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(54) **DEVICE HAVING AN IMPROVED APPARATUS AND METHOD FOR SETTING POWER MANAGEMENT MODE**

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(52) **U.S. Cl.** **702/132**; 702/60; 702/63; 713/300; 713/340; 324/425

(58) **Field of Classification Search** 702/132, 702/60, 63; 324/425; 713/300, 320, 340
See application file for complete search history.

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(57) **ABSTRACT**

The present invention supports power management modes which includes (1) a maximum power performance mode, (2) a battery-optimized mode, and (3) a performance/optimization cycling mode for performing the maximum performance mode and the battery-optimized mode alternately within a prescribed period of time. The cycling mode allows flexibility in power management and faster charging of the battery.

63 Claims, 6 Drawing Sheets

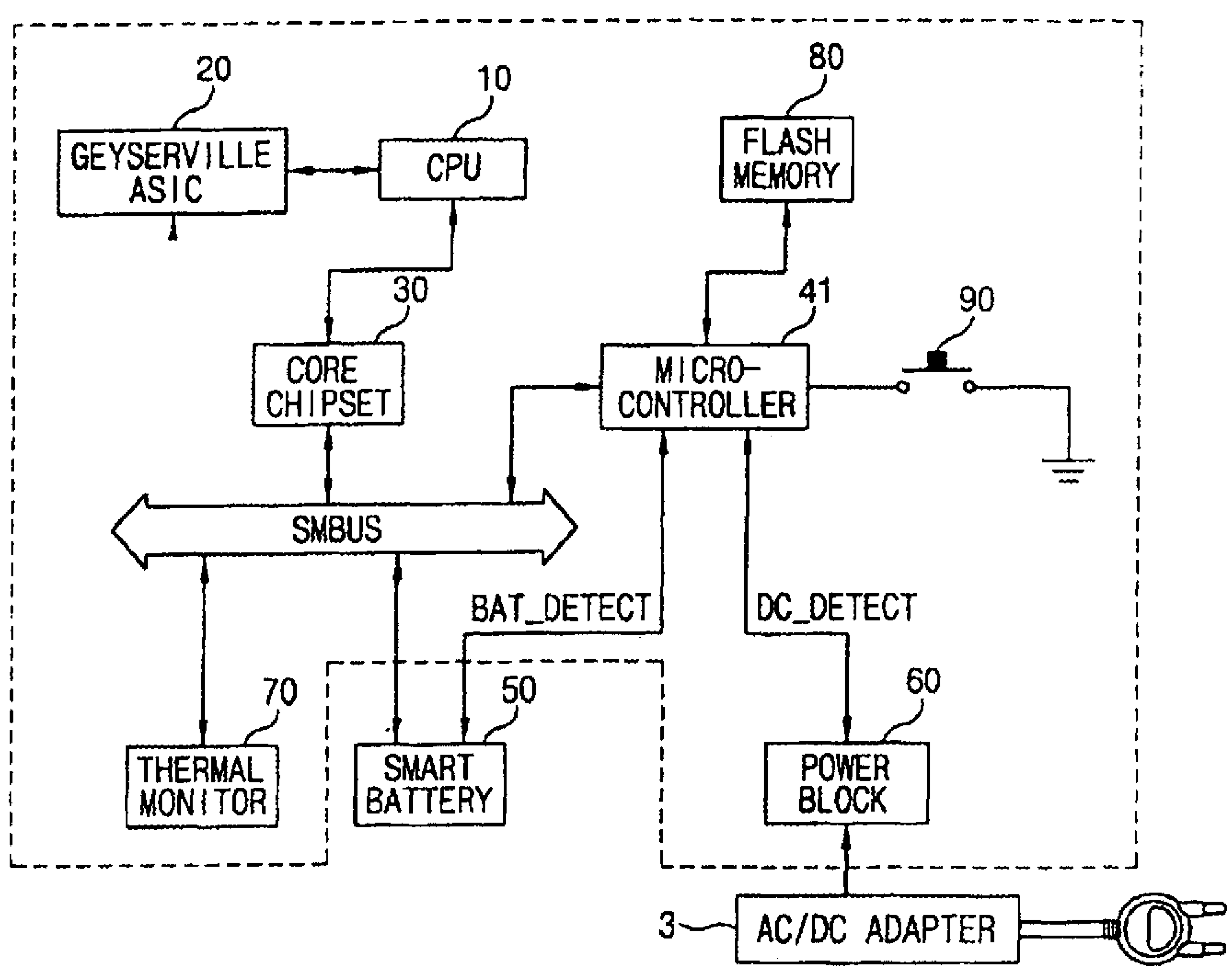


FIG.1A
CONVENTIONAL ART

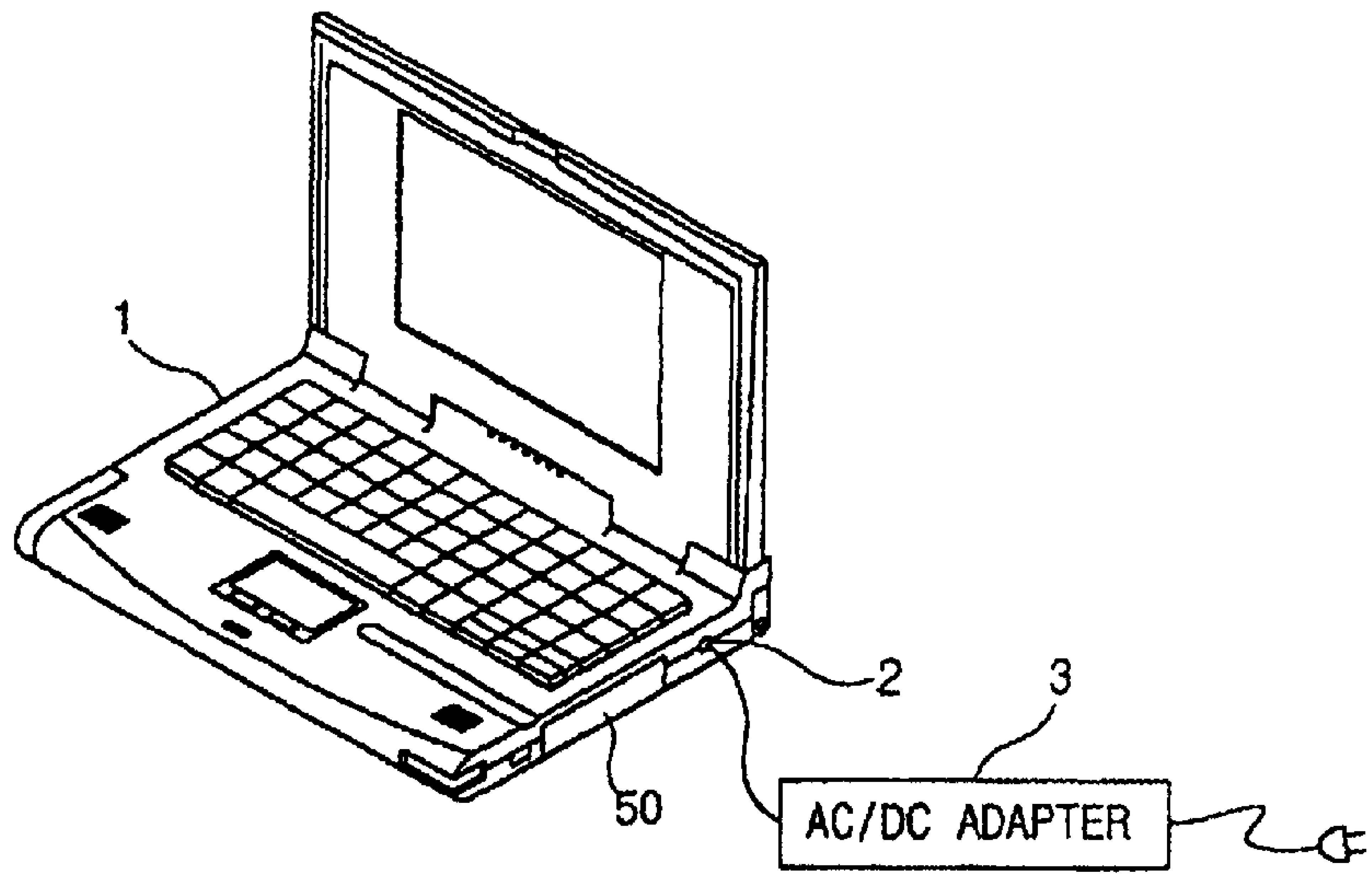


FIG.1B
CONVENTIONAL ART

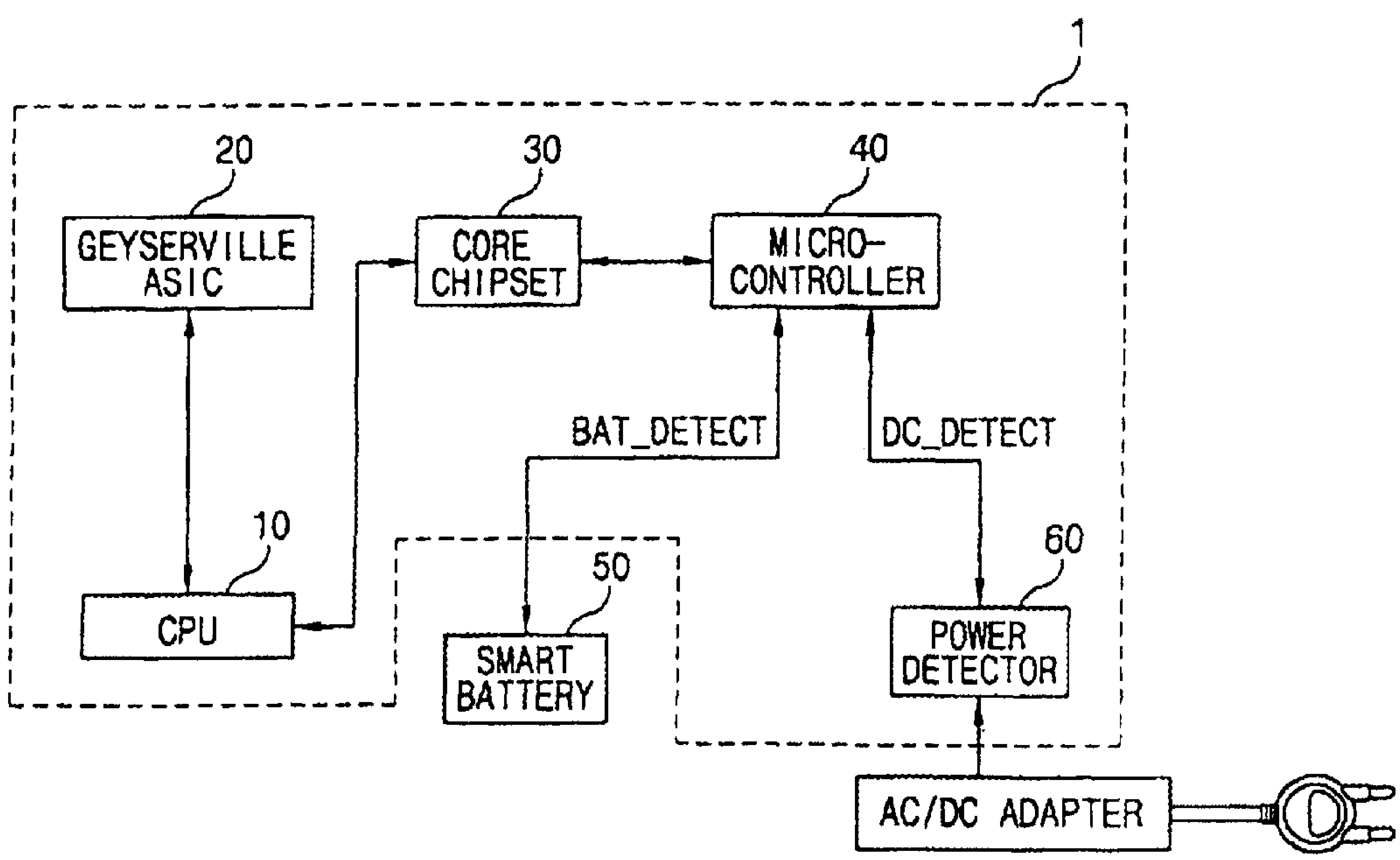


FIG.2

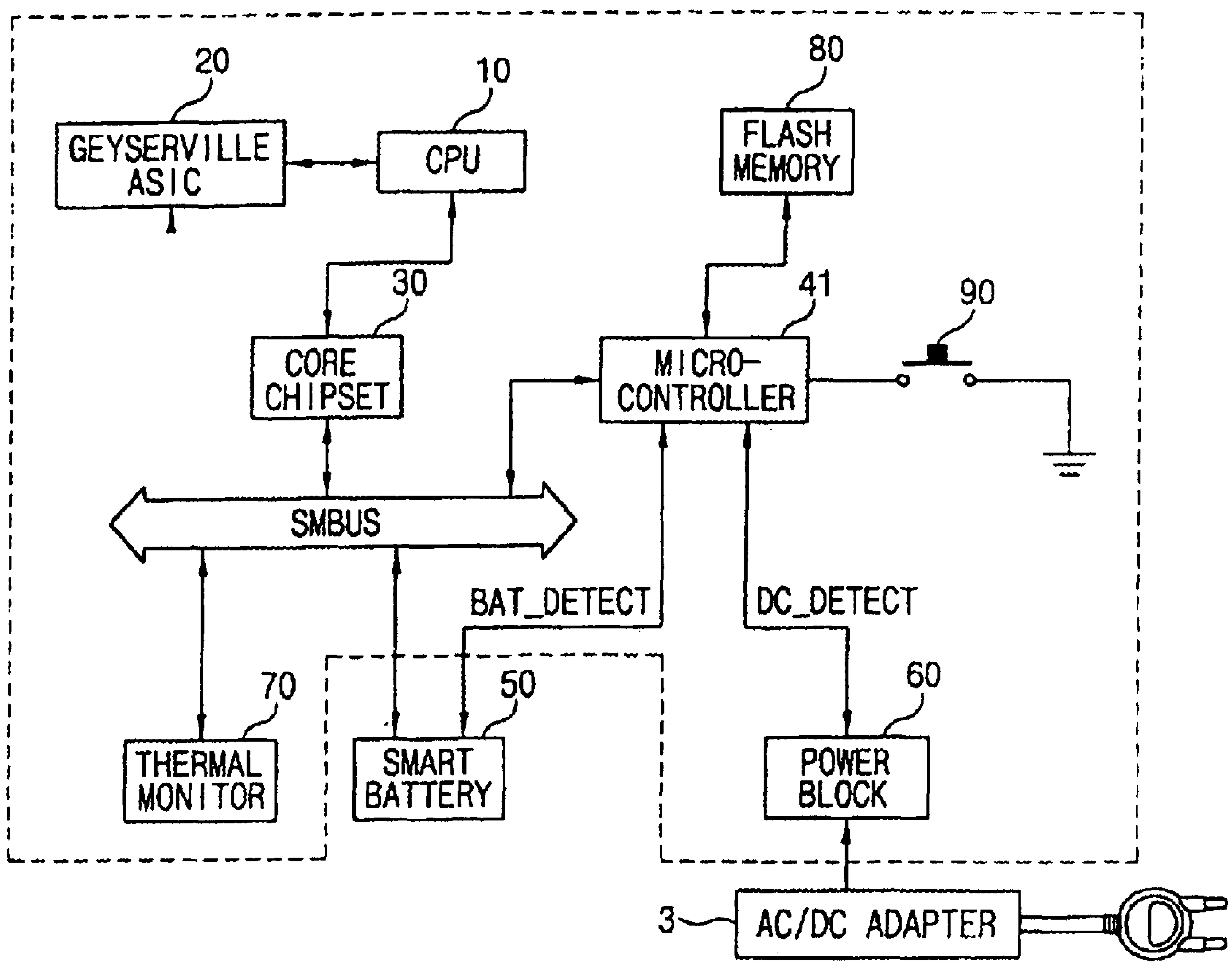

20
GEYSERVILLE ASIC
10
CPU
80
FLASH MEMORY
30
CORE CHIPSET
41
MICRO-CONTROLLER
90
SMBUS
BAT_DETECT
DC_DETECT
70
THERMAL MONITOR
50
SMART BATTERY
60
POWER BLOCK
3
AC/DC ADAPTER

FIG. 3

A/C POWER	TEMPERATURE	RESIDUAL AMOUNT OF BATTERY	POWER MANAGEMENT MODE
A/C POWER CONNECTED	LOW/MIDDLE	OVER 50%	M.P.M
		BELOW 50%	P.O.C.M.1
	HIGH	IRRELEVANT	P.O.C.M.2
A/C POWER NOT CONNECTED	LOW	HIGH	P.O.C.M.2
		MIDDLE	P.O.C.M.3
		LOW	B.O.M
	MIDDLE	HIGH	P.O.C.M.3
		MIDDLE	P.O.C.M.4
		LOW	B.O.M
	HIGH	HIGH	P.O.C.M.4
		MIDDLE	B.O.M
		LOW	B.O.M

M.P.M:MAXIMUM POWER PERFORMANCE MODE
P.O.C.M.:PERFORMANCE/OPTIMIZATION CYCLING MODE
B.O.M:BATTERY OPTIMIZED MODE

FIG.4A

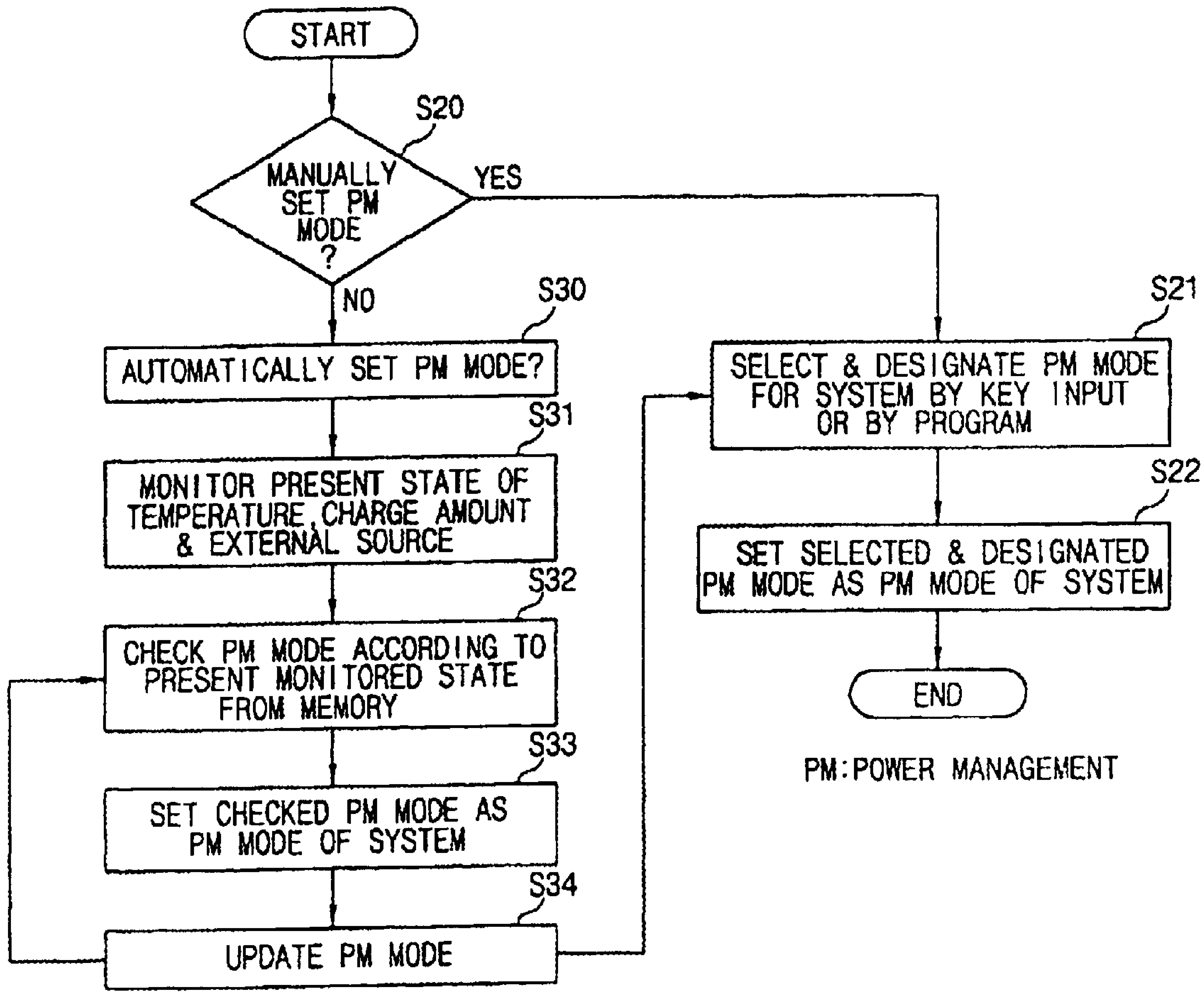

START
S20
MANUALLY SET PM MODE ?
YES
NO
S30
AUTOMATICALLY SET PM MODE?
S31
MONITOR PRESENT STATE OF TEMPERATURE, CHARGE AMOUNT & EXTERNAL SOURCE
S32
CHECK PM MODE ACCORDING TO PRESENT MONITORED STATE FROM MEMORY
S33
SET CHECKED PM MODE AS PM MODE OF SYSTEM
S34
UPDATE PM MODE
S21
SELECT & DESIGNATE PM MODE FOR SYSTEM BY KEY INPUT OR BY PROGRAM
S22
SET SELECTED & DESIGNATED PM MODE AS PM MODE OF SYSTEM
END
PM:POWER MANAGEMENT

FIG. 4B

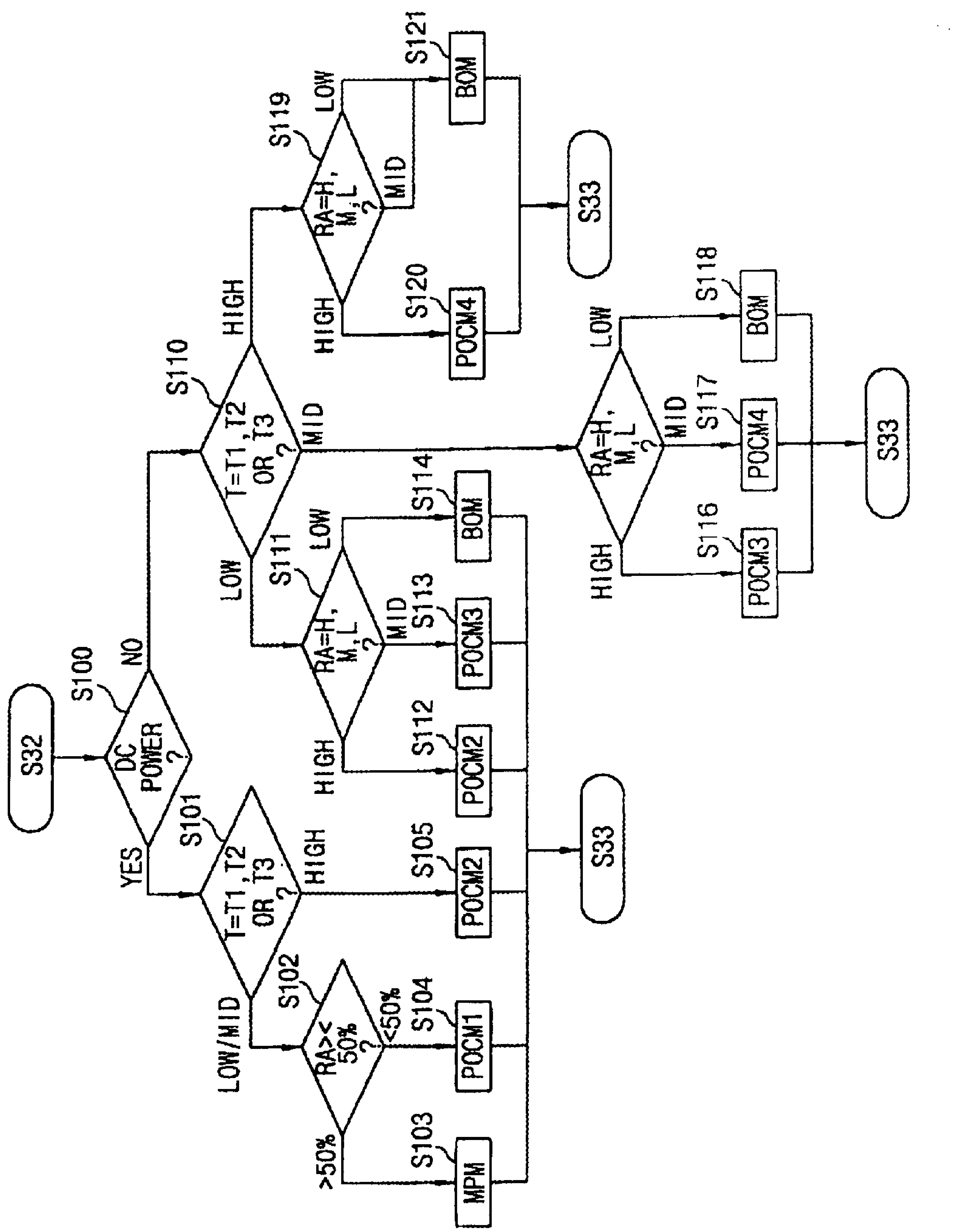

S32
S100
DC POWER ?
YES
NO
S101
T=T1, T2 OR T3 ?
LOW/MID
HIGH
S102
RA>< 50% ?
>50%
<50%
S103
MPM
S104
POCM1
S105
POCM2
S33
S110
T=T1, T2 OR T3 ?
LOW
MID
HIGH
S111
RA=H, M, L ?
HIGH
MID
LOW
S112
POCM2
S113
POCM3
S114
BOM
S116
POCM3
S117
POCM4
S118
BOM
S33
S119
RA=H, M, L ?
S120
POCM4
S121
BOM
S33

FIG.5A

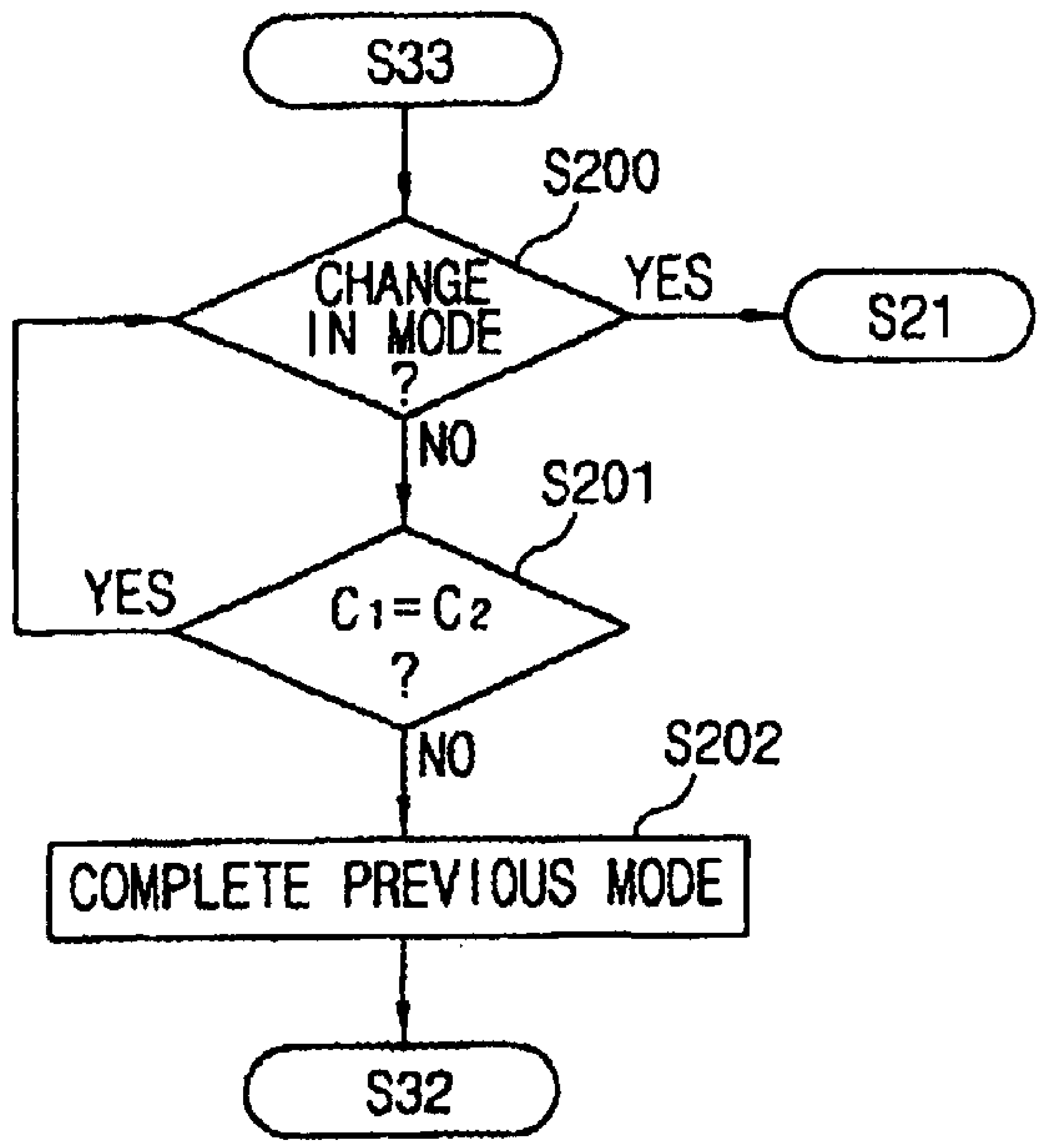
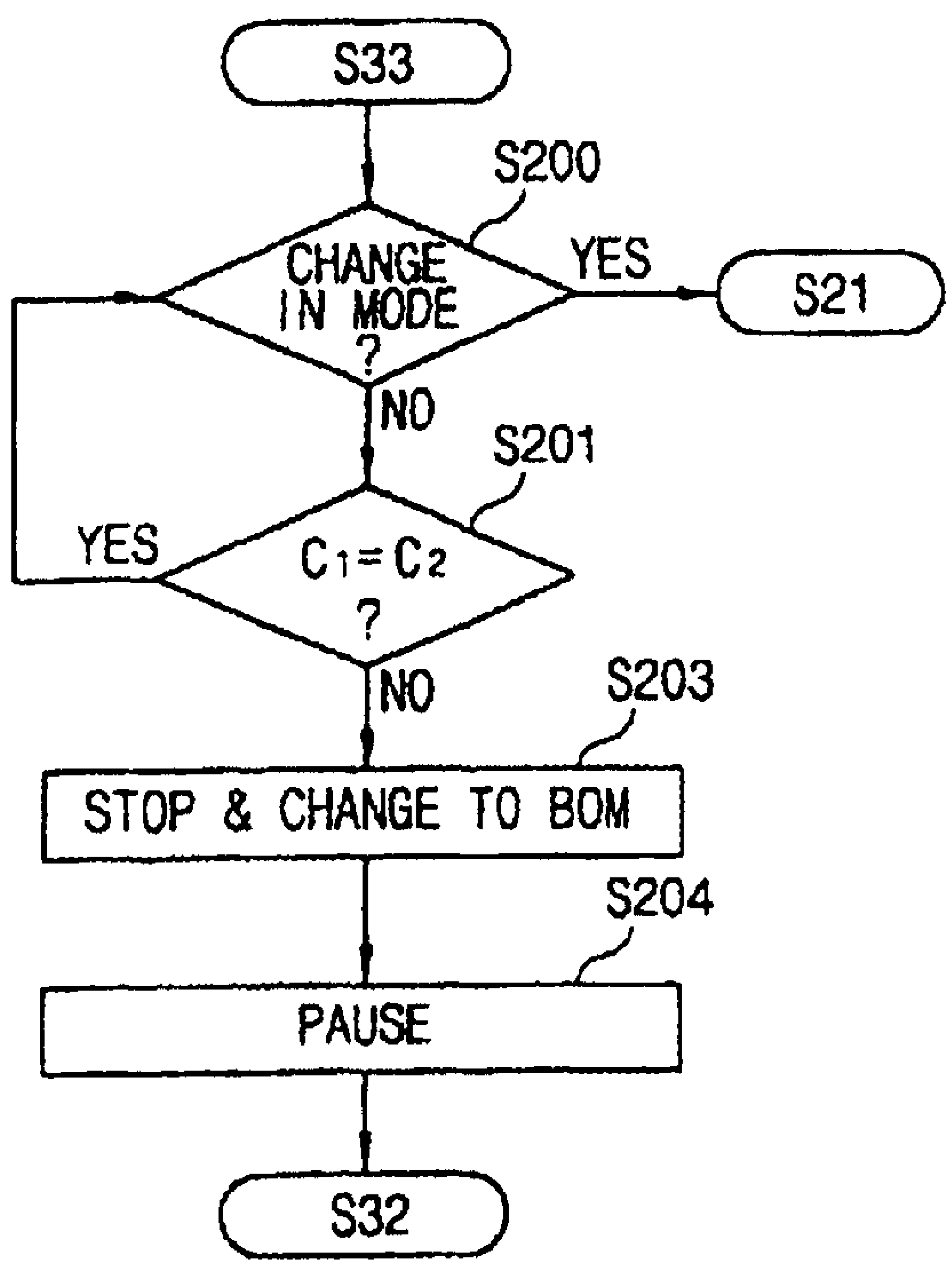

S33
S200
CHANGE IN MODE ?
YES
S21
NO
S201
YES
C1=C2 ?
NO
S202
COMPLETE PREVIOUS MODE
S32

FIG.5B


S33
S200
CHANGE IN MODE ?
YES
S21
NO
S201
YES
C1=C2 ?
NO
S203
STOP & CHANGE TO BOM
S204
PAUSE
S32

DEVICE HAVING AN IMPROVED APPARATUS AND METHOD FOR SETTING POWER MANAGEMENT MODE

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an electronic device, and more particularly, a device having an apparatus and method for setting a power management mode.

2. Background of the Related Art

In an electronic device using a battery, such as a notebook computer, power management is important. For notebook computers using a Pentium CPU manufactured by the Intel Corporation, the CPU uses a Geyserville technology, which supports two power management modes, i.e., a high performance mode and a battery-optimized mode.

The notebook computer uses the high performance mode under the environment of AC power source, and uses the battery-optimized mode under the environment of a battery-only power source. In addition, the menu wherein an user can set the default mode in each environment is realized through Power Management applet (WordPad, Graphic Panel, or the like) in control panel programs of Microsoft Windows.

FIG. **1**A illustrates a notebook computer **1** having a recess for receiving a smart battery **50** and input **2** for receiving the voltage from an AC/DC adapter **3**, and FIG. **1**B illustrates a schematic block diagram of a general notebook. In FIG. **1**B, a central processing unit (CPU) **10** controls the overall operation, and a Geyserville ASIC **20** controls the mode-switching of a power mode driven in the system. A core chipset **30** manages the I/O interface between the system and a peripheral device upon receipt of a command from the CPU. A micro controller **40** handles the interaction of a keyboard, mouse interface, power management, and battery interface. A smart battery **50** is used as a power source when an external power source is not available or not used, and a power detector **40** detects the application of the external power source.

The conventional notebook computer system implements the power management mode of the CPU according to which power source is provided. Since power management is implemented by only two modes, i.e., the maximum performance mode and battery-optimized mode, according to whether or not AC power detected from the power detector **60** is applied, the power management is not efficiently achieved from an optimized power use point of view. Here, the maximum performance mode means a state where the load of the system is maximum and other devices are operated according to this. The battery-optimized mode means idle state of parts of a device, that is, power save state. In addition, in the case where the battery residual amount of the notebook computer is less than 50%, if a AC power source is plugged into the computer while using a battery only as a power source during a work on computer, most of the power is supplied to the system and only a part thereof is supplied to the battery, for thereby making the charging speed slower.

The above references are incorporated by reference herein where appropriate for appropriate teachings of additional or alternative details, features and/or technical background.

SUMMARY OF THE INVENTION

An object of the invention is to solve at least the above problems and/or disadvantages and to provide at least the advantages described hereinafter.

An object of the present invention is to improve power management. Another object of the present invention is to allow flexibility in power management.

A further object of the present invention is to allow user to set the power management.

Still another object of the present invention is to quickly charge the battery.

A further object of the present invention is to increase the number of power management modes.

It is an object of the present invention to provide an apparatus and method for setting a power management mode capable of easily and simply setting the power management mode for a notebook computer system, and automatically setting the power management mode for the notebook computer system as an optimized mode according to the current operating state.

It is another object of the present invention to provide a charging method for reducing the charge time of a battery by appropriately converting the operating mode of a central processing unit of a Geyserville within the range of less effecting the performance of a computer, if the charging residual amount of a charging battery is judged to be less than a predetermined value when a power mode is converted to an adapter mode from a battery mode.

To achieve the above objects, there is provided an apparatus for setting a power management mode according to the present invention which includes: at least one detecting unit for monitoring the temperature state of a notebook computer, the charging state of a battery, and the power applying state from external source; a storing unit for storing the state of the individual condition and an appropriate power management mode in connection with each other; and a control unit for reading the power management mode corresponding to the current state of the individual monitored condition from the storing unit and for setting the same as a power management mode for the notebook computer.

In addition, there is provided a method for setting a power management mode according to the present invention which includes the steps of: continuously monitoring the temperature state of a notebook computer, charging state of a battery and whether an external power is applied or not for setting a power management mode; reporting the result of the monitoring to a control unit and setting the power management mode as manual or automatic by an user; and checking the power management mode according to the current monitoring state from a memory to set the same as the power management mode for the apparatus, if the power management mode is set manual, or selecting and setting the power management mode by key input by the user, if the power management mode is set automatic.

Furthermore, while the notebook computer is operated only by the battery, it is operated in a maximum performance mode if the battery residual amount is more than 50% when an AC power source is inputted. On the other hand, if the battery residual amount is less than 50%, the maximum performance mode is switched to a Geyserville cycling mode so as to make the charging speed higher.

The present invention can be achieved in a whole or in parts by a method of selecting one of a plurality of modes for power management, the method comprising: selecting a maximum performance mode based on a first condition; selecting a battery-optimized mode based on a second condition; and selecting a third mode different from maximum performance mode and the battery-optimized mode based on a third condition.

The present invention can be achieved in a whole or in parts by a apparatus for allowing a system to have a plurality of modes for power management comprising: a controller which supports the plurality of modes, wherein the plurality of modes includes a maximum performance mode, a battery optimized mode and a performance/optimization cycling mode, wherein during the performance/optimization cycling mode, the maximum performance mode is performed for a first prescribed period of time and the battery optimized mode is performed for a second prescribed period of time.

The present invention can be achieved in a whole or in parts by a method for setting a power management mode for a system, comprising: continuously monitoring the temperature state of the system, the charging state of a battery, and the application of power from an external source for setting a power management mode; and checking the power management mode according to the result of the monitoring from a memory for setting the same as the power management mode for the apparatus.

The present invention can be achieved in a whole or in parts by a system having prescribed function and operation to achieve a prescribed result, the system having an apparatus for setting a power management mode, wherein the apparatus includes: at least one detector to monitor a condition of the system based on the temperature, remaining charge of a battery, and whether an external power is applied or not; and a controller for determining the power management mode corresponding to monitored condition from the storing unit.

Additional advantages, objects, and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The objects and advantages of the invention may be realized and attained as particularly pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in detail with reference to the following drawings in which like reference numerals refer to like elements wherein:

FIG. **1**A illustrates a notebook computer;

FIG. **1**B illustrates a schematic block diagram of a general notebook;

FIG. **2** illustrates the construction of a notebook system according to an apparatus for setting a power management mode according to a preferred embodiment of the present invention;

FIG. **3** illustrates the correlation of detected conditions with the power management mode in accordance with a preferred embodiment of the present invention;

FIG. **4**A illustrates a method for manually or automatically setting the power management mode according to a preferred embodiment of the present invention;

FIG. **4**B illustrates the details of the step for automatically checking the power management mode of FIG. **4**A;

FIG. **5**A illustrates the details of automatically updating the power management mode of FIG. **4**A accordance with a first preferred embodiment of the present invention; and

FIG. **5**B illustrates the details of automatically updating the power management mode of FIG. **4**A in accordance with a second preferred embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

FIG. **2** illustrates the construction of a notebook system according to an apparatus for setting a power management mode of the present invention. FIG. **2** is somewhat similar to FIG. **1**, but further includes: a thermal monitor **70** for detecting the temperature of a predetermined position on a PCB of a computer main board; a flash memory **80** for storing the state of an individual preset condition for setting a power management mode and an appropriate optimized power management mode in connection with each other; and a power mode setting button **90** for manually setting a power management mode by an user. According to the state of the individual preset condition for setting a power management mode and whether or not the user depresses the power mode setting button **90**, the function and operation of a controller **41** for automatically or manually setting the power management mode for the notebook system are different from FIG. **1**.

The controller **41** supports power management modes for a notebook computer system, including (1) a maximum power performance mode wherein the load of the system is maximum and other devices are operated according to this, (2) a battery-optimized mode wherein parts of the devices are in power save state in case of an idle state, and (3) a performance/optimization cycling mode for performing the maximum performance mode and the battery-optimized mode alternately within a prescribed period of time.

The performance/optimization cycling mode (POCM) includes at least one additional power management mode, which alternately utilizes the maximum performance mode (PM) and the battery optimized mode (BOM) for a prescribed period of time D_T based on MPM and BOM duration ratio $R_{P/O}$, where $R_{P/O}=T_P/T_O$, T_P being the cumulative duration of the maximum performance mode for a first prescribed period of time D_1 and T_O being the cumulative duration of the battery optimized mode for a second prescribed period of time D_2. Since the PCOM is performed for a period of time D_T, $D_T=D_1+D_2$.

For example, in the preferred embodiment, there are four additional power management modes based on the duration ratio $R_{P/O}$ of POCM**1**, POCM**2**, POCM**3** and POCM**4** for a prescribed period of time D_T of 100 ms. In POCM**1**, the $R_{P/O}$=4:1, where T_P=80 ms and T_O=20 ms, such that the MPM is performed for 80 ms and thereafter BOM is performed for 20 ms within the 100 ms prescribed period of time D_T. In POCM**2**, the $R_{P/O}$=3:2, where T_P=60 ms and T_O=40 ms, such that the MPM is performed for 60 ms and thereafter BOM is performed for 40 ms within the 100 ms prescribed period of time D_T. In POCM**3**, the $R_{P/O}$=2:3, where T_P=40 ms and T_O=60 ms, such that the MPM is performed for 40 ms and thereafter BOM is performed for 60 ms within the 100 ms prescribed period of time D_T. In POCM**4**, the $R_{P/O}$=1:4, where T_P=20 ms and T_O=80 ms, such that the MPM is performed for 20 ms and thereafter BOM is performed for 80 ms within the 100 ms prescribed period of time D_T.

In the preferred embodiment of POCM, the MPM and the BOM are alternately performed once. However, as can be appreciated, the cycling between the MPM and the BOM can be performed repetitively for the prescribed period of time DT based on the duration ratio $R_{P/O}$. For example, the MPM can be performed for first 40 ms, the BOM can be performed for the next 10 ms, the MPM can be performed for the next 40 ms and the BOM can be performed for the last 10 ms in the POCM**1** such that the duration ratio $R_{P/O}$ of 4:1 is maintained for the prescribed period of time D_T.

As can be further appreciated, the prescribed period of time can be variably set by the manufacturer or the user, with or without manufacturers recommendation, depending on the contemplated use of the notebook computer or whether the user desires more speedier charge of the smart battery during the mode cycling. Further, the duration ratio $R_{P/P}$ can be variably set by the manufacturer or the user, with or without the manufacturer's recommendation, depending on the contemplated use of the notebook computer or whether the user desires more speedier charge of the smart battery.

As described above, the user can use the power mode setting button to select one of MPM, BOM, POCM**1**, POCM**2**, POCM**3** and POCM**4**, which will be described hereinafter, or the controller **41** can automatically control the power management mode based on information provided by the thermal monitor **70** and smart battery **50** via the system bus SMBUS and the detection of the external power source via the power block **60**, which is compared with the information stored in the flash memory **80**.

The thermal monitor **70** continuously detects the internal temperature of the notebook system and transmits the value thereof to the controller **41**. The temperature T detected by the thermal monitor, sensor or temperature detection unit **70** is pre-classified into a low temperature value T_L if the detected temperature falls within a first temperature range T_1, a medium temperature value T_M if the detected temperature falls within a second temperature range T_2, and a high temperature value T_H if the detected temperature falls within a third temperature range T_3, where $T_1<T_2<T_3$.

Similarly, the smart battery provides information regarding the residual amount RA of charge and the residual amount detected by the controller **41** is classified in to low, medium and high. A low residual amount RA_L is determined if the RA is less than 20%, a medium residual amount RA_M is determined if the RA is between 20% to 50%; and a high residual amount RA_H is determined if the RA is greater than 50%.

The information regarding the detection of the external power source, temperature classification and residual amount classification is stored in the flash memory **80**. Further, the flash memory stores the power management mode operation for the controller based on such information. Further, the flash memory preferably stores D_T and $R_{P/O}$ for PCOM.

FIG. **3** illustrates the correlation of such information with the power management mode stored in the flash memory **80**. When the external power source is connected and the temperature values is T_L or T_M, the controller **41** supports MPM when the RA is over 50% and the controller **41** supports POCM**1** when the RA is less than 50%. However, when the temperature value is T_H, the RA is irrelevant and the controller **41** supports POCM**2**.

In the instance of external power source disconnect, the power management mode vary between BOM and POCM in the preferred embodiment. When the temperature value is T_L, the controller **41** supports POCM**2** when the RA is RA_H, POCM**3** when the RA is RA_M, and BOM when the RA is RA_L. When the temperature value is T_M, the controller **41** supports POCM**3** when RA is RA_H, POCM**4** when RA is RA_M, and BOM when RA is RA_L. When the temperature value is T_H, the controller **41** supports POCM**4** when RA is RA_H, BOM when RA is RA_M or RA_L.

As can be appreciated, the dominant and subordinate information used for power management mode can be varied. In the preferred embodiment, the temperature was used as the dominant information and the residual amount as the subordinate information. Such criteria can be switched, and further, both criteria need not be used. Moreover, the power management mode using MPM, BOM and POCM based on temperature, residual amount and external power detection is not limited to the particular format illustrated in FIG. **4**. Further, other addition or replacement information can be used to correlate the power management.

FIG. **4**A illustrates a method for manually or automatically setting the power management mode according to a preferred embodiment of the present invention.

As shown, the controller determines whether the user has selected manual power management mode by the user pressing the power mode setting button **90** (S**20**). Whenever the power mode setting button **90** is pressed, the controller **41** changes the power management mode between MPM, POCM**1**, POCM**2**, POCM**3**, POCM**4** and BOM in sequence or any other appropriate sequences for the power management mode. After selection by the user (S**21**) the power management mode is set (S**22**).

In addition, the user can manually sets the power management mode of the notebook system by software. For example, the user can select the control panel program or management program of the operating system of the notebook PC, Macintosh, or other type of computers to select and designate a desired power management mode of the notebook system among the maximum power mode, performance/optimization cycling mode, and battery-optimized mode, on the Power Management Applet Menu or BIOS Set-up Menu. The controller **41** sets the selected and designated power management mode as the power management mode of the notebook system, thereby manually setting the power management mode of the notebook system.

However, if the manual power management mode is not set, automatic setting of power management mode is selected and designated on the Power Management Applet Menu or BIOS Set-up Menu (S**30**). The controller **41** monitors the state of each condition for setting the power management mode inputted from the thermal monitor **70**, smart battery **50**, and power detector **60** (S**31**).

The power management mode appropriate for the monitored state is checked from the flash memory **80** (S**32**). For example, if the temperature of a certain particular portion of the computer inputted from the thermal monitor **70** is judged to be a medium level T_M, the residual amount of a charging power inputted from the smart battery **50** is judged to be over 50%, and an AC power is judged to be connected, the controller **41** determines that the power management mode appropriate for the state of the above conditions is POCM**1** based on the information stored in the flash memory **80**. Thereafter, the controller **41** sets the power management mode (S**33**) and automatically updates the power management mode (S**34**) until the manual management mode is set.

FIG. **4**B illustrates the details of step S**32**. First, the controller **41** checks the application of external power source based on the DC_DETECT signal from the power detector **60** (S**100**). If the power source is detected, the controller **41** checks the temperature T provided by the thermal monitor via system bus SMBUS and check whether such information corresponds to T_L, T_M or T_H (S**101**). If $T=T_L$ or T_M, the controller checks if RA>50% or RA<50% (S**102**). If RA>50%, the power management mode is determined to be MPM (S**103**). However, if RA<50%, the power management mode is determined to be POCM**1** (S**104**). On the other hand, if $T=T_H$, the power management mode is determined to be POCM**2** (S**105**).

If the external power source is not detected, the controller **41** checks the temperature T provided by the thermal monitor via system bus SMBUS and check whether such information corresponds to T_L, T_M or T_H (S**110**).

If $T=T_L$, the controller checks the RA (S**111**). If $RA=RA_H$, the power management mode is determined to be POCM**2** (S**112**); if $RA=RA_M$, the power management mode is determined to be POCM**3** (S**113**); and if $RA=RA_L$, the power management mode is determined to be BOM (S**114**).

If $T=T_M$, the controller checks the RA (S**115**). If $RA=RA_H$, the power management mode is determined to be POCM**3** (S**116**); if $RA=RA_M$, the power management mode is determined to be POCM**4** (S**117**); and if $RA=RA_L$, the power management mode is determined to be BOM (S**118**).

If $T=T_H$, the controller checks the RA (S**119**). If $RA=RA_H$, the power management mode is determined to be POCM**4** (S**120**); if $RA=RA_M$, the power management mode is determined to be BOM; and if $RA=RA_L$, the power management mode is determined to be BOM (S**121**).

FIGS. **5**A illustrates the details of automatically updating the power management mode of step S**33** in accordance with a first preferred embodiment of the present invention. FIG. **5**B illustrates the details of automatically updating the power management mode of step S**33** in accordance with a second preferred embodiment of the present invention.

As shown in FIGS. **5**A and **5**B, the controller **41** determines whether there has been a change in power management mode to manual management by the user (S**200**). If so, the process returns to step S**21**. If not, the controller rechecks the present condition C_2 for power management mode inputted from the thermal monitor **70**, smart battery **50** and power detector **60**, and compares the present condition C_2 with the previous condition C_1 (S**201**). If the condition has not changed, the process returns to step S**200**. However, if C_2 does not equal C_1, two alternative process is used to change the power mode setting.

In FIG. **5**A, the controller **41** allows the system to complete the power management mode of the previous condition (S**202**). After the completion, the controller **41** returns to step S**32** to change the power management. For example, if the previous condition C_1 corresponded to the power management mode of POGM**1** and the change in condition C_2 corresponding to POGM**2** was detected during the mid-interval, i.e., 50 ms, of the prescribed period of time D_T, i.e., 100 ms, the controller **41** changes the power management mode to POGM**2** after the 100 ms.

In FIG. **5**B, the controller immediately stops the power management mode of the previous condition C_1 and changes the power management mode to BOM and is paused in this mode for a preset period of time. Thereafter, the controller **41** changes to the power management mode corresponding to the new condition C_2 by returning to step S**32**. For example, if the previous condition C_1 corresponded to the power management mode of POGM**1** and the change in condition C_2 corresponding to POGM**2** was detected during the mid-interval, i.e., 50 ms, the power management mode of POGM**1** is halted and changed to BOM and paused for a prescribed period of time. Thereafter, the controller **41** changes the power management mode to POGM**2**.

The present invention has various advantages. For example, power management is improved and there is more flexibility in the power management. Further, the user can manually set the power management or the power management can be automatically set and updated. Moreover, there is an increase in the number of power management modes, which increase the flexibility in power management, and the battery can be more quickly charged.

The foregoing embodiments and advantages are merely exemplary and are not to be construed as limiting the present invention. The present teaching can be readily applied to other types of apparatuses. The description of the present invention is intended to be illustrative, and not to limit the scope of the claims. Many alternatives, modifications, and variations will be apparent to those skilled in the art. In the claims, means-plus-function clauses are intended to cover the structures described herein as performing the recited function and not only structural equivalents but also equivalent structures. For example, the present invention is not limited to notebook computer, but is readily applicable to all devices using a battery as an alternate power source, including cameras, camcorders, audio players, radios, cell phones, etc.

What is claimed is:

1. A system having prescribed function and operation to achieve a prescribed result, the system having an apparatus for setting a power management mode, wherein the apparatus includes:

at least one detector to monitor a condition of the system based on a temperature, remaining charge of a battery, **[**and**]** *or* whether an external power is applied or not; and

a controller for determining the power management mode corresponding to the monitored condition from a storing unit, wherein the power management mode comprises**[**,**]** a maximum performance mode, a battery-optimized mode, and *a* cycling mode, **[**for performing**]** *wherein the cycling mode performs* automatic alternation between the maximum performance mode and the battery-optimized mode based on a prescribed ratio.

2. The system of claim **1**, wherein the cycling mode is performed for a prescribed period of time.

3. The system of claim **1**, further comprising a storage device for storing a correlation between the power management mode and the monitored condition.

4. The system of claim **1**, wherein at least one **[**senor**]** *sensor* includes a thermal sensor for detecting the temperature.

5. The system of claim **1**, further **[**comprises**]** *comprising* a key input for selecting one of *an* automatic power management mode and *a* manual power management mode.

6. The system of claim **1**, further **[**comprises**]** *comprising* a readable medium containing means for selecting one of *an* automatic power management mode and *a* manual management mode.

7. A method for setting a power management mode for a system, comprising:

[continuously**]** monitoring a temperature state of the system, a charging state of a battery, and an application of power from an external source **[**for setting a power management mode**]**; and

[checking**]** *setting* the power management mode according to **[**the**]** *a* result of the monitoring **[**from a memory for setting the same as the power management mode for an apparatus**]**, wherein the power management mode comprises**[**,**]** a maximum performance mode, a battery-optimized mode, and *a* cycling mode, **[**for performing**]** *wherein the cycling mode performs* automatic alternation between the maximum performance mode and the battery-optimized mode based on a prescribed ratio.

8. The method of claim **7**, further comprising storing a correlation between the power management mode and **[**the**]** *a* monitored condition.

9. The method of claim **7**, further comprising selecting one of automatic power management mode and *a* manual management mode.

10. An apparatus for allowing a system to have a plurality of modes for power management comprising:

a controller which supports the plurality of modes, wherein the plurality of modes includes a maximum performance mode, a battery optimized mode and a performance/optimization cycling mode,

wherein during the performance/optimization cycling mode, *the controller* automatically **[**repeating**]** *repeats* the maximum performance mode for a first prescribed period of time and the battery optimized mode for a second prescribed period of time or vice versa based on a prescribed ratio of the first prescribed period of time and the second prescribed period of time.

11. The apparatus of claim **10**, wherein the controller selects one of the plurality of modes based on temperature of the system.

12. The apparatus of claim **11**, wherein the controller further selects the mode based on remaining charge.

13. The apparatus of claim **12**, wherein the controller further selects the **[**modes**]** *mode* based on a connection to an external power source.

14. A method of selecting one of a plurality of modes for power management, the method comprising:

selecting a maximum performance mode based on a first condition;

selecting a battery-optimized mode based on a second condition; and

selecting a third mode different from maximum performance mode and the battery-optimized mode based on a third condition, wherein the third mode is a hybrid of the maximum performance mode and the battery-optimized mode.

15. The method of claim 14, wherein the third mode comprises automatically alternating between the maximum performance mode and the battery-optimized mode within a prescribed period of time.

16. The method of claim 15, wherein in the third mode, the alternation within a prescribed period of time is manually set based on a prescribed ratio between the maximum performance mode and the battery-optimized mode during the prescribed period of time.

17. The method of claim 14, further comprising storing a correlation between the plurality of modes for power management, the first condition, the second condition and the third condition.

18. A computer operating system program for use in a personal computing system, comprising:

a first computer program for monitoring the presence of an external power supply and a remaining power capacity of an internal power supply;

a power management control panel program with a set of user-selectable options relating to a plurality of power management modes, wherein one power management mode is a cycling mode comprised of cycling among two or more power management modes; and

a first memory location containing a set of automatic power management options;

wherein the computer operating system program correlates the set of automatic power management options with the first computer program in the event that the set of user-selectable options has not been actuated by a user.

19. The computer operating system program of claim 18, further comprising:

a second memory location containing a set of user-selected options relating to the plurality of power management modes.

20. The computer operating system program of claim 18, wherein the cycling mode cycles among two or more power management modes based on a prescribed ratio.

21. The computer system of claim 18, wherein the cycling mode comprises automatically alternating between the maximum performance mode and the battery-optimized mode within a prescribed period of time.

22. The computer operating system program of claim 18, further comprising:

a second computer program for monitoring a temperature;

wherein the computer system program correlates the set of automatic power management options with the second computer program.

23. The computer operating system of claim 18, wherein the plurality of power management modes comprises more than five modes, each with a different power load.

24. The computer operating system of claim 18, wherein the cycling mode cycles among two or more power management modes controlled at least in part by the first computer program.

25. A method of executing an operating system for use in a personal computer, comprising:

providing a smart battery interface function, wherein a remaining battery charge of an internal battery power supply is classified among a plurality of residual charge levels;

providing an external power supply presence detector function, wherein the presence of an external source of electrical power is determined;

providing a user interface function for a power management control program; comprised of user-selectable options; and

providing at least five power management modes, each with a different power load over a given time period;

wherein a single power management mode is selected based in part on the smart battery interface function, the external power supply presence detector function, or the user interface function for a power management control program.

26. The method of claim 25, wherein one power management mode comprises a cycling mode comprised of cycling among two or more power management modes.

27. The method of claim 26, wherein the cycling mode cycles among two or more power management modes based on a prescribed ratio.

28. The method of claim 26, wherein the cycling mode comprises automatically alternating between a maximum performance mode and a battery-optimized mode within a prescribed period of time.

29. The method of claim 25, further comprising:

providing a system bus;

wherein the single power management mode is continuously selected based on information provided from the smart battery interface function and the external power supply presence function via the system bus.

30. The method of claim 25, further comprising:

providing a temperature monitor;

wherein the operating system continuously correlates a monitored temperature value to a set of temperature-related data to determine whether to select a power management mode with a lower power load.

31. The method of claim 26, wherein the cycling mode cycles among two or more power management modes controlled at least in part by the first, second or third conditions.

32. A method for controlling the power management of a computing system, comprising:

providing a user interface program with a set of user-selectable options relating to power management;

providing a smart battery interface function, wherein a remaining battery charge of an internal battery power supply is classified among a plurality of residual charge levels;

providing a plurality of power management modes comprised of a maximum performance mode, a battery optimized mode, and a hybrid mode, wherein the hybrid mode automatically alternates between at least the maximum performance mode and the battery-optimized mode;

wherein a power management mode is selected based in part on the set of user-selectable options and the smart battery interface function.

33. The method of claim 32 wherein the hybrid mode cycles among modes according to a prescribed ratio.

34. The method of claim 32, further comprising:

providing a temperature monitor;

wherein a monitored temperature value is continuously correlated to a set of temperature-related data to determine whether to select a power management mode with a lower power load.

35. The method of claim 32, wherein the hybrid mode comprises automatically alternating between a maximum performance mode and a battery-optimized mode within a prescribed period of time.

36. The method of claim 32, wherein the computing system is a personal computer.

37. The method of claim 36, further comprising:

providing a system bus;

wherein the power management mode is selected based on information provided from the smart battery interface function via the system bus.

38. The method of claim 32, further comprising:

providing an external power supply presence detector function, wherein the presence of an external source of electrical power is used to determine whether to select a power management mode with a higher power load.

39. A method of controlling power management of a computing system comprising:

setting a first operation mode of the computing system, wherein the first operation mode comprises a maximum performance mode or a battery optimized mode;

monitoring the presence of an external power supply and a remaining power capacity of an internal power supply;

controllably selecting among the maximum performance mode, the battery optimized mode or one or more third power management modes based on the monitoring, wherein the one or more third power management modes vary based on the remaining power capacity of the internal power supply.

40. The method of claim 39, wherein the one or more third power management modes comprises at least a cycling mode, wherein the cycling mode cycles among two or more power management modes.

41. The method of claim 40, wherein the cycling adjusts based on the remaining power capacity of the internal power supply.

42. The method of claim 40, wherein the cycling adjusts based on a monitored temperature level in the computing system.

43. The method of claim 40, wherein the cycling adjusts based on user input data.

44. The method of claim 43, wherein the user input data is input via a user interface program.

45. A software program for controlling power management in a computing system, comprising:

first software of the software program, wherein a user may input user power management control data via the first software;

second software of the software program, wherein the second software results in data based on monitoring the presence of an external power supply and a remaining power capacity of an internal power supply;

third software, wherein the third software controllably selecting among a maximum performance mode, a battery optimized mode and one or more third power management modes based on data from the first and second, wherein the one or more third power management modes automatically adapt based on changed data from the first or second software.

46. The software program of claim 45, wherein the one or more third power management modes comprises at least a cycling mode, wherein the cycling mode cycles among two or more power management modes.

47. The software program of claim 46, wherein the cycling adapts based on the remaining power capacity of the internal power supply.

48. The software program of claim 46, wherein the cycling adapts based on user input power management preference data.

49. The software program of claim 45, wherein data resulting from the first and second software are stored in a memory, wherein as data stored in the memory changes based on the operation of the first and second software, the one or more third power management modes is/are controlled to adapt to the changed data stored in the memory.

50. The software program of claim 49, wherein the one or more third power management modes is/are controlled such that, at a point in time after which an external power supply is coupled to the computing system, if the remaining power capacity of the internal supply is below a threshold, then a first level of charging power is supplied to the internal supply, and if the remaining power capacity of the internal supply is above a threshold, then a second level of charging power is supplied to the internal supply.

51. The software program of claim 50, wherein the first level of charging power is greater than the second level of charging power.

52. The software program of claim 45, further comprising fourth software of the software program, wherein the fourth software results in data based on a measured temperature in the computing system.

53. The software program of claim 52, wherein the one or more third power management modes comprise at least a cycling mode, wherein the cycling mode cycles among two or more power management modes.

54. The software program of claim 53, wherein the cycling adapts based on a monitored temperature level in the computing system.

55. The software program of claim 52, wherein data resulting from the first, second and fourth software are stored in a memory, wherein as data stored in the memory changes based on the operation of the first, second and fourth software, the one or more third power management modes is/are controlled to adapt to the changed data stored in the memory.

56. The software program of claim 55, wherein the one or more third power management modes is/are controlled such that, at a point in time after which an external power supply is coupled to the computing system, if the remaining power capacity of the internal supply is below a threshold, then a first level of charging power is supplied to the internal supply, and if the remaining power capacity of the internal supply is above a threshold, then a second level of charging power is supplied to the internal supply.

57. The software program of claim 56, wherein the first level of charging power is greater than the second level of charging power.

58. A method of selecting one of a plurality of modes for power management within a computing system, the method comprising:

selecting a performance optimization mode based on a first condition;

selecting a battery optimization mode based on a second condition; and

selecting a third mode different from maximum performance mode and the battery-optimized mode based on a third condition, wherein the third mode comprises at least a cycling mode, wherein the cycling mode cycles among two or more power management modes.

59. The method of claim 58, wherein the third mode comprises alternating between the performance optimization mode and the battery optimization mode.

60. The method of claim 58, wherein the third mode comprises alternating among at least two modes based upon a prescribed ratio.

61. The method of claim 58, wherein in the third mode, the prescribed ratio is determined based upon user selections.

62. The method of claim 58, further comprising storing a correlation between the plurality of modes for power management, the first condition, the second condition and the third condition.

63. The method of claim 58, wherein the computing system is a personal computer.

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