



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 057 652 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
06.12.2000 Bulletin 2000/49

(51) Int. Cl.⁷: **B41J 29/393**

(21) Application number: **00304308.0**

(22) Date of filing: **22.05.2000**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **26.05.1999 JP 14723399**

(71) Applicant:
SEIKO EPSON CORPORATION
Shinjuku-ku Tokyo (JP)

(72) Inventor: **Otsuka, Syuji**
Suwa-shi, Nagano-ken (JP)

(74) Representative:
Sturt, Clifford Mark et al
Miller Sturt Kenyon
9 John Street
London WC1N 2ES (GB)

(54) **Printer and charging device**

(57) The object of the present invention is to realize a charging device of a backup power supply for supplying power to perform backup operation to a printer by simplified circuit configuration. The other object of the present invention is to provide a printer which can decrease use of components such as a primary battery undesirable for environment and can realize low cost and low power consumption.

The main power supply unit (6B) of the present invention transits to sleep mode from ON state when a panel switch (5) is turned off. A RTC (34) has a timer (34B) and a comparator (34C), checks output voltage of the rechargeable battery (36a) by the comparator (34C). When the comparator (34C) detected that the output voltage became lower than a reference voltage RefV, the RTC (34) outputs a power ON signal (34d) until the timer (34B) counts up 3 minutes. A second switch (38) is turned on by the power ON signal (34d), and the main power supply unit (6B) returns to ON state only for 3 minutes in order to charge the rechargeable battery (30a) by using power supplied from the main power supply unit (6B).

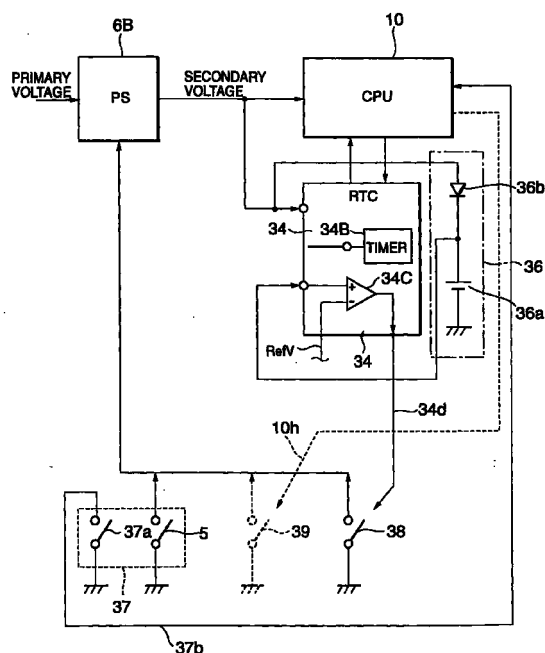


FIG.4

EP 1 057 652 A2

Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a printer and a charging device of a backup power supply for the printer. Especially, the present invention relates to a charging system of the backup power supply such as a rechargeable battery for supplying power to a Real Time Clock IC and the like in the printer.

Related Background Art

[0002] There are conventional electric apparatuses such as printers which performs backup operation by using power supplied from a rechargeable battery charged in advance when a main power supply is turned off. For example, it is impossible to immediately cut off the supply of power for an ink jet printer, even if the main power supply is turned off at any state, for example, a state that an user switches off a main switch, or a state that an outlet is pulled out. It is necessary for the ink jet printer to perform a capping process after moving a print head to a home position before cutting off power supply, because of preventing consolidation of ink.

[0003] Therefore, many types of ink jet printers having a switching power supply controls changeover of the supply of power at secondary side of the switching power supply. Because of this, power is supplied to these printers as long as the outlet is not forcedly pulled out.

[0004] A switching regulator is generally used as the main power supply of the ink jet printer. The switching regulator of the ink jet printer oscillates intermittently at voltage wave with low duty ratio while the main switch is OFF. During this period, CPU and the like monitor the state of the main switch provided to the secondary side of the power supply. When the main switch is turned off, the CPU allows the capping process of the print head to perform, and then sends a prescribed signal to the main power supply. The main power supply receives the signal from the CPU and transmits to the above-mentioned intermittent oscillation state.

[0005] Furthermore, it is necessary for the printer and the like to perform a backup operation for a memory, when the main power supply is turned off. As the backup operation, operational information of the printer is recorded to the memory such as an EEPROM.

[0006] The ink jet printer has a Real Time Clock IC, which is hereinafter called as RTC. The RTC is used to perform several types of pumping operation for adjusting the suction amount of the ink in accordance with the length of unused time and to print printing time to ends of print papers based on unique commands from a host computer. When a prescribed signal is inputted, the

RTC is a digital IC which outputs current time, for example, xx(hour) xx(minute) xx (second) on xx(month) xx(day), xx(year). The ink jet printer has to supply power to the RTC, even if the main switch is OFF.

[0007] Generally, electric apparatuses such as the printer is provided with an electric double layer capacitor or a rechargeable battery as a backup power supply. The backup power supply is charged while the main power supply is ON, and continuously drives the RTC or performs the backup operation for the memory by using the charged power when the main switch is turned off. Hereinafter, an example in which the RTC in the printer is continuously driven will be specifically described.

[0008] A first example has the rechargeable battery such as a Lie battery or a Ni-Cd battery in the printer, and allows the RTC to drive by using power that the rechargeable battery discharged. For example, a printer of the first example is provided with a Li battery 81 as shown in Fig. 1. A RTC 83 is driven by the power supplied constantly from the Li battery 81. The RTC 83 outputs a digital signal 87 showing the current time to a CPU 85 when a prescribed signal 86 is inputted from the CPU 85.

[0009] A printer of a second example, as shown in Fig. 2, has a high performance capacitor, which is called a super capacitor, a gold capacitor, electric double layer capacitor, or the like. The capacitor is charged while the main switch of the printer is ON, and the RTC is continuously driven by electric charge charged to the capacitor when the main switch of the printer is turned off.

[0010] The RTC 93 is driven by the power supplied from the main power supply 98. While the main supply is ON, the capacitor 91 is charged by the power supplied from the main power supply 98. The main switch of the printer is turned off, and the RTC 93 is continuously driven by the electric charge charged to the capacitor 91. Similarly to the first example, when a prescribed signal 96 is inputted from the CPU 95, the RTC 93 outputs to the CPU 95 a digital signal 97 indicating the current time.

[0011] However, it is necessary to use the rechargeable battery with high capacity for apparatuses in which OFF time of the main switch is longer than ON time, in order to allow the apparatuses to normally operate even if the charging time of the rechargeable battery becomes short. However, when such a battery is used, the cost of the apparatuses becomes high. Therefore, a primary battery impossible to recharge has to be used instead of using the rechargeable battery.

[0012] As a method of solving the above-mentioned problem, even if user turns off the main switch, when the outlet is not pulled out, there is a method in which power generated by the above-mentioned intermittent oscillation of the main power supply is used to charge the rechargeable battery. However, in case of allowing the main power supply to intermittently oscillate, because the rechargeable battery is charged at unstable low voltage, it is necessary to provide boosting means in the

charging circuit.

[0013] Furthermore, it is necessary to provide a changeover circuit which switches whether to charge the rechargeable battery from the intermittent oscillating state or to charge the battery from the voltage at normal power ON. Therefore, circuit configuration becomes complicate. Even if a charging circuit having boosting means is used, charging efficiency lowers just by the amount for being charged after boosting, thereby increasing power consumption during OFF of the main switch.

SUMMARY OF THE INVENTION

[0014] A first object of the present invention is to provide a printer having a backup power supply and a charging device which can realize low price and low power consumption, without using a primary battery impossible to recharge.

[0015] Furthermore, a second object of the present invention is to provide a printer and a charging device which can realize low power consumption by restraining the charging time to the shortest time.

[0016] In order to achieve the foregoing object, a printer comprising:

a printer mechanism;
a printer controller for controlling said printer mechanism;
a main power supply unit for supplying power to said printer mechanism and said printer controller;
a backup power supply capable of repeating charge/discharge for supplying power to perform a prescribed backup operation to said printer controller by discharge, and
charging controller for allowing said main power supply unit to turn on by period necessary to charge said backup power supply and charging said backup power supply by using power of said main power supply unit when said main power supply unit is ON state.

[0017] Furthermore, a printer comprising:

a printer mechanism;
a printer controller for controlling said printer mechanism;
a main power supply unit capable of supplying power to said printer mechanism and said printer controller, and taking at least two states of ON state and sleep state;
a backup power supply capable of repeating charge/discharge for supplying power to perform a prescribed backup operation to said printer controller by discharge, and
charging controller for turning on said main power supply unit by a prescribed period when said main power supply unit is in the sleep state in order to

charge said backup power supply by using power of said main power supply unit.

[0018] Furthermore, a charging device of a backup power supply for a printer which can supply power for performing a prescribed backup operation to the printer having a main power supply unit capable of taking at least two states of ON state and a prescribed sleep state when a main power supply unit is not in ON state, and which can perform charge/discharge comprising

charging controller for automatically turning on said main power supply unit only by a prescribed charging period when said main power supply unit is in the sleep state in order to charge said backup power supply by using power of said main power supply unit.

[0019] Furthermore, a printer comprising:

a printer mechanism;
a printer controller for controlling said printer mechanism;
a main power supply unit for supplying power to said printer mechanism and said printer controller;
a backup power supply capable of repeating charge/discharge for supplying power to perform a prescribed backup operation to said printer controller by discharge;
hysteretic management means for managing past hysteretic information relating to charge of said backup power supply, and
charging time calculation means for calculating ON period of said main power supply unit in the future with reference to past charging time for said backup power supply that said hysteretic management means manage,
wherein said backup power supply is charged by using power of said main power supply unit when said main power supply unit is in ON state.

[0020] Furthermore, a charging device of a backup power supply for a printer which can supply power for performing a prescribed backup operation to the printer having a main power supply unit capable of taking at least two states of ON state and a prescribed sleep state when a main power supply unit is not in ON state, and which can perform charge/discharge comprising:

hysteretic management means for managing past hysteretic information relating to charge of said backup power supply, and
charging time calculation means for calculating ON period of said main power supply unit in the future with reference to past charging time for said backup power supply that said hysteretic management means manage,
wherein said backup power supply is charged by

using power of said main power supply unit when said main power supply unit is in ON state.

[0021] According to the present invention, for example, even if the main switch is turned off by user, it is possible to safely perform a prescribed backup operation, to reduce use of components such as a primary battery undesirable for environment, and to realize low cost and low power consumption. Furthermore, it is possible to realize the charging device of the backup power supply for supplying power to perform a prescribed backup operation for the printer by a simplified configuration. Accordingly, the industrial value of the present invention is very large. Furthermore, because the present invention controls the ON period of the main switch based on hysteretic information, it is possible to shorten charging time and to reduce power consumption.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

Fig. 1 is a block diagram of a conventional charging device having a rechargeable battery.

Fig. 2 is a block diagram of a conventional charging device having a capacitor.

Fig. 3 is a diagram showing schematic configuration of a printer according to the present invention.

Fig. 4 is a block diagram showing schematic configuration of a first embodiment relating to a charging device of a backup power supply.

Fig. 5 is a flowchart showing processes and operations of the charging device of the present embodiment.

Fig. 6 is a diagram showing a change for time of voltage between ends of the electric double layer capacitor.

Fig. 7 is a diagram showing change of voltage between ends of the electric double layer capacitor by charge/discharge.

Fig. 8 is a block diagram showing schematic configuration of a third embodiment of a charging device according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0023] Hereinafter, a printer and a charging device according to the present invention will be specifically described with reference to the drawings. First of all, the overall configuration of an ink jet printer, which is common to all embodiments, will be described.

[0024] As shown in Fig. 3, the ink jet printer according to these embodiments has a printer controller 2, a print engine 4, a main power supply unit 6, and a RTC unit 8.

[0025] The printer controller 2 has a CPU 10, a

ROM 12, a RAM 14, an EEPROM 16, a mechanic interface block (mechanic I/F) 18, and a host interface block 20. These are connected to each other via a bus 22.

[0026] The print engine 4 has a print head 42, a carriage mechanism consisted of a carriage 43 and the like, a paper feeder mechanism consisted of a paper feeder (PF) motor 44 and the like. The paper feeder mechanism has the PF motor and a paper feeder roller (unshown), and sends out a print recording medium such as a recording paper 45 in order to scan the print head 42 in sub scanning direction.

[0027] The carriage mechanism has a carriage 43 for mounting the print head 42 and a carriage (CR) motor 43a for allowing the carriage 43 to run via a timing belt and the like, in order to scan the print head 42 in main scanning direction.

[0028] The print head 42 spits out fine ink dewes by using a piezoelectric element. The carriage 43 returns to home position in a prescribed case, in order to perform various maintenance for the print head 42. For example, when cutting off the power, at the state the carriage 43 has returned to the home position, a capping process is performed. In this capping process, an ink spray portion is capped.

[0029] The main power supply unit 6 has a switching regulator (unshown) and the like. The main power supply unit 6 is supplied with alternating power from commercial power supply (unshown). The main power supply unit 6 supplies 42V to the print head 42 of the print engine 4 and the like, and 5.0V or 3.3V to the printer controller 2.

[0030] As shown in Fig. 3, the main power supply unit 6 is connected to a panel switch 5 provided to the printer panel. The panel switch 5 outputs ON/OFF signals alternatively by each time when user operates the panel switch 5. An ON switch and an OFF switch are separately provided to the panel switch 5.

[0031] The main power supply unit 6 is turned on/off by receiving the signal from the panel switch 5. Even if the panel switch 5 is turned off, as long as the power supply plug 32 is not pulled out, the main power supply unit 6 enters a prescribed sleep state.

[0032] Here, the prescribed sleep state means that the panel switch 5 is turned off, the supply of the power to the printer mechanism such as the printer engine is cut off, a little power is supplied to CPU 10 and the like. Typically, in this state, the main power supply oscillates intermittently, as described above.

[0033] The RTC unit 8 has a RTC 34 and a backup power supply 36. The backup power supply 36 has a rechargeable battery 36a and a diode 36b, and acts when the main power supply unit 6 is OFF. The RTC 34 continuously acts by power supplied from the backup power supply 36, even while the main power supply unit 6 is cut off.

[0034] The RTC 34 outputs a digital signal 34a indicating the current time to a CPU 10 when a prescribed signal 10a is supplied from the CPU 10.

[0035] There are two events which are triggers to turn on the main power supply unit 6. A first event is an event in case that the voltage of the backup power supply 36 becomes low. A second event is an event in case that a prescribed time passes off after entering the sleep state.

[0036] Hereinafter, first of all, a second and a third embodiments relating to a charging device of a backup power supply will be explained in detail.

(First Embodiment)

[0037] Fig. 4 is a block diagram showing schematic configuration of a first embodiment relating to a charging device of a backup power supply. The charging device of the first embodiment has a feature in which the main power supply unit 6 is turned on by a signal from the RTC 34 by using the above-mentioned first event as a trigger, and then the rechargeable battery 36a is continuously charged during required minimum supplementary charging time necessary to complete the charge for the rechargeable battery 36a, and then the main power supply unit 6 returns again to a intermittent oscillation state.

[0038] More specifically, as shown in Fig. 4, the charging device of the first embodiment has a main power supply unit (PS) 6, a CPU 10, a RTC 34, a first switch 37, and a second switch 38. The main power supply unit 6, for example, supplies 42V to a printer driver such as a printer engine 4 and a secondary voltage of 5.0V or 3.3V to a logic circuit such as a printer controller 2.

[0039] The CPU 10, as described after, checks the state of the panel switch 5 of the printer. When the main power supply unit 6 is turned on from the sleep mode, the CPU 10 performs various control operations depending on whether the power ON depends on the panel switch 5 or the RTC 34.

[0040] The RTC 34 of the present embodiment has a timer 34B and a comparator 34C. The comparator 34C checks the output voltage of the rechargeable voltage 36a. The comparator 34C compares the output voltage of the rechargeable battery 36a with a prescribed reference voltage RefV which is, for example, (1.5V+).

[0041] When the comparator 34C determines that the output voltage of the rechargeable battery 36a underruns the reference voltage RefV, the RTC 34 outputs a power ON signal 34d, sets the second switch 38 to ON, and returns the main power supply unit 6 to ON state. The power ON signal 34d is outputted, for example, for 3 minutes, and the main power supply unit 6 is set to ON only during 3 minutes. The timer 34B counts during 3 minutes as a prescribed supplementary charging time.

[0042] The first switch 37 has the panel switch 5 of the printer shown in Fig. 3 and another switch 37a which opens and shuts simultaneously working with the panel

switch 5. When the panel switch 5 is in OFF, as long as the outlet is not pull out, the main power supply unit 6 transits to the intermittent oscillation state. After then, if the panel switch 5 is turned on, the main power supply unit 6 returns to state for outputting a normal secondary voltage.

[0043] When the panel switch 5 is turned on/off, the switch 37a opens or shuts simultaneously working with the panel switch 5. Because of this, as shown in Fig. 4, the signal 37b for transmitting ON/OFF of the panel switch 5 is outputted, and is transmitted to the CPU 10.

[0044] Fig. 5 is a flowchart showing processes and operations of the charging device according to the present embodiment. Hereinafter, with reference to the flowchart of Fig. 5, the processes and operations of the charging device of Fig. 4 will be described.

[0045] First of all, for example, when user turned off the panel switch 5 of the printer, as long as the power supply cable 30 is not pulled off, as shown in Fig. 5, the printer enters the sleep mode (S301), thereby becoming the above-mentioned intermittent oscillating state.

[0046] During the sleeping mode, for example, when the panel switch 5 is turned on by user, or when the main power supply unit 6 is turned on by a power ON signal 34d from the RTC 34 (S302), it is determined whether the power ON depends on the RTC 34 or the panel switch 5 (S303).

[0047] In case of the power ON depending on the RTC 34, the power ON state is continued for 3 minutes (S304). The charge for the rechargeable battery 36a is performed for 3 minutes. The main power supply unit 6 is turned off after 3 minutes. In this time, the panel switch 5 returns to OFF state. The CPU 10 always checks whether the panel switch 5 is turned on or not (S305). If the panel switch 5 keeps OFF state, the process of the step S301 is performed, thereby continuing the above-mentioned sleep mode.

[0048] On the other hand, when the panel switch 5 is turned on, as described hereinafter, in the same way as the case the power ON depends on the panel switch 5 in step S303, the CPU 10 checks whether or not the panel switch 5 is turned off (S306). If the panel switch 5 is turned off (Yes in step S306), the CPU 10 waits until the processes necessary to cut off the supply of power for the printer, for example, the capping process is completed.

[0049] When all the processes necessary to cut off the supply of power for the printer is completed (Yes in step S307), it is determined whether more than three minutes passed off (S308). If determined that more than three minutes passed off (Yes in S308), process of the step S301 is performed to continue the above-mentioned sleep mode.

[0050] When three minutes do not yet pass off (No in S308), the CPU 10 waits while checking the panel switch 5 until the remaining time to three minutes passes off (S309). That is, the CPU 10 checks whether or not the panel switch 5 is turned off (S310), as long as

the panel switch 5 is not turned off (No in step S310), the process of the step S306 is again performed. When the panel switch 5 is turned off (Yes in step S310), the process of the step S301 is again performed, thereby continuing the above-mentioned sleep mode.

[0051] As described above, according to the charging device of the present embodiment, during the sleeping mode (energy saving mode) in which the main power supply unit of the printer performs the intermittent oscillation, even if voltage of the rechargeable battery 36a becomes low, it is possible to automatically allow the main power supply unit 6 to transit to ON state, and to charge the rechargeable battery 36a by using the power supplied from the main power supply unit 6.

(Second Embodiment)

[0052] A charging device of a second embodiment has a feature in which the above-mentioned second event is used as a trigger. That is, when becoming the intermittent oscillating state depending on the power OFF, by each of the constant period (supplementary charging interval time), the CPU generates a signal during a constant time (supplementary charging time). The main power unit 6 is turned on/off by the signal from the CPU.

[0053] More specifically, the charging device of the second embodiment has a third switch 39, as shown by a dotted line in Fig. 4. The third switch 39 is turned on by a prescribed supplementary charging signal 10h from the CPU 10. When the third switch 39 is turned on, the main power supply unit 6 returns from the intermittent oscillating state to the state outputting the normal secondary voltage. The supplementary charging signal 10h is sent only for 3 minutes, for example, by 24 or 10 hours, during the intermittent oscillating state.

[0054] The processes and the operations of the charging device according to the second embodiment is the same as that of the first embodiment, except that the CPU 10 performs the processes of steps S303 and S304 of Fig. 5. Because of this, detailed description relating to the processes and the operations of the second embodiment will be omitted.

[0055] The CPU 10 may generate the above-mentioned signal based on the result of executing prescribed control instruction groups (program) stored in the ROM 12 with reference to time information from the RTC 34 or the timer 34B which may be provided in the CPU 10.

(Third Embodiment)

[0056] A third embodiment uses an electric double layer capacitor as the backup power supply for allowing the above-mentioned RTC to continuously run during power OFF. Optimization of the charging time for the electric double layer capacitor is realized by managing and referring hysteresis information relating to voltage

between ends of the electric double layer capacitor.

[0057] The RTC and the electric double layer capacitor of the third embodiment is built in the ink jet printer, similarly to the first and second embodiments. Because the other configuration of the third embodiment is the same as that of the first and second embodiments, the detailed description will be omitted. First of all, a first example of control method using the hysteresis information according to the present embodiment will be described hereinafter.

-- First example by hysteresis control--

[0058] Fig. 6 is a diagram showing a change for time of voltage between ends of the electric double layer capacitor. When the electric double layer capacitor is being already charged at state that the main power supply unit 6 is turned on as referred to 401, if the main power supply unit 6 is turned off as referred to 402, the voltage between ends of the electric double layer capacitor becomes low gradually, as shown in Fig. 6. A minimum voltage shown in Fig. 6 expresses a maximum voltage that operation of the RTC stops.

[0059] The simplest example of the hysteresis control is the case that the main power supply unit 6 is turned on when voltage between ends of the electric double layer capacitor has lowered till the minimum voltage. In this case, the hysteresis information that operation of the RTC 34 stopped is obtained. At this timing, zero is set. That is, the timer such as a CPU timer is set to zero, and the charging time Tch becomes full charge after 3 minutes pass off.

[0060] Practically, voltage between ends of the electric double layer capacitor rises linearly as shown by solid line in Fig. 6. Curb of a dashed line as shown in 405 shows the amount of an entered energy. After 3 minutes pass off, the main power supply unit is turned off and the electric double layer capacitor begins discharge, as shown in 406. In accordance with this, the voltage lowers gradually as shown in 407.

[0061] However, as shown in Fig. 6B, if the discharge is stopped by a minute as shown in 411, instead of lowering along the dotted line as shown in 412, the voltage lowers drastically as shown in 411a, and then the voltage lowers gradually as shown in 411b.

[0062] At such state, the printer continues to run, and the main power supply unit 6 is turned off as an event at any time as shown in 406. In this case, it is unnecessary to charge further for 3 minutes. As shown in the same drawing, for example, when the event which is turned off on the condition of Tch 3 minutes occurs, this event means that it is unnecessary to maintain ON any longer. Accordingly, at this point when charge of the electric double layer capacitor finished, the discharge begins as shown in 406 and 413.

[0063] On the other hand, different from the above-mentioned event, if the OFF instruction is issued at the time discharging for a minute as shown in 414, without

turning off, the ON state is continued until 3 minutes passe off as shown in 415. This is also a hysteretic control to keep the ON state.

-- Second example by hysteretic control--

[0064] Fig. 7 is a diagram showing change of voltage between ends of the electric double layer capacitor by charge/discharge. A horizontal axis of Fig. 7 is a time (t), and a vertical axis of Fig. 7 is the voltage (v) between ends of the electric double layer capacitor.

[0065] After the electric double layer capacitor has been charged so as to be held for 400 hours, when 200 hours pass off after the main power supply unit 6 is turned off, only half of 3 minutes may be charged.

[0066] Therefore, when there is an indication to turn on the main power supply unit 6 only for a minute at the time when 200 hours has passed off, the charge is performed for further 30 seconds. Therefore, low power consumption is realized only by one and half minute. It is possible to detect the time after the main power supply unit 6 is turned off by the signal from the RTC 34.

-- Specific circuit configuration --

[0067] Fig. 8 is a block diagram showing schematic configuration of a third embodiment of a charging device according to the present invention. The charging device of Fig. 8 has power supply unit 601, a CPU 602, an electric double layer capacitor 603 functioned as a backup power supply, and a RTC 604.

[0068] Inside of the main power supply unit 601 is provided with a compact power supply 607 for detecting on/off condition of a switch 601a. When ON of the switch 601a is detected, the electric double layer capacitor 603 is charged, and the power is supplied to each part of the printer. The main power supply unit 601 begins the supply of the power by signal from the RTC 604.

[0069] Inside of the RTC 604 is provided with a voltage detecting section 604a for detecting the charging voltage of the electric double layer capacitor 603. Inside of the CPU 602 is provided with a comparison determining section 602a for determining whether or not the charging voltage detected by the voltage detecting section 604a is lower than a prescribed reference voltage, and a charge indicating section 602b for allowing the main power supply unit 6 to turn on when determined to be low. The voltage detecting section 604a, the comparison determining section 602a, and the charge indicating section 602b correspond to hysteretic management means.

[0070] The main power supply unit 6 begins the supply of the power not only in case the switch 601a is turned on, but also by the signal from the RTC 604. When the main power supply unit 6 begins the supply of the power based on the signal from the RTC 604, the CPU 602 restarts. The CPU 602 can detect the reason

why the main power supply unit 601 has begun the supply of the power by receiving the signal from the RTC 604.

[0071] As described specifically above, the third embodiment detects the condition of the electric double layer capacitor based on time. In an exceptional case, the CPU 602 has to detect the above-mentioned minimum voltage and whether or not the RTC 604 stopped.

[0072] The present invention is not limited certain embodiments described above, and is applicable to other embodiments in the range of Claims described after.

[0073] For example, in the first embodiment, when the voltage of the backup power supply has lowered, by using the first event as the trigger, an example which turns on the main power supply unit based on the signal from the RTC and performs supplementary charge has been described. In the second embodiment, when the prescribed time has passed off after entering the sleep state, by using the second event as the trigger, the main power supply unit is turned on by the signal from the CPU to perform supplementary charge. As other embodiment, in case that a prescribed time passed off after entering the sleep state, by using the second event as the trigger, the main power supply unit may be turned on by the signal from the RTC to perform supplementary charge.

[0074] An example in which both of the power ON depending on the signal from the RTC in the first and third embodiments and the power ON depending on the signal from the CPU in the second embodiment are used is also conceivable. It is possible to adjust both signals by adding simplified OR means.

[0075] In the above-mentioned embodiments, charging systems for allowing the RTC to continuously run when the main power supply unit 6 is not in ON state has been described. Objects that the rechargeable battery supplies the power are not limited. For example, besides the RTC, backup operation of the memory and the like may be performed by using the rechargeable battery.

[0076] The backup power supply is required that it is possible to repeat charge/discharge and to supply the power for performing a prescribed backup operation when the main power supply unit 6 is not in ON state. If these requirement are filled, any besides the rechargeable battery and the electric double layer capacitor is applicable as the backup power supply.

[0077] On the other hand, in the above-mentioned embodiments, examples that the printer has the charging device, and the charging device is constituted of the CPU in the printer, and the timer and the comparator in the RTC has been described. The charging device may be constituted as an external unit of the printer.

[0078] In the above-mentioned embodiments, the present invention has been described as an example of the ink jet printer for performing the capping. The present invention is also applicable to other printers

such as a laser printer which has the main power supply unit with ON state and sleep state, and can repeat charge/discharge. That is, the present invention is applicable to any types of the printers which has the backup power supply for supplying the power to perform a prescribed backup operation when the main power supply unit is not ON state.

Claims

1. A printer comprising:

a printer mechanism;
 a printer controller for controlling said printer mechanism;
 a main power supply unit for supplying power to said printer mechanism and said printer controller;
 a backup power supply capable of repeating charge/discharge for supplying power to perform a prescribed backup operation to said printer controller by discharge, and charging controller for allowing said main power supply unit to turn on by period necessary to charge said backup power supply and charging said backup power supply by using power of said main power supply unit when said main power supply unit is ON state.

2. A printer comprising:

a printer mechanism;
 a printer controller for controlling said printer mechanism;
 a main power supply unit capable of supplying power to said printer mechanism and said printer controller, and taking at least two states of ON state and sleep state;
 a backup power supply capable of repeating charge/discharge for supplying power to perform a prescribed backup operation to said printer controller by discharge, and charging controller for tuning on said main power supply unit by a prescribed period when said main power supply unit is in the sleep state in order to charge said backup power supply by using power of said main power supply unit.

3. The printer according to Claim 2 further comprising clocking means, wherein said charging controller changes said main power supply unit to ON state periodically at a prescribed interval by said clocking means when said main power supply unit enters said sleep state.

4. The printer according to Claim 2 further comprising signal output means for outputting a signal for

changing said main power supply unit to ON state periodically at a prescribed interval, wherein said charging controller periodically charges said backup power supply based on the signal outputted from said signal output means.

5. The printer according to Claim 2 further comprising voltage checking means for checking output voltage of said backup voltage,

wherein said charging controller changes said main power supply unit to ON state when said voltage checking means has determined that output voltage of said backup power supply is equal to or less than a prescribed reference voltage, and charges said backup power supply by using power of said main power supply unit.

6. The printer according to Claim 2, wherein said backup power supply is a rechargeable battery.

7. The printer according to Claim 2, wherein said backup power supply includes a capacitor.

8. A charging device of a backup power supply for a printer which can supply power for performing a prescribed backup operation to the printer having a main power supply unit capable of taking at least two states of ON state and a prescribed sleep state when a main power supply unit is not in ON state, and which can perform charge/discharge comprising

charging controller for automatically turning on said main power supply unit only by a prescribed charging period when said main power supply unit is in the sleep state in order to charge said backup power supply by using power of said main power supply unit.

9. The charging device according to Claim 8, wherein said charging device is attached at outside of the printer.

10. The charging device according to Claim 8, comprising:

a central processing unit;
 clocking means for sending time to said central processing unit, and
 switching means for switching said switching means said main power supply unit to ON state when said main power supply unit is in the sleep state, wherein said charging controller switches said switching means based on a signal that said clocking means output by said prescribed charging period at a prescribed interval.

11. The charging device according to Claim 8, comprising:

ing:

a central processing unit;
clocking means for sending time to said central
processing unit, and
switching means for switching said main power
supply unit to ON state when said main power
supply unit is in the sleep state,
wherein said central processing unit changes
over said switching means based on a signal
that said central processing unit outputs only
by a prescribed period at a prescribed interval.

12. The charging device according to Claim 8, comprising:

a central processing unit;
clocking means for sending time to said central
processing unit, and
switching means for switching said main power
supply unit to ON state when said main power
supply unit is in the sleep state,
wherein said clocking means have voltage
checking means for checking output voltage of
said backup power supply, and turn on said
main power supply unit in order to charge said
backup power supply by using power of said
main power supply when said voltage checking
means detect that output voltage of said
backup power supply is equal to or less than a
prescribed reference voltage.

13. A printer comprising:

a printer mechanism;
a printer controller for controlling said printer
mechanism;
a main power supply unit for supplying power to
said printer mechanism and said printer controller;
a backup power supply capable of repeating
charge/discharge for supplying power to perform
a prescribed backup operation to said
printer controller by discharge;
hysteretic management means for managing
past hysteretic information relating to charge of
said backup power supply, and
charging time calculation means for calculating
ON period of said main power supply unit in the
future with reference to past charging time for
said backup power supply that said hysteretic
management means manage,
wherein said backup power supply is charged
by using power of said main power supply unit
when said main power supply unit is in ON
state.

14. The printer according to Claim 13,

wherein said hysteretic management means have
at least a central processing unit and clocking
means for sending time to said central processing
unit, and

wherein said central processing unit calculates ON
period of said main power supply unit in the future
based on a signal outputted from said clocking
means when said main power supply unit is in ON
state.

15. The printer according to Claim 13 wherein said
backup power supply is an electric double layer
capacitor.

16. The printer according to Claim 15 wherein said
main power supply unit is turned on by period when
electric double layer capacitor is fully charged after
said main power supply unit is once turned on.

17. The printer according to Claim 13,
wherein said hysteretic management means including:

voltage detecting means for detecting voltage
between ends of said electric double layer
capacitor;

comparison determining means for comparing
said voltage between ends detected by said
voltage detecting means with a prescribed
threshold voltage and determining whether or
not said voltage between ends became lower
than said threshold voltage, and

charge indicating means for indicating charge
to said backup power supply when said comparison
determining means determined that
said voltage between ends became lower than
said threshold voltage.

18. A charging device of a backup power supply for a
printer which can supply power for performing a
prescribed backup operation to the printer having a
main power supply unit capable of taking at least
two states of ON state and a prescribed sleep state
when a main power supply unit is not in ON state,
and which can perform charge/discharge comprising:

hysteretic management means for managing
past hysteretic information relating to charge of
said backup power supply, and
charging time calculation means for calculating
ON period of said main power supply unit in the
future with reference to past charging time for
said backup power supply that said hysteretic
management means manage,
wherein said backup power supply is charged
by using power of said main power supply unit
when said main power supply unit is in ON

state.

19. The charging device according to Claim 18,
wherein said hysteretic management means have
at least a central processing unit and clocking 5
means for sending time to said central processing
unit, and
wherein said central processing unit calculates ON
period of said main power supply unit in the future
based on a signal outputted from said clocking 10
means when said main power supply unit is in ON
state.
20. The charging device according to Claim 18 wherein
said backup power supply is an electric double 15
layer capacitor.
21. The charging device according to Claim 20 wherein
said main power supply unit is turned on by time
when electric double layer capacitor is fully charged 20
after said main power supply unit is once turned on.

25

30

35

40

45

50

55

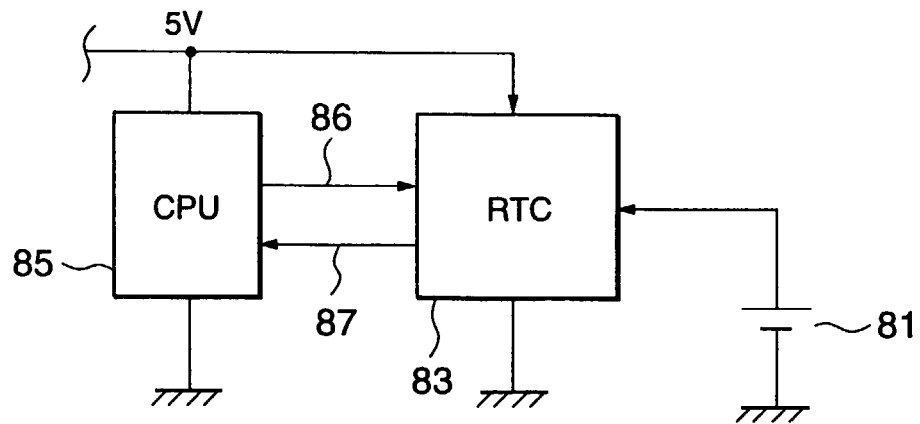


FIG.1

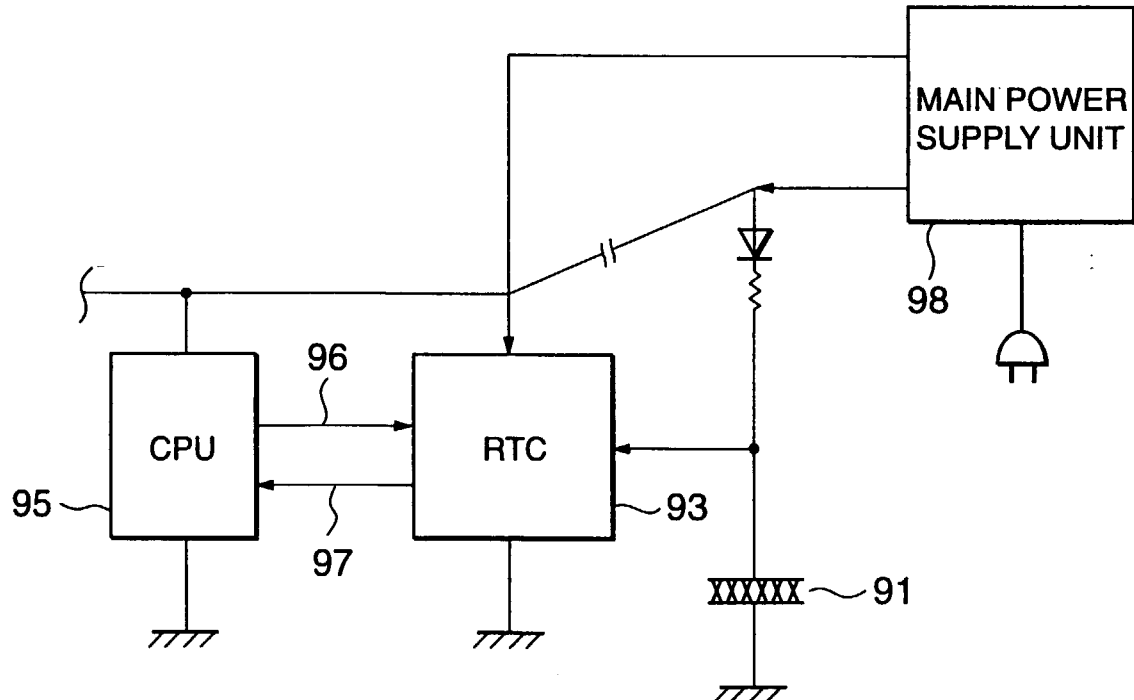


FIG.2

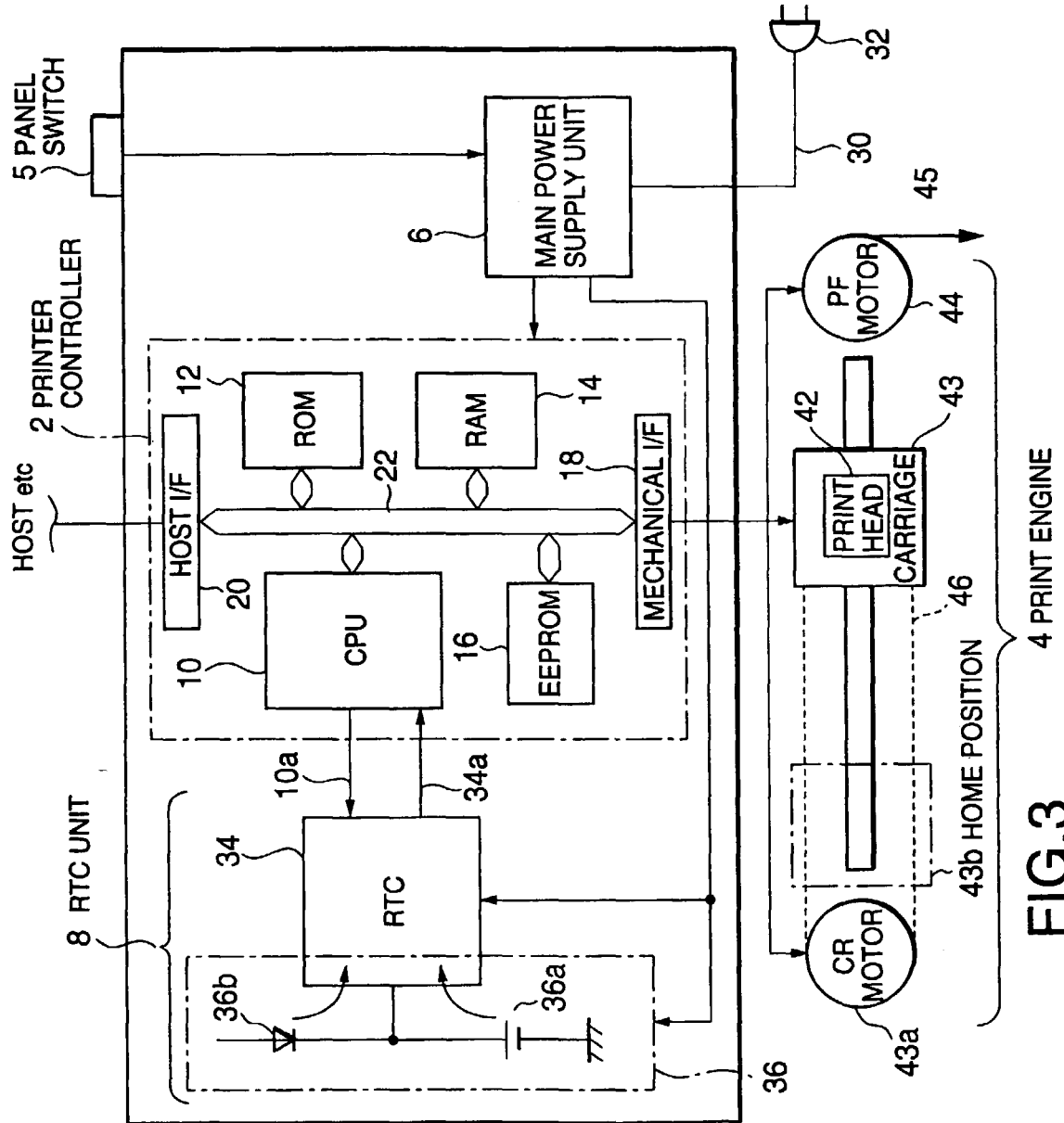


FIG.3

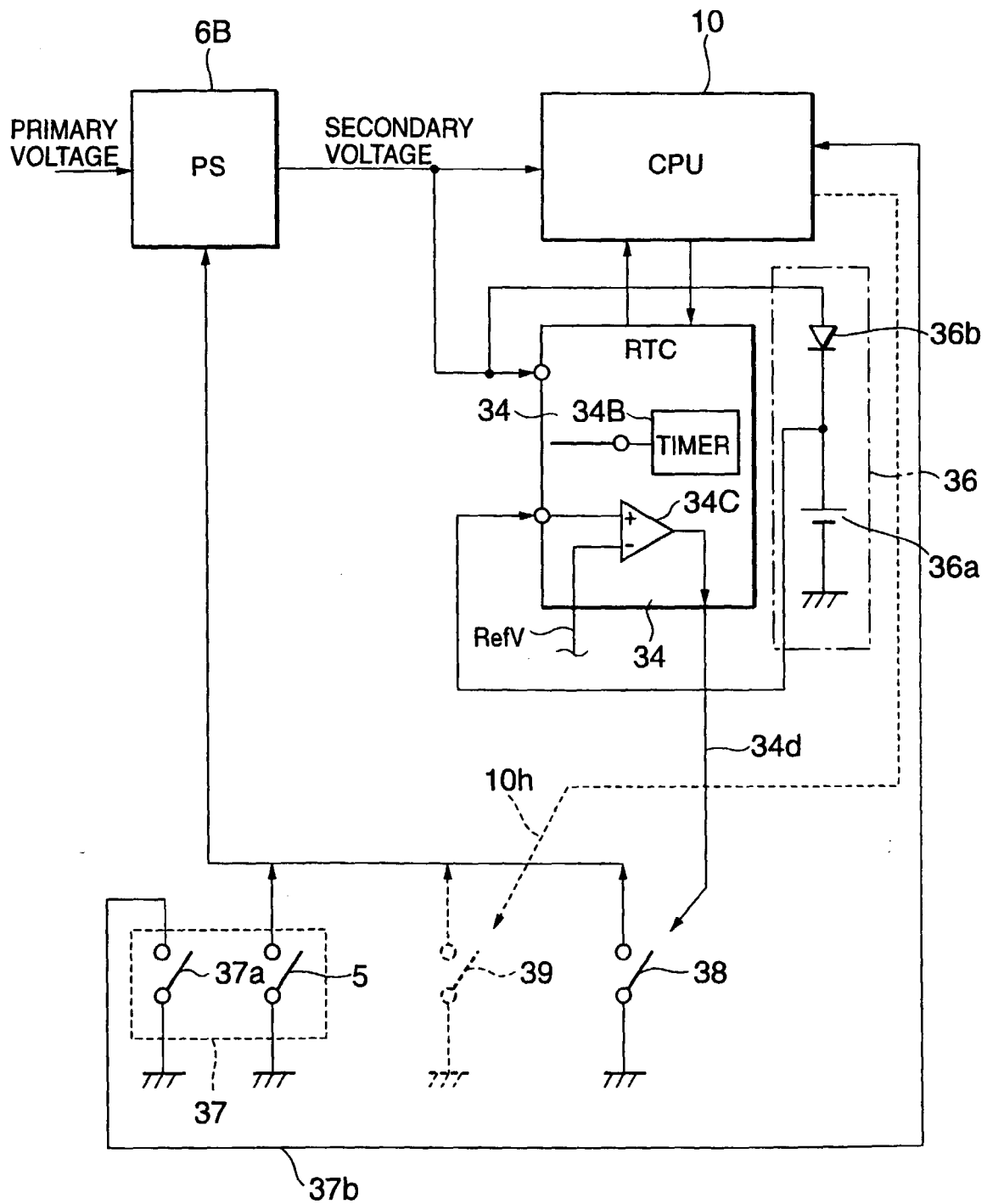


FIG.4

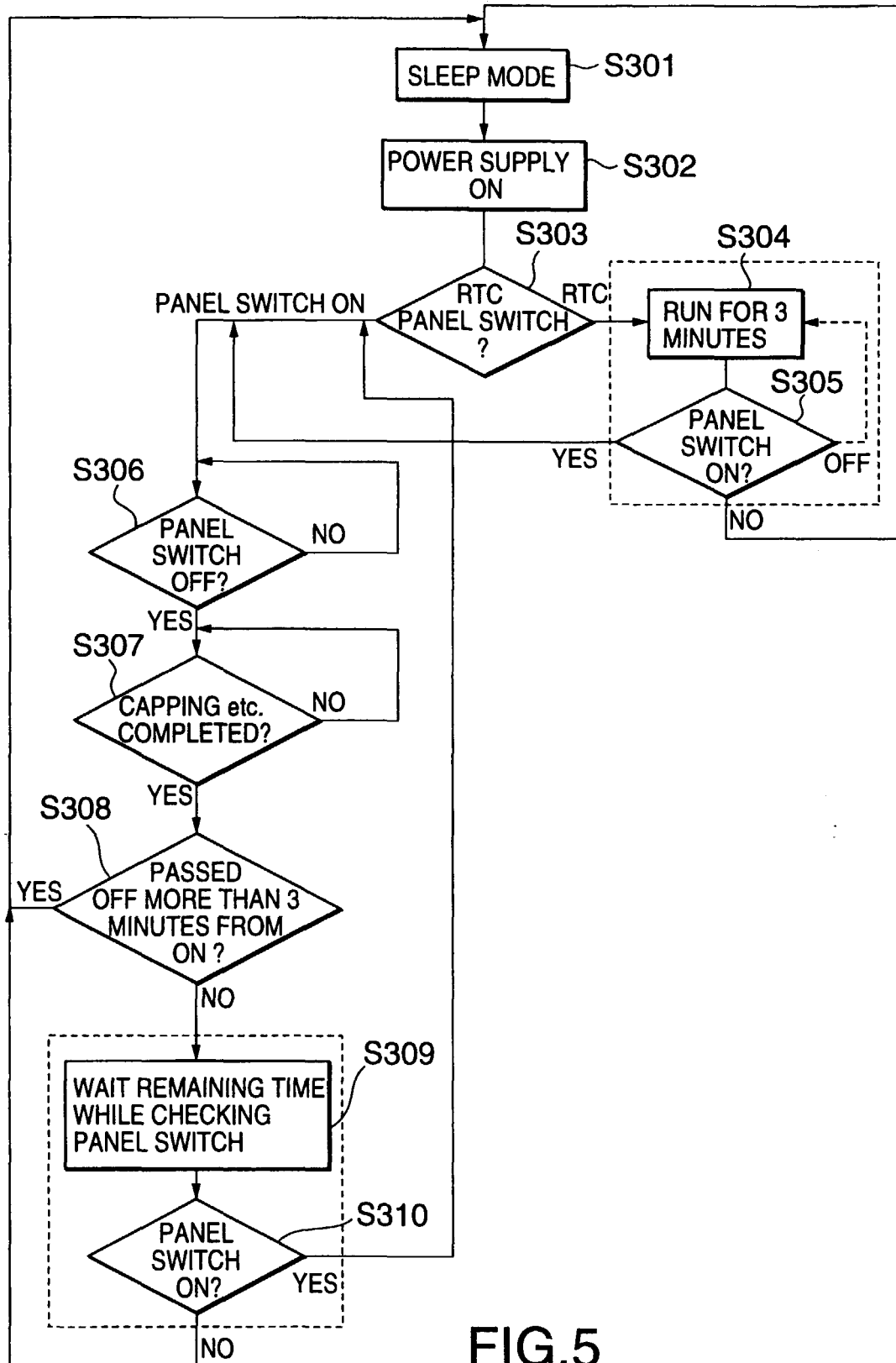
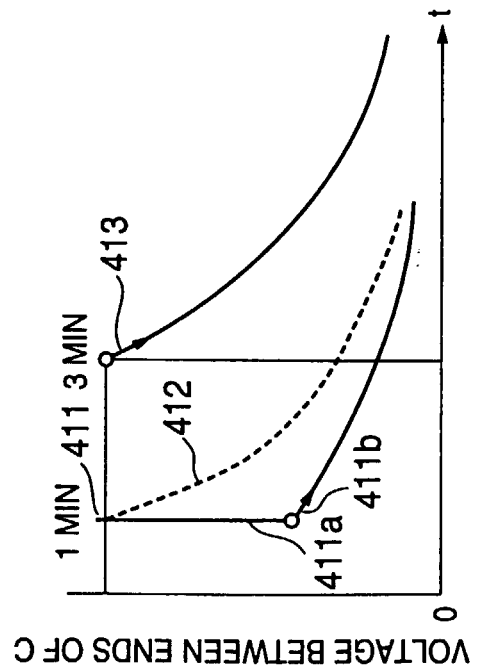
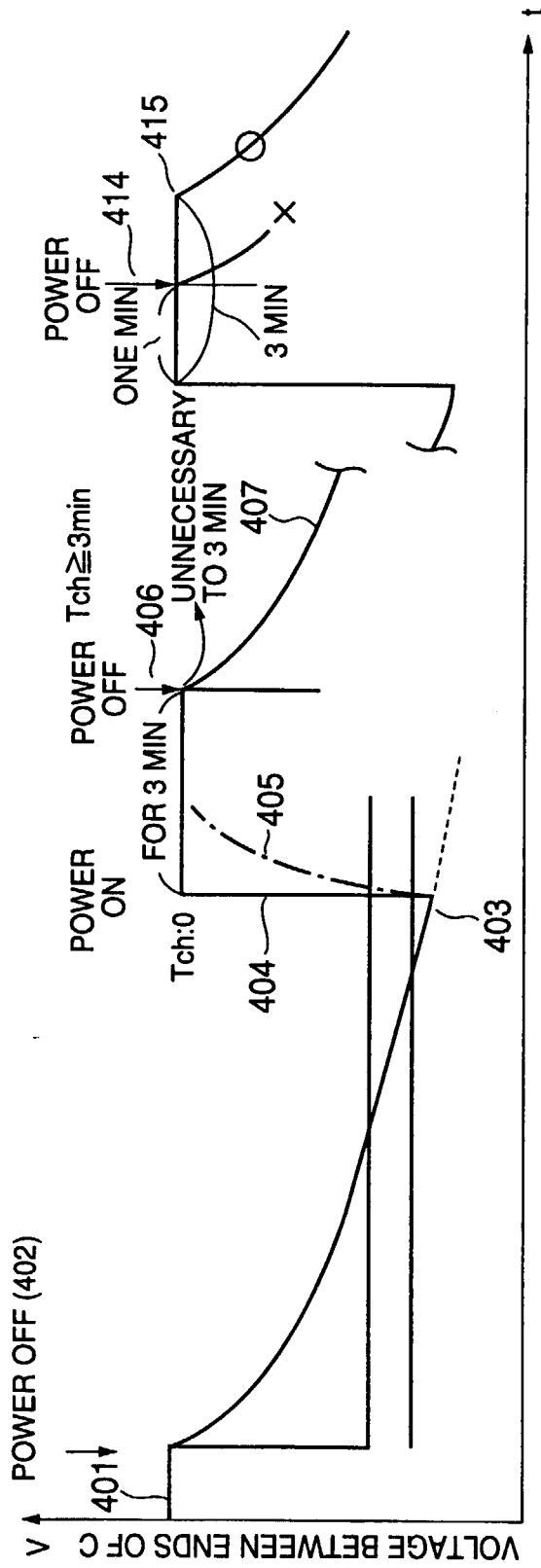


FIG.5



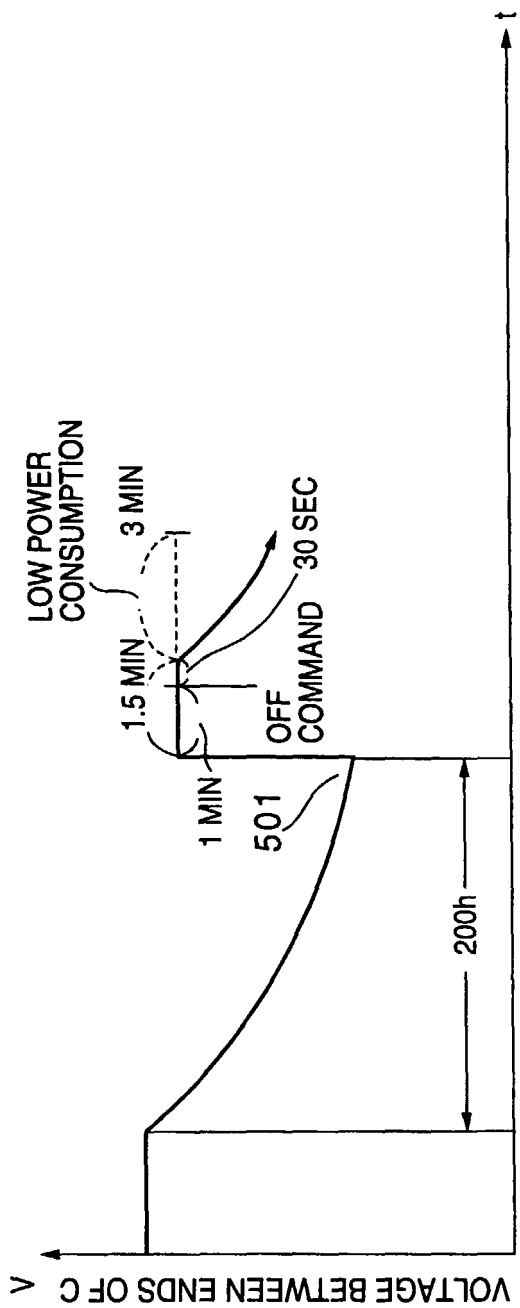


FIG.7

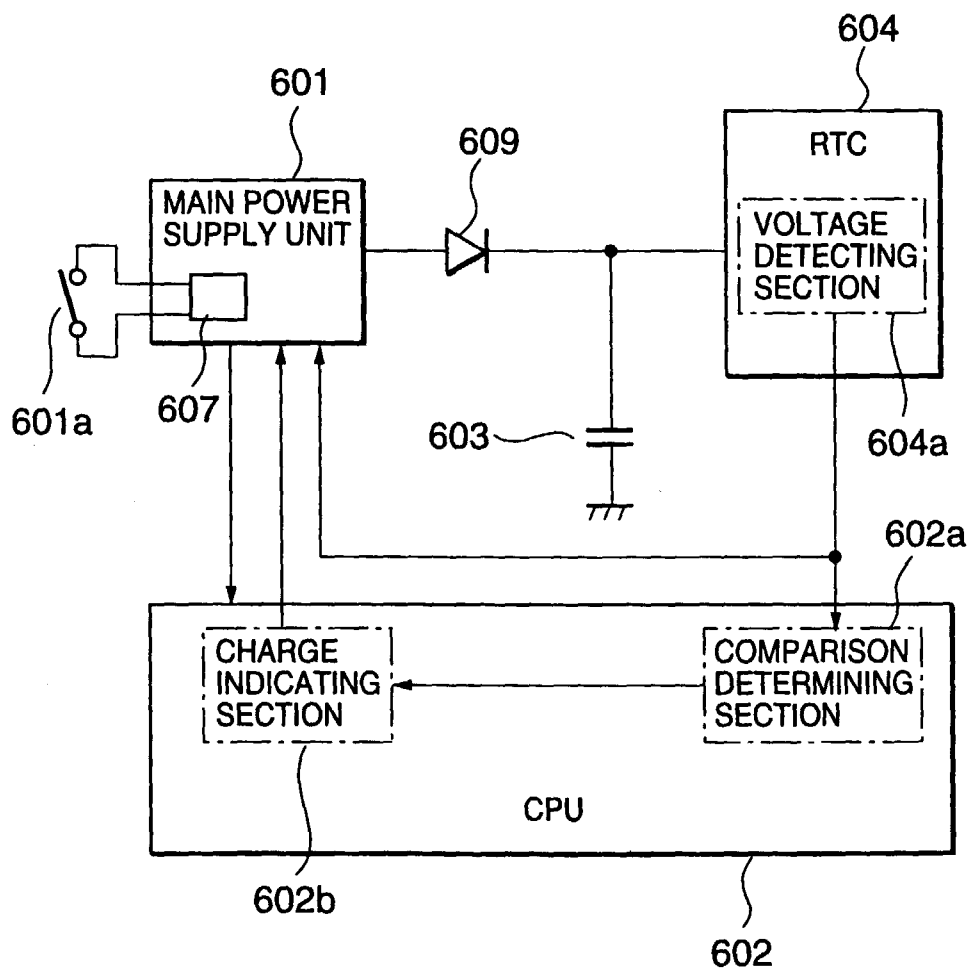


FIG.8