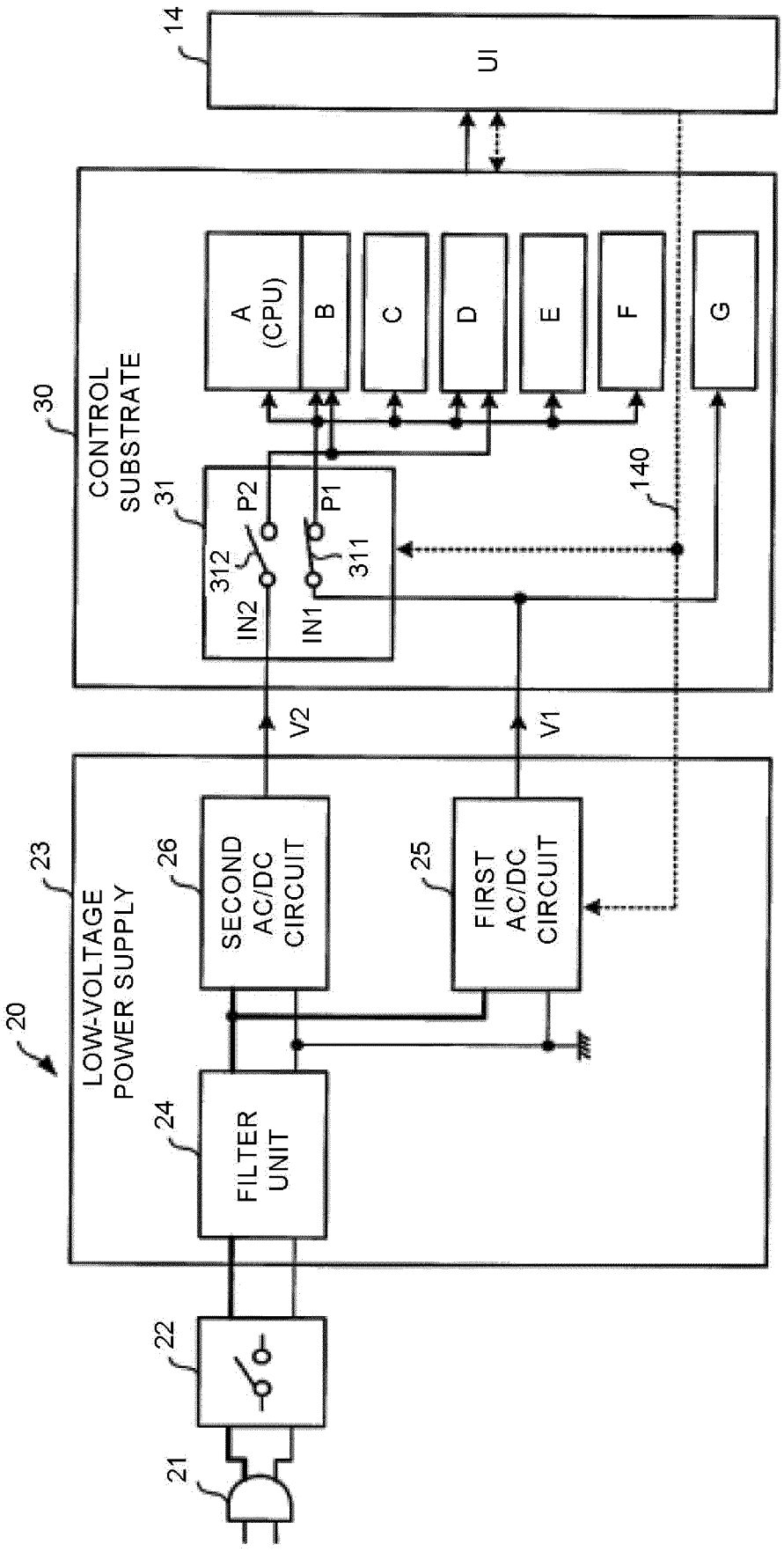

14
UI
30
CONTROL SUBSTRATE
A (CPU)
B
C
D
E
F
G
31
P2
P1
312
311
IN2
IN1
140
V2
V1
23
LOW-VOLTAGE POWER SUPPLY
26
SECOND AC/DC CIRCUIT
25
FIRST AC/DC CIRCUIT
20
24
FILTER UNIT
22
21

FIG.2

FIG.3

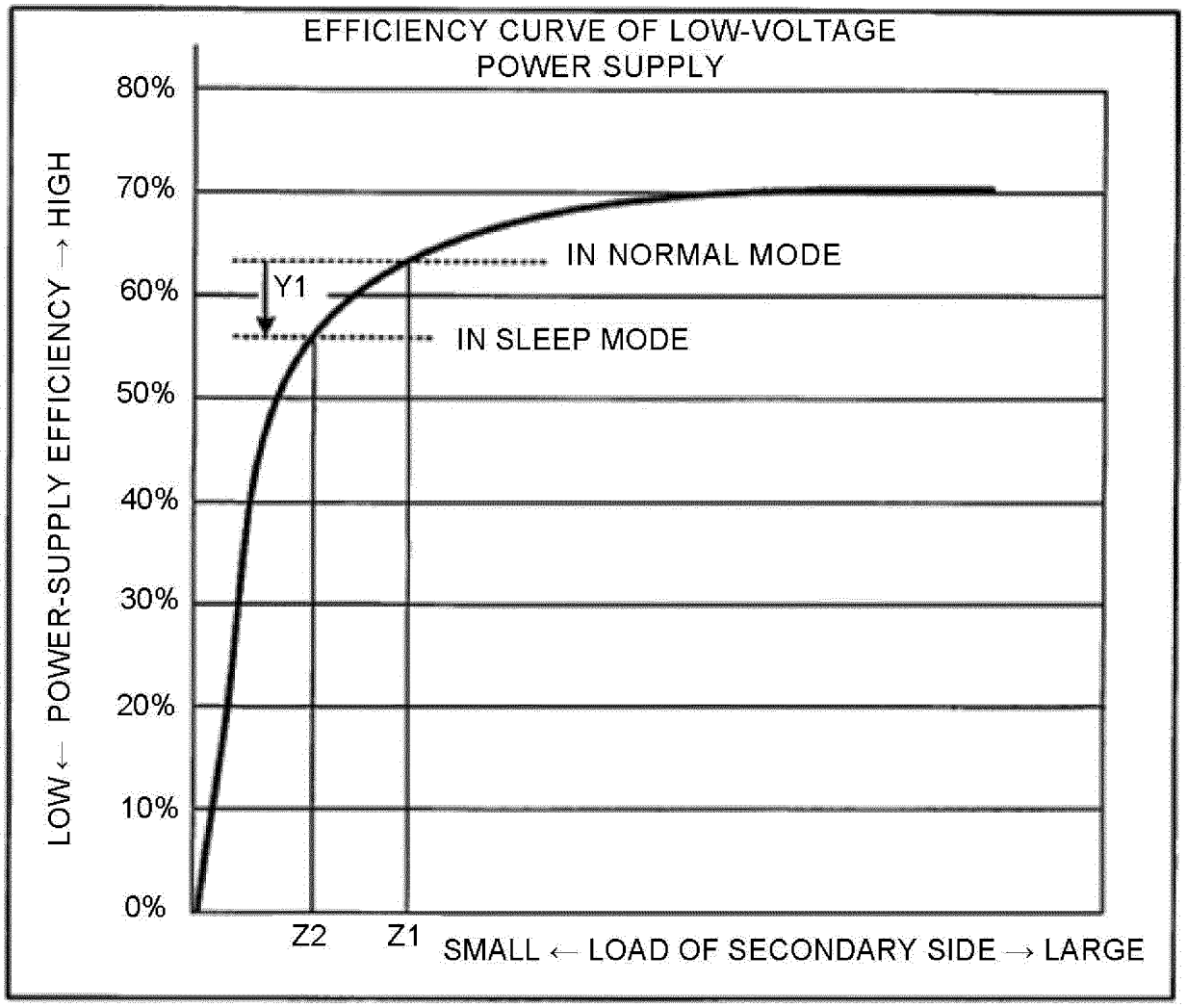
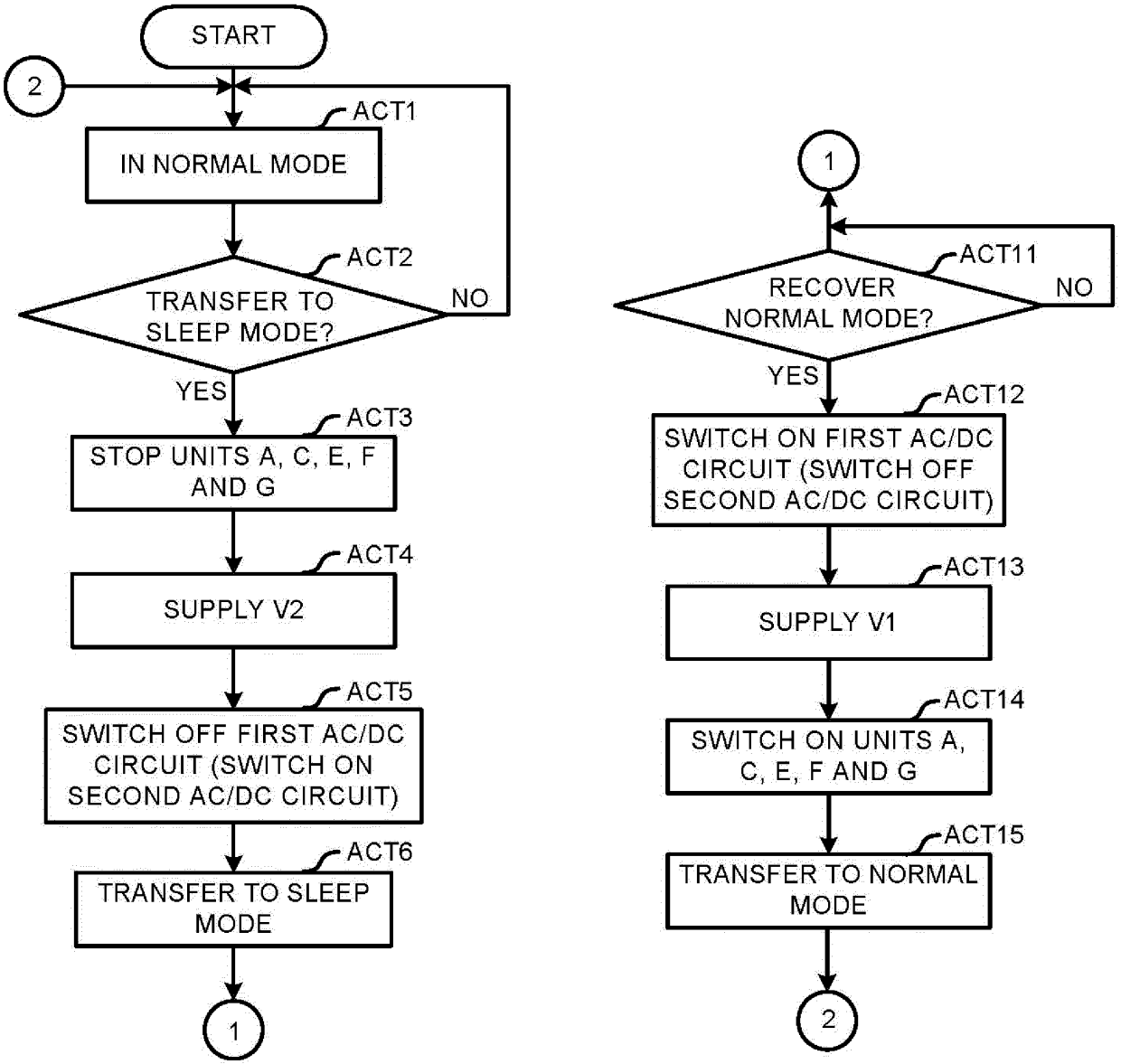

EFFICIENCY CURVE OF LOW-VOLTAGE POWER SUPPLY
80%
70%
60%
50%
40%
30%
20%
10%
0%
LOW ← POWER-SUPPLY EFFICIENCY → HIGH
IN NORMAL MODE
Y1
IN SLEEP MODE
Z2
Z1
SMALL ← LOAD OF SECONDARY SIDE → LARGE

FIG.4


START
2
ACT1
IN NORMAL MODE
ACT2
TRANSFER TO SLEEP MODE?
NO
YES
ACT3
STOP UNITS A, C, E, F AND G
ACT4
SUPPLY V2
ACT5
SWITCH OFF FIRST AC/DC CIRCUIT (SWITCH ON SECOND AC/DC CIRCUIT)
ACT6
TRANSFER TO SLEEP MODE
1
1
ACT11
RECOVER NORMAL MODE?
NO
YES
ACT12
SWITCH ON FIRST AC/DC CIRCUIT (SWITCH OFF SECOND AC/DC CIRCUIT)
ACT13
SUPPLY V1
ACT14
SWITCH ON UNITS A, C, E, F AND G
ACT15
TRANSFER TO NORMAL MODE
2

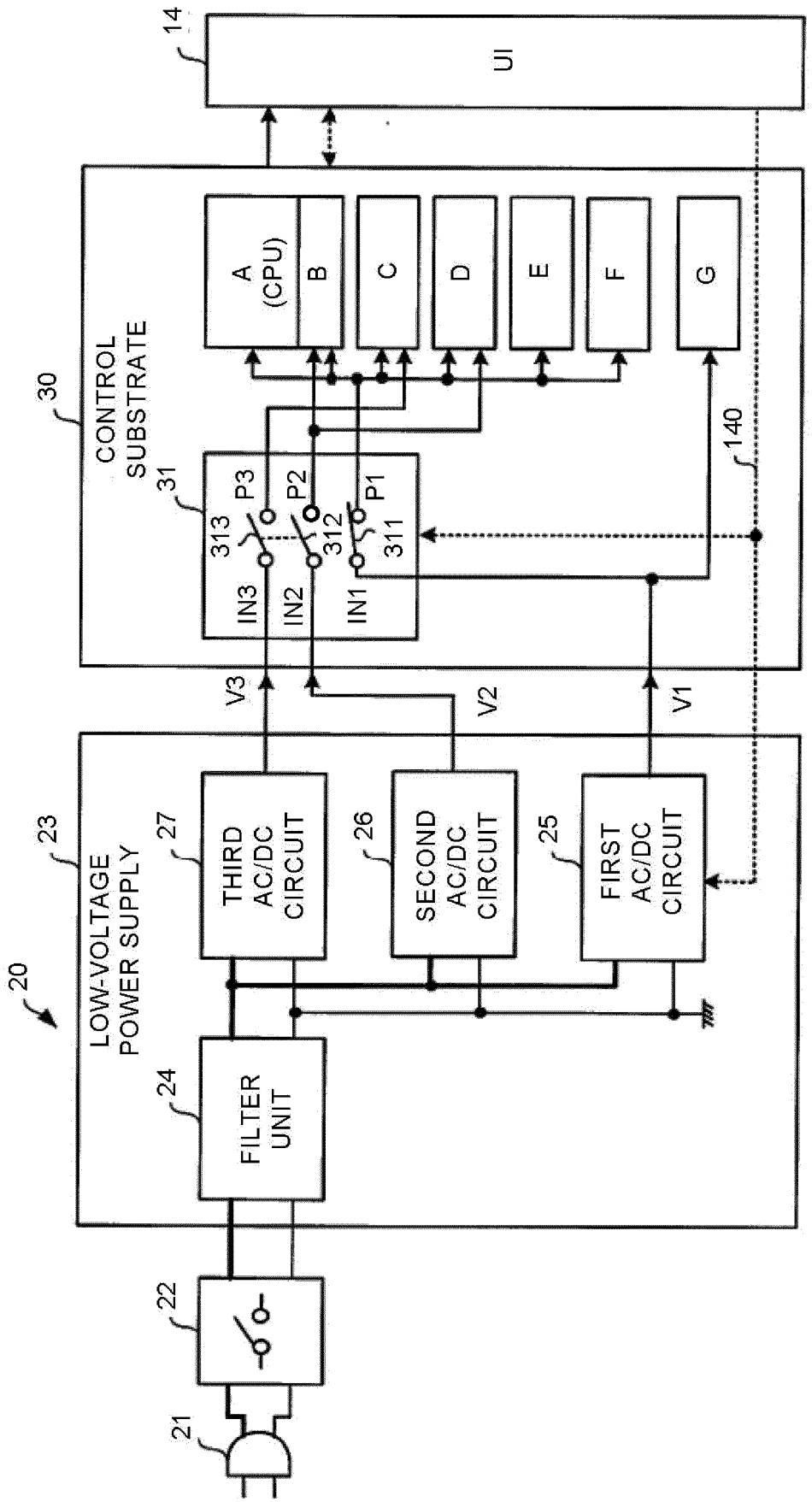

20
21
22
23
24
25
26
27
30
31
140
14
UI
A (CPU)
B
C
D
E
F
G
CONTROL SUBSTRATE
P3
P2
P1
313
312
311
IN3
IN2
IN1
V3
V2
V1
LOW-VOLTAGE POWER SUPPLY
THIRD AC/DC CIRCUIT
SECOND AC/DC CIRCUIT
FIRST AC/DC CIRCUIT
FILTER UNIT

FIG.5

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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