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CA 2354523 A1 2001/04/19

(21) 2 354 523

(12) DEMANDE DE BREVET CANADIEN
CANADIAN PATENT APPLICATION

(13) A1

(86) Date de dépôt PCT/PCT Filing Date: 2000/10/12
(87) Date publication PCT/PCT Publication Date: 2001/04/19
(85) Entrée phase nationale/National Entry: 2001/06/12
(86) N° demande PCT/PCT Application No.: JP 00/07074
(87) N° publication PCT/PCT Publication No.: WO 01/27736
(30) Priorités/Priorities: 1999/10/12 (11/289703) JP;
2000/09/28 (2000/296184) JP

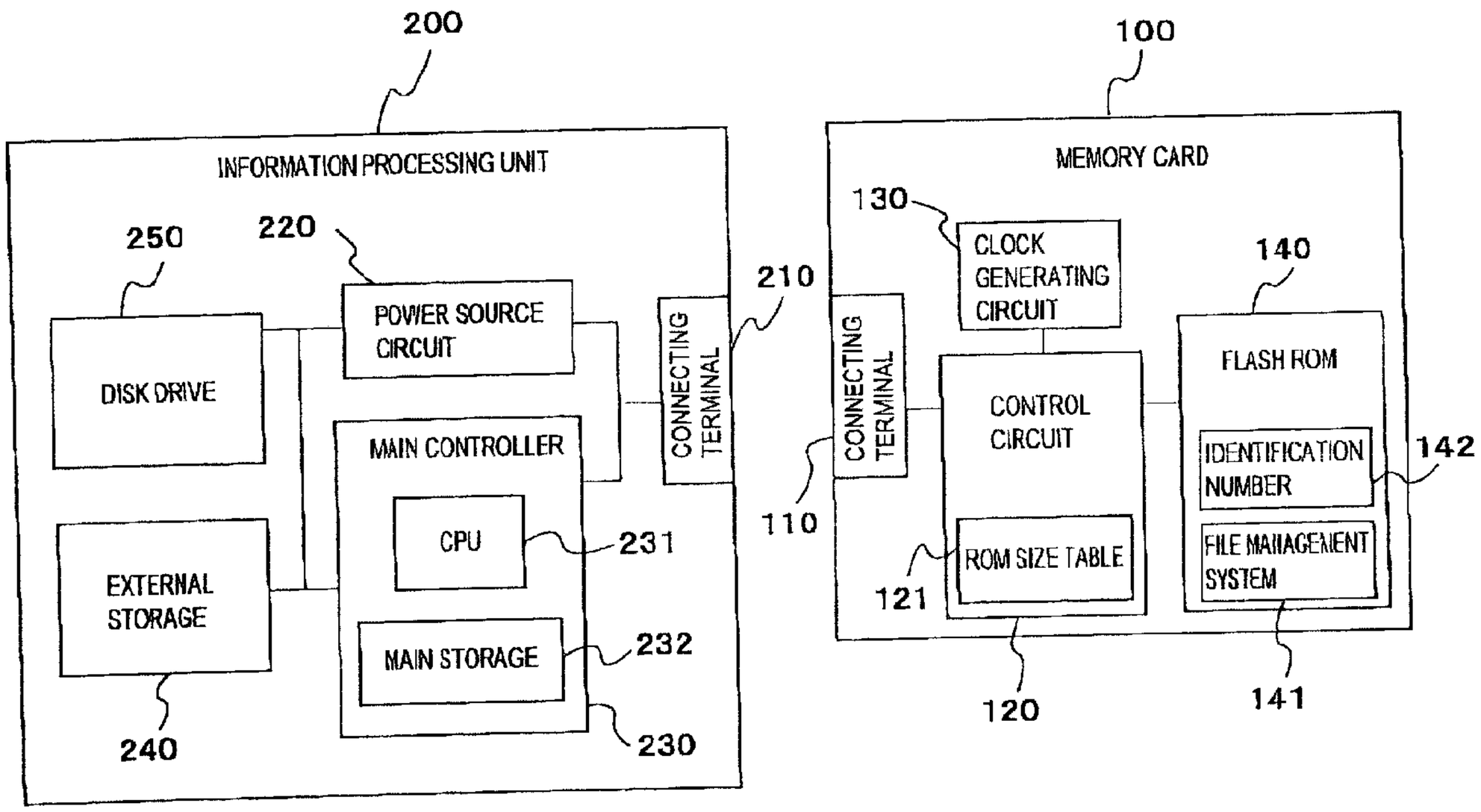
(51) Cl.Int.^{7}/Int.Cl.^{7} G06F 3/06, G06F 3/08, G11C 16/02, G06K 19/00, G06K 17/00

(71) Demandeur/Applicant:
SONY COMPUTER ENTERTAINMENT INC., JP

(72) Inventeurs/Inventors:
YOSHIMORI, MASAHARU, JP;
FUKUNAGA, YOICHIRO, JP;
TANAKA, MAKOTO, JP

(74) Agent: GOWLING LAFLEUR HENDERSON LLP

(54) Titre : DISPOSITIF LUDIQUE, PROCESSEUR D'INFORMATIONS ET ENREGISTREUR PORTABLE
(54) Title: ENTERTAINMENT DEVICE, INFORMATION PROCESSOR, AND PORTABLE RECORDER



(57) Abrégé/Abstract:
An information processor which can control read/write even if the memory capacity of a portable memory device is changed and a portable memory device and an entertainment device which are controlled by such an information processor. A memory card (100) and an information processor (200) to which the memory card (100) is detachably attached are provided. The memory card (100) has a flash ROM (140) in which the page size which can be read/written at a time is predetermined, identification information (142), and a ROM size table (121). The information processor (200) captures information representing the page size from the memory card and controls data read/write of the flash ROM (140).

ABSTRACT

The present invention provides an information processing unit capable of controlling reading and writing operations even when the capacity of a portable storage device is changed, a portable storage device controlled by the information processing unit, and an entertainment apparatus.

The entertainment apparatus has a memory card 100, and an information processing unit 200 to which the memory card 100 is detachably connected. The memory card 100 is provided with a flash ROM 140 in which the size of a page or data capable of being read and written at a time are determined in advance, identification information 142 and an ROM size table 121. The information processing unit 200 is adapted to obtain page size-indicating information from the memory card, and control in accordance with the page size the reading and writing of data with respect to the flash ROM 140.

Entertainment Device, Information Processor, and Portable Recorder

TECHNICAL FIELD

This invention relates to an entertainment apparatus, an information processing unit used therefor, and techniques concerning a portable storage device fixed detachably to the information processing unit, and more particularly to input and output control techniques for the information processing apparatus and the portable storage device.

BACKGROUND ART

In an entertainment apparatus comprising an information processing unit and a memory card capable of being attached to and detachable from the information processing unit, the memory card serves as an external storage for the information processing unit. The memory card is provided with a flash ROM, a control circuit, a clock generating circuit and a connecting terminal. When the memory card is connected to the information processing unit, the former communicates with the latter through the connecting terminal. The controlling of the communication and read write operations for the flash ROM are carried out by the control circuit. The data which the information processing unit desires to store in the memory card and the like are stored in the flash ROM by a unit of file.

The read write operations for the flash ROM are carried

out by a page of predetermined size. The information processing unit cannot read and write over one page of data in one action out of and in the memory card.

DISCLOSURE OF THE INVENTION

The size of a page are determined usually in accordance with the capacity of the flash ROM as a whole. Therefore, when a read write control program for the information processing unit is developed for a flash ROM of a specific capacity, a flash ROM of some other capacity becomes unable to be utilized by the program, and the extendability becomes low. Namely, when the capacity of the flash ROM of the memory card is changed in the future, it becomes necessary to correct the control program. Even when the capacity of the flash ROM is increased with the control program used without being corrected, there is the possibility that the increased portion of the capacity of the flash ROM cannot be sufficiently utilized.

The present invention has been made in view of these circumstances, and provides an information processing unit the write read operations of which can be controlled even when the storage capacity of a portable storage device is changed, a portable storage device controlled by the information processing unit, and an entertainment apparatus.

According to a first embodiment of the present invention, the entertainment apparatus comprising a portable storage device, and an information processing unit to which the portable storage

device is detachably connected,

the portable storage device being provided with:

a storage member in which a size of a page out of and in which data can be read and written by one processing operation are pre-determined, and

a holding member for holding information capable of identifying the page size,

the information processing unit being provided with:

a control member for controlling the reading and writing of the storage member on the basis of the information held in the holding member.

According to a second embodiment of the present invention, the information processing unit detachably connected to a portable storage device,

the portable storage device being provided with:

a storage member in which a size of a page out of and in which data can be read and written by one processing operation are pre-determined; and

a holding member for holding information capable of identifying the page size,

the information processing unit comprises:

a means for obtaining the information indicating page size to be identified by page size-identifiable information; and

a means for giving instructions to carry out read write operations to the storage member,

wherein;

the instruction-giving means gives instructions to keep the page size of data to be read and written by one processing operation not higher than the page size.

According to a third embodiment of the present invention, the portable storage device connected detachably to an information processing unit, comprises:

a storage member in which a size of a page out of and in which data can be read and written by one processing operation are pre-determined,

a holding member for holding information capable of identifying the page size; and

an instruction executing member for receiving instructions from the information processing unit and executing the instructions, wherein:

the instruction executing member outputs the page size-identifiable information with reference to the holding member when the instruction executing member receives a page size inquiring instructions; and

executes inputs and outputs information into and from the storage member when the instruction executing member receives input-output instructions for the storage member.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sketch drawing of the information processing unit and memory card according to the present invention;

Fig. 2 is a construction diagram of hardware of the

information processing unit and memory card according to the present invention;

Fig. 3 is a functional block diagram of a main controller in the information processing unit according to the present invention;

Fig. 4 is a functional block diagram of a control circuit in the information processing unit according to the present invention; and

Fig. 5 is a flow chart of the procedure for command generation and analysis.

BEST MODE FOR CARRYING OUT THE INVENTION

Hereinafter, modes of embodiments of the present invention will now be described with reference to the drawings.

In the following modes of embodiments, an information processing unit capable of playing a game, reproducing images and sounds, and communicating with some other device and the like, and a memory card which can be attached to and removed from the information processing unit will be described as examples.

When a game played by using the information processing unit is, for example, interrupted, the progress of the game made theretofore is written in the memory card and stored as data. The game can be resumed and continued from the condition at the point of the interruption of the game by using the data on the operational progress and the like.

Fig. 1 is a sketch drawing showing a memory card 100 and an information processing unit 200 of this mode of embodiment. The memory card 100 is put into a memory card inserting hole 260 provided at the front of the information processing unit 200. Besides these members, a controller (not shown) and a TV monitor (not shown) are connected to the information processing unit 200, and the resultant product as a whole is formed as an entertainment apparatus 10. The controller is connected by inserting a plug joined to a cable (neither of which is shown) into a connector inserting hole 270.

Fig. 2 is a construction diagram of hardware of the memory card 100 and the information processing unit 200 of this embodiment.

The memory card 100 is provided with a connecting terminal 110, a control circuit 120, a clock generating circuit 130, a flash ROM 140, and a housing 150 (refer to Fig. 1) holding these parts therein.

When the memory card 100 is put into the memory card inserting hole 260 of the information processing unit 200, the connecting terminal 110 contacts the connecting terminal 210 of the information processing unit 200, and is electrically connected thereto. The control circuit 120 comprises, for example, a gate array (gate arrays), and retains an ROM size table 121 which will be described later. The clock generating circuit 130 generates a clock signal for operating the memory card. The flash ROM 140 stores the information sent from the

information-processing unit 200 by a unit of each file. Because of its nature, the flash ROM 140 can be read and written in by a unit of data, called page, in one process. Accordingly, when the size of one file exceeds it of one page, the file is stored in plural pages. The size of the page is determined in accordance with the capacity of the flash ROM 140. In a predetermined region of the flash ROM 140, a file management system 141 and an identification number 142 of the ROM are stored. The file management system 141 stores information concerning the condition of use of the flash ROM 140. For example, the file management system 141 stores in a corresponding manner an address of the flash ROM 140 and a name of file stored in the address. The identification number 142 is a number peculiar to the flash ROM 140 mounted on each memory card. With reference to this identification number 142 and the information in the ROM size table 121, the capacity of the flash ROM 140 and a page size can be determined.

The information processing unit 200 is provided at least with a connecting terminal 210, a power source circuit 220, a main controller 230, an external storage device 240 and a disk drive 250. The main controller 230 is provided at least with a CPU 231 and a main memory 232. The power source circuit 220 supplies electric power to the information processing unit 200 and memory card 100.

A functional block of the main controller 230 will now be shown in Fig. 3.

The main controller 230 is provided at least with a memory card management unit 300 for managing the memory card, and an application execution function (which will hereinafter be referred to as "AP") 400 attained by executing an application program. The memory card management unit 300 receives a demand from the AP 400, and manages an input into and an output from the memory card 100. The AP 400 sends to the memory card management unit 300 commands for reading and writing data by a unit of file.

The memory card management unit 300 is further provided with a command generating member 301, a communication control member 302 and a file management system table 303.

The file management system table 303 is formed by loading the file management system 141 of the memory card 100 thereinto. The loading of the file management system 141 is done when the information processing unit 100 accesses the memory card 100 for the first time after the memory card 100 is inserted into the information processing unit 200. While the memory card 100 is inserted in the information-processing unit 200, the already-made file management system table 303 is utilized. When the memory card 100 is once removed and then re-inserted, the file management system table 303 is re-loaded. The file management system 141 contains information peculiar to each memory card. Therefore, accessing the flash ROM on the basis of a file management system for some other memory card may destroy the data in the flash ROM 140. The withdrawing and inserting of the memory card, for instance, can be detected by providing

a switch in the vicinity of the memory card inserting hole 260.

The command generating member 301 issues a command for obtaining information of the page size and a command for accessing the flash ROM 140. The command for accessing the flash ROM 140 is generated after receiving a command for reading and writing information by a unit of file from the AP 400.

The command for obtaining the page size is issued simultaneously with the loading of the file management system 141. The obtained information of the page size is held in the command generating member 301.

The command for accessing the flash ROM 140 includes three subcommands, namely, a subcommand for setting an address out of and in which data are read and written on the flash ROM 140, a subcommand for transmitting and receiving data to be read and written to and from the flash ROM 140, and a subcommand for executing the writing of data in the flash ROM 140, or finishing the reading of data.

In order to generate the address setting subcommand, the command generating member 301 obtains an address with reference to the file management system table 303. In order to generate the transmission and reception subcommand, the command generating member 301 generates the subcommand by a unit of file when the size of the file to be read and written do not exceed page size. When the size of the file to be read and written exceed the page size, the command generating member 301 divides the file so that the size of the data to be read and written

by one process become not larger than the page size. The command generating member 301 then generates a transmission and reception subcommand. Namely, when the size of a file to be read and written exceeds the page size, file reading and writing instructions are given in a plurally divided manner. This is based on the nature of the flash ROM 140 which can be read and written data only by a page as a unit of data.

The communication control member 302 controls the communication with the memory card 100.

A functional block diagram of the control circuit 120 will now be shown in Fig. 4.

The control circuit 120 is provided at least with a communication control member 501, a command analysis member 502, a buffer 503 and a read write control member 504. The communication control member 501 receives commands and the like from the information processing unit 200, and returns the page size of the flash ROM 140, the results of a process, and the data read out and so on. The command analysis member 502 analyzes the commands received, and outputs an address setting instruction and a read write instruction, which are to be sent to the flash ROM 140, to the read write control member 504. The command analysis member 502 further obtains the identification number 142 through the read write control member 504. The command analysis member 502 identifies the page size of the flash ROM 140 on the basis of the ROM size table 121 and outputs the page size of the flash ROM 140. The buffer 503 temporarily stores

the contents of the data to be read and written. The read write control member 504 controls the reading and writing of data out of and in the flash ROM 140.

In this embodiment, the control circuit 120 is formed of gate arrays, so that the function of the control circuits is all attained by hardware logic. This function can also be attained by software by providing the memory circuit with a microcomputer.

The operation of the memory card 100 having the above-described construction and information-processing unit 200 will now be described.

Fig. 5 shows the procedure for generating and analyzing of commands. First, as preprocessing for generating commands, the command generating member 301 loads the file management system 141 and obtains the page size from the memory card 100 with which the communication control member 302 communicates (S201). In this condition, the memory card management unit 300 becomes able to receive commands from the AP 400. The command generating member 301 then becomes on standby for receiving a command from the AP 400 (S202).

When the AP 400 issues a command for reading or writing data with respect to the memory card 100, the command generating member 301 receives the command. The command generating member 301 ascertains whether the memory card 100 has been replaced or not. When the memory card is replaced, the communication control member 302 re-loads the file management system and

re-obtains the page size (S203 and S204).

The command generating member 301 obtains an address to be accessed of the flash ROM 140 with reference to the file management system table 303. The command generating member 301 generates an address setting subcommand. The generated address setting subcommand is sent to the memory card 100 through the communication control member 302 (S205). In the memory card 100, the communication control member 501 receives the command. The command analysis member 502 sets the address of the flash ROM 140 (S101).

When the size of the data to be read and written is larger than the page size, the command generating member 301 determines the size of the data processed by one access, in such a manner that the size of the date become not larger than the page size (S207).

The command generating member 301 generates a transmission and reception subcommand to be transmitted to the memory card 100, and transmits a transmission and reception command thereto through the communication control member 302(S208). The memory card 100 receives the transmission and reception subcommand. The command analysis member 502 executes the accumulation of data on the buffer 503 or the reading of data out of the flash ROM 140 on the basis of the content of the command (S102). When data to be read and written still remain, the steps S206-S208 are repeated (S209).

When the data to be read and written run out, the subcommand

generating member 301 generates an execution subcommand, and transmits (S210) the execution command.

In the memory card, the following processing operations are carried out respectively in accordance with the execution subcommand.

In order to write data, the data stored in the buffer 503 are written into the flash ROM 140 in accordance with the execution subcommand. As a result, the content of the flash ROM 140 is updated. In order to read data, the reading out data from the flash ROM 140 is finished. Namely, a series of processing operations including reading and writing operations are completed in accordance with the execution subcommand.

According to this embodiment described above, it is possible to access the flash ROM reliably even when the page size of the flash ROM mounted on the memory card is different.

According to the present invention, it is possible to provide an information-processing unit capable of controlling reading and writing operations even when the capacity of a portable storage device is changed, a portable storage device controlled by the information processing unit, and an entertainment apparatus.

CLAIMS

1. An entertainment apparatus comprising a portable storage device, and an information processing unit to which said portable storage device is detachably connected,

said portable storage device being provided with:

a storage member in which a size of a page out of and in which data can be read and written by one processing operation are pre-determined, and

a holding member for holding information capable of identifying the page size,

said information processing unit being provided with:

a control member for controlling the reading and writing said storage member on the basis of the information held in said holding member.

2. An information processing unit detachably connected to a portable storage device,

said portable storage device being provided with:

a storage member in which a size of a page out of and in which data can be read and written by one processing operation are pre-determined, and

a holding member for holding information capable of identifying the page size,

comprising;

a control member for controlling the reading and writing said storage member on the basis of the information held in said

holding member.

3. An information processing unit detachably connected to a portable storage device,

said portable storage device being provided with:

a storage member in which a size of a page out of and in which data can be read and written by one processing operation are pre-determined, and

a holding member for holding information capable of identifying the page size,

comprising;

a means for obtaining from the portable storage device the information-indicating page size to be identified, by page size-identifiable information, and

a means for giving instructions to carry out read write operations to the storage member,

wherein;

said instruction-giving means gives instructions to said storage member to read and write the whole data, when the size of said whole data to be read and written are not larger than the page size determined by the page size indicating information obtained by said obtaining means.

4. The information processing unit according to Claim 3, wherein:

said instruction-giving means divides said whole data to

be read and written, when the size of said whole data exceeds said page size determined by said page size indicating information, into size not exceeding said page size, and gives instructions to said storage member to carry out read or write operations by each divided data.

5. A portable storage device connected detachably to an information processing unit, comprising:

a storage member in which a size of a page out of and in which data can be read and written by one processing operation are pre-determined, and

a holding member for holding information capable of identifying the page size; and

an instruction executing member for receiving instructions from said information processing unit and executing the instructions,

wherein;

said instruction executing member outputs the page size-identifiable information with reference to said holding member when said instruction executing member receives a page size inquiring instructions, and

executes inputs and outputs information into and from said storage member when said instruction executing member receives input-output instructions for said storage member.

6. The portable storage device according to Claim 5, wherein:

said page size identifiable information is information for identifying said storage member, and page size information prepared to correspond said identifying information to said page size,

said instruction executing member determines said page size on the basis of the identifying information and said page size information.

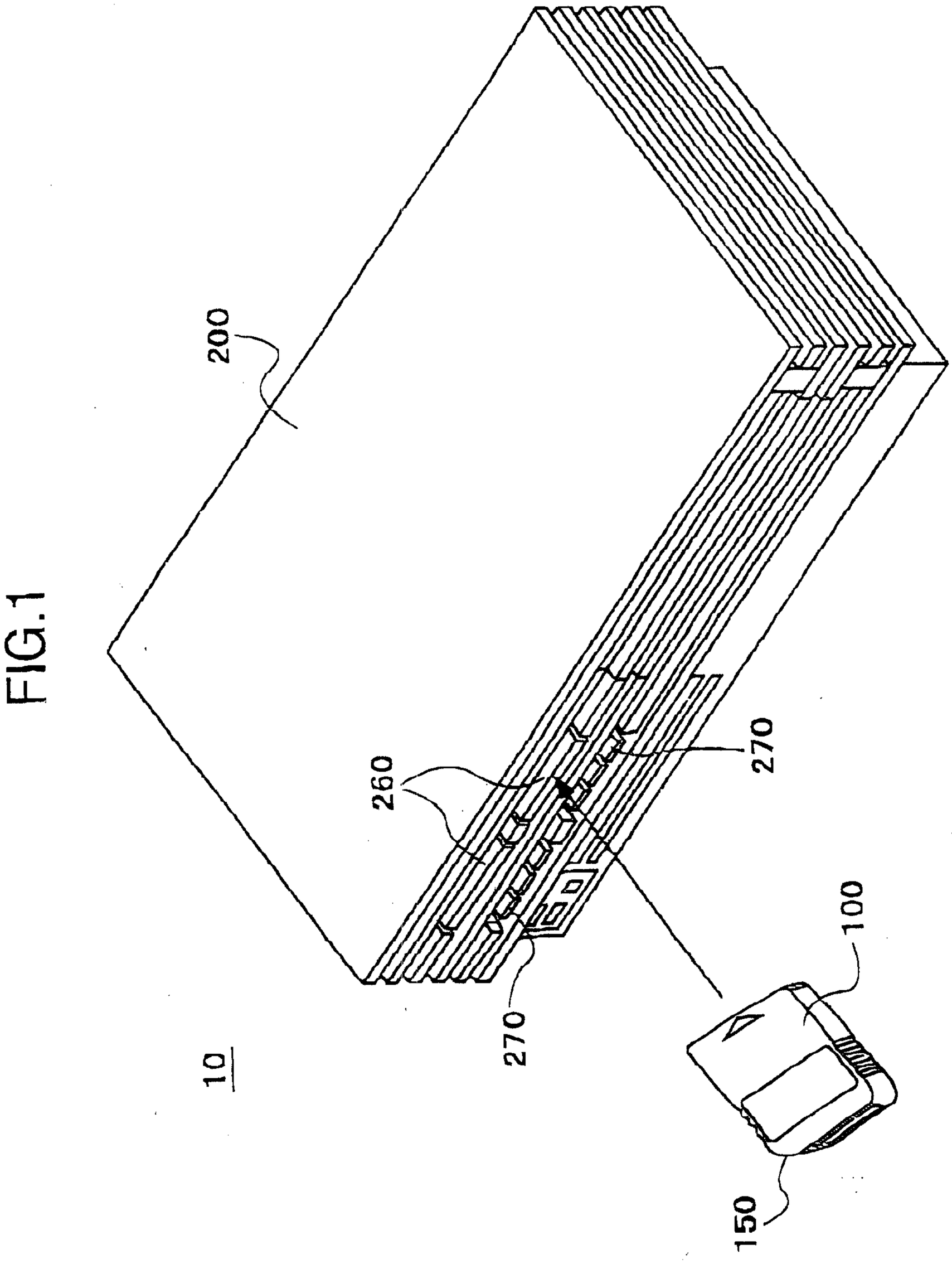


FIG.1

FIG.2

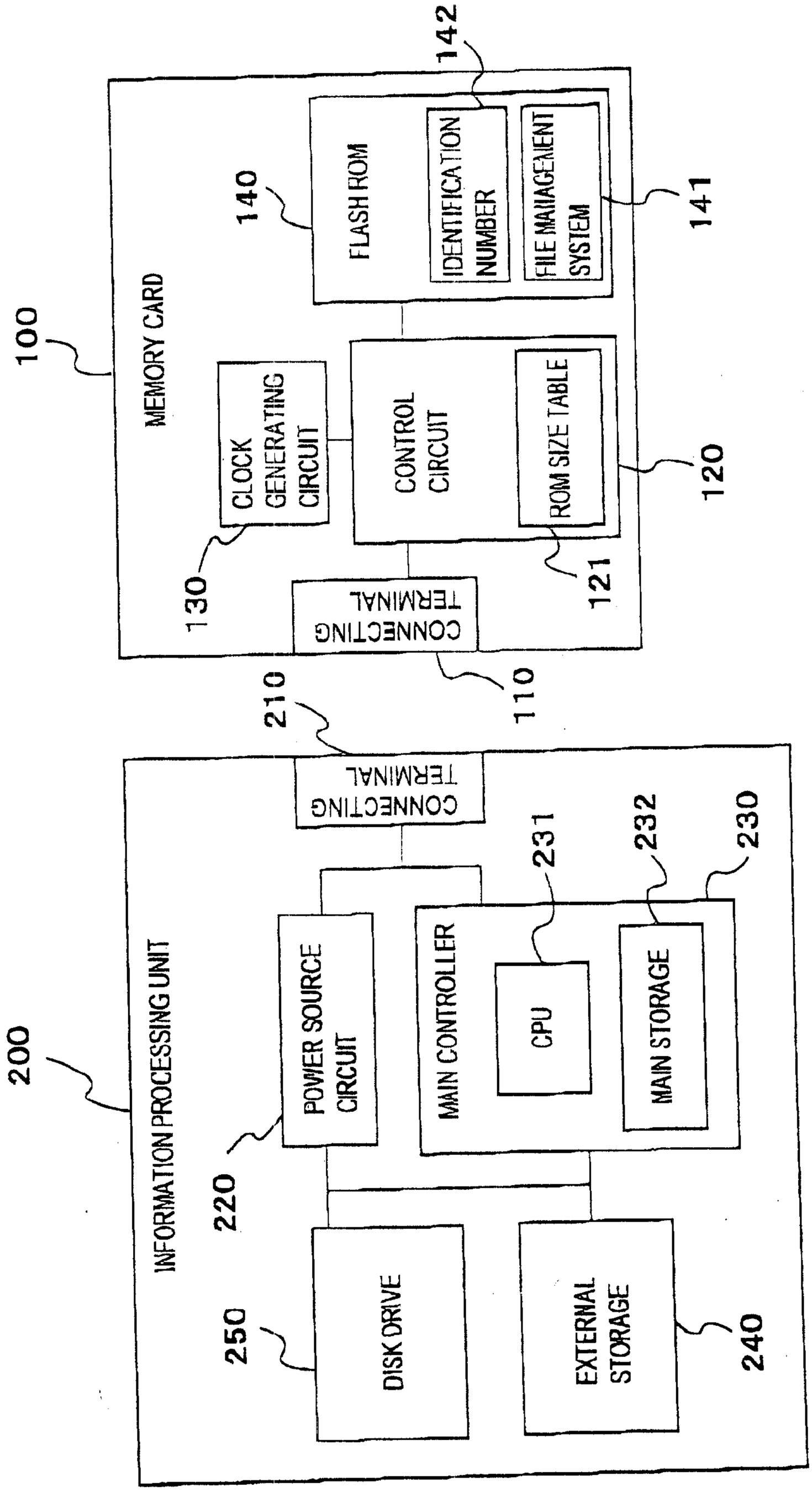

100
MEMORY CARD
140
FLASH ROM
142
IDENTIFICATION NUMBER
FILE MANAGEMENT SYSTEM
141
CLOCK GENERATING CIRCUIT
130
CONTROL CIRCUIT
ROM SIZE TABLE
120
121
CONNECTING TERMINAL
110
210
CONNECTING TERMINAL
200
INFORMATION PROCESSING UNIT
POWER SOURCE CIRCUIT
220
MAIN CONTROLLER
231
CPU
232
MAIN STORAGE
230
250
DISK DRIVE
EXTERNAL STORAGE
240

FIG.3

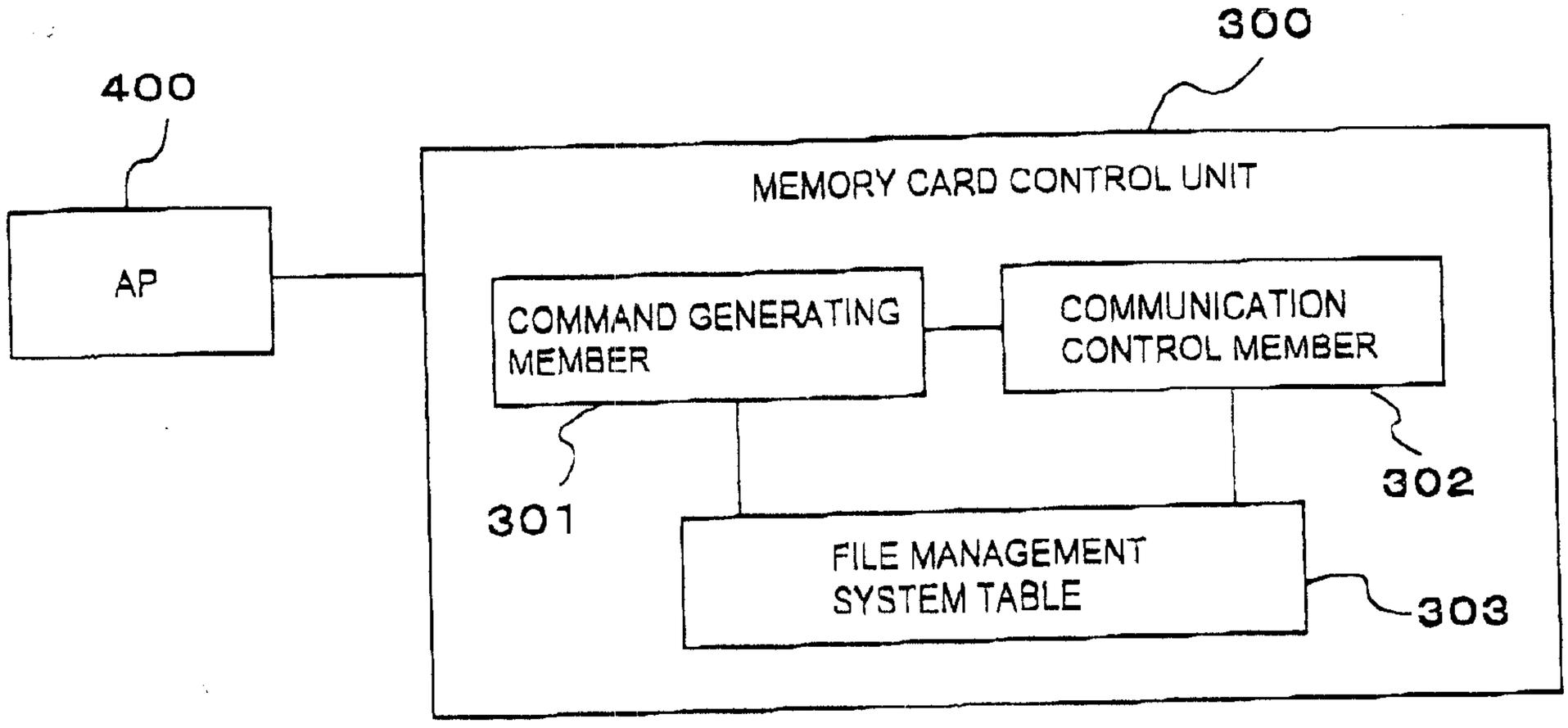

400
AP
300
MEMORY CARD CONTROL UNIT
COMMAND GENERATING MEMBER
COMMUNICATION CONTROL MEMBER
301
302
FILE MANAGEMENT SYSTEM TABLE
303

FIG.4

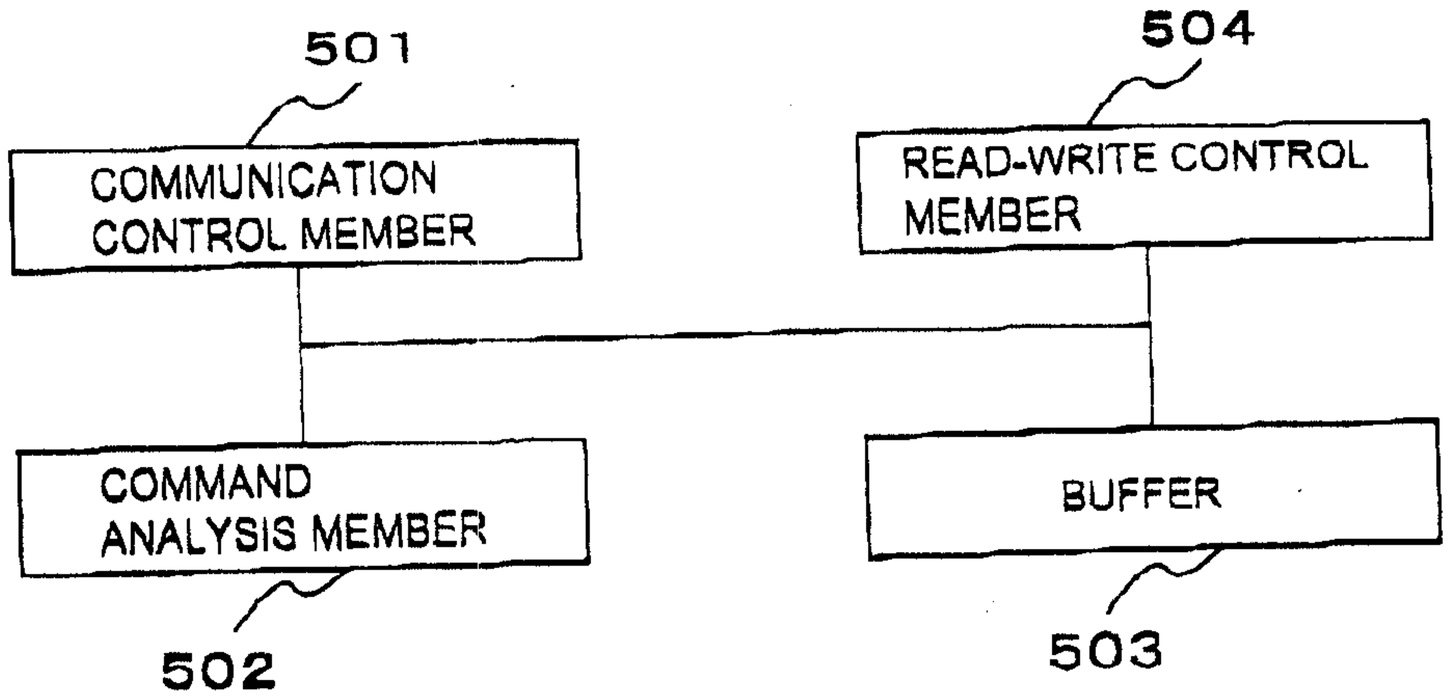
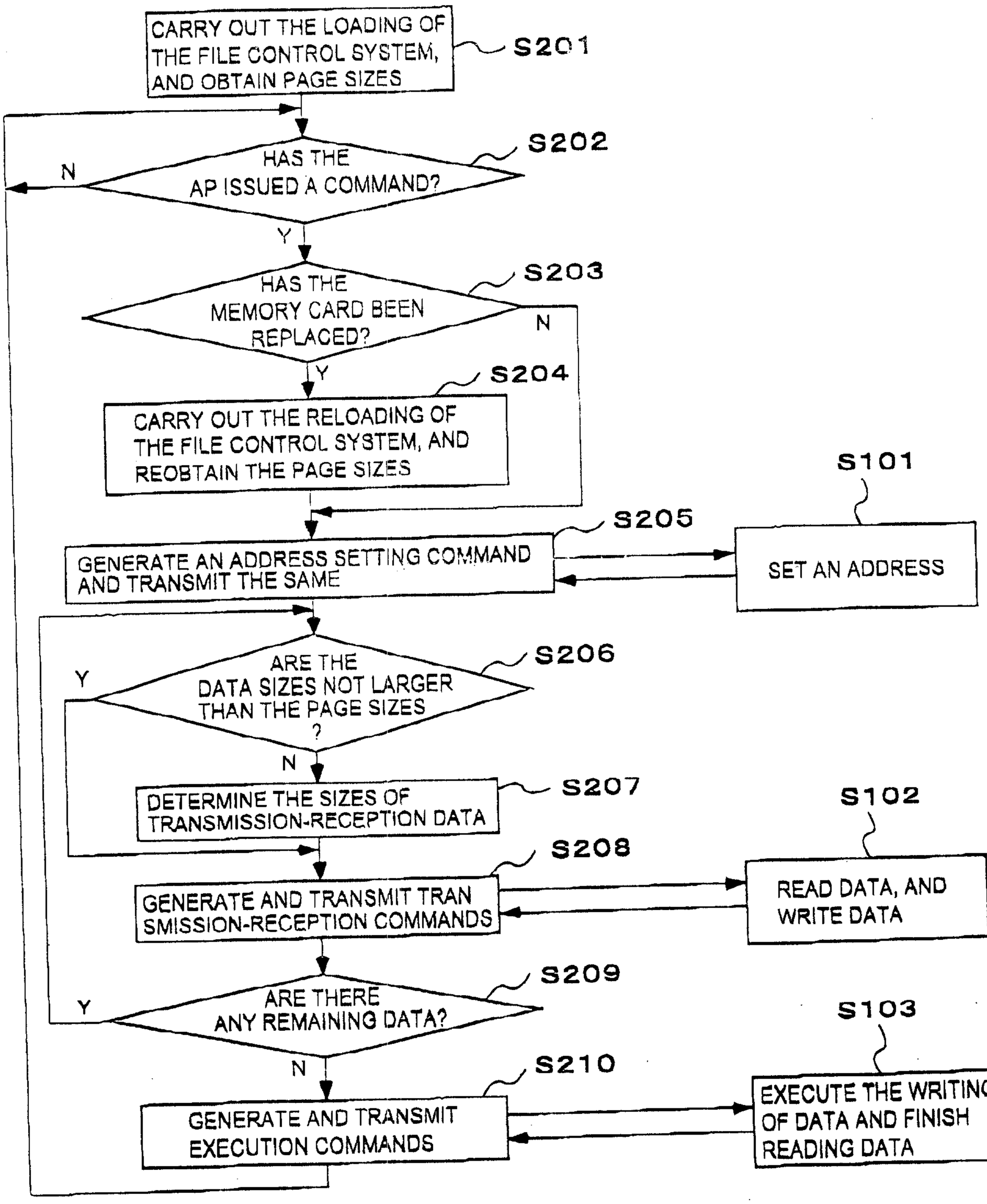
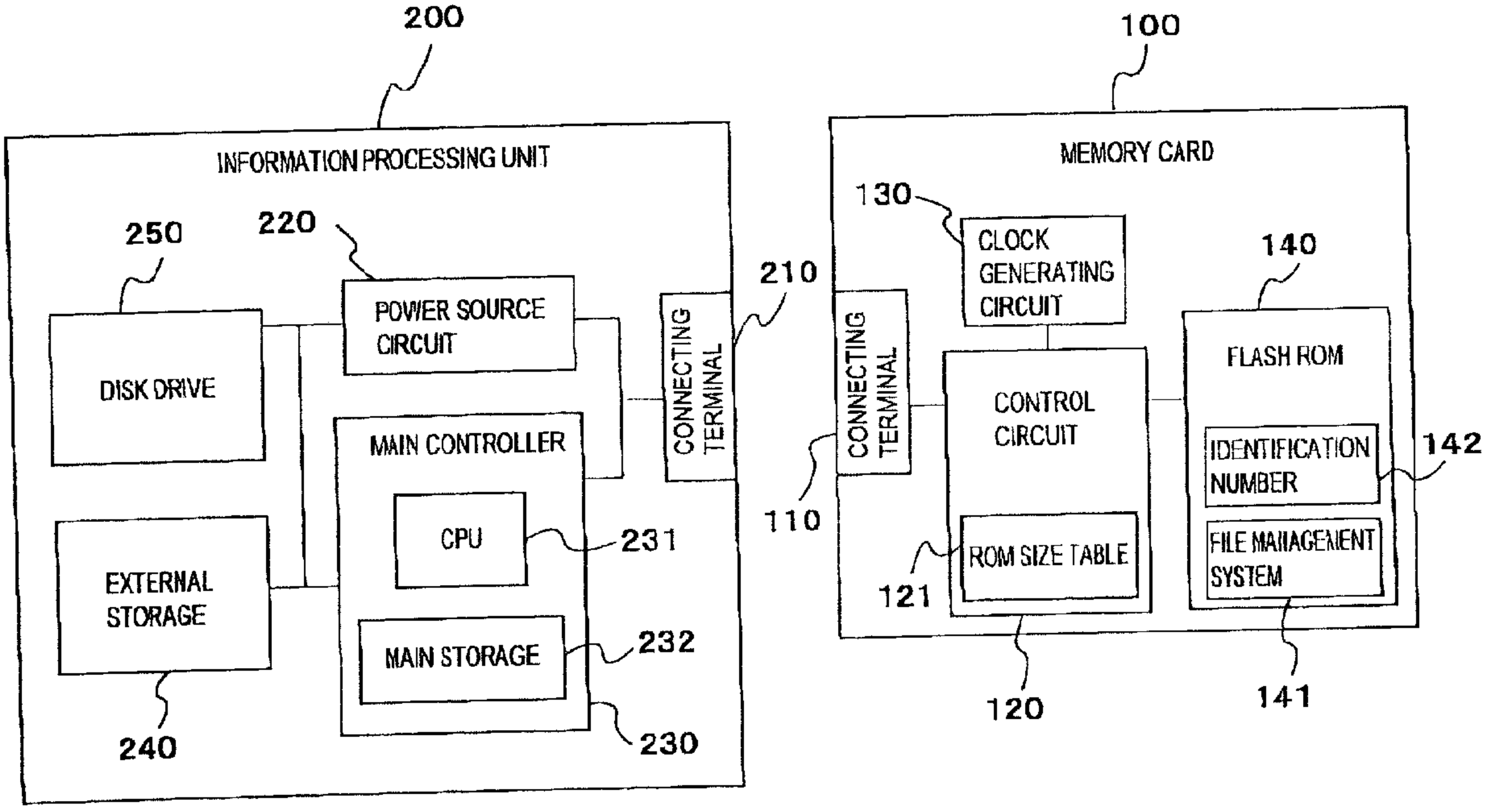

501
COMMUNICATION CONTROL MEMBER
504
READ-WRITE CONTROL MEMBER
COMMAND ANALYSIS MEMBER
BUFFER
502
503

FIG.5


INFORMATION PROCESSING UNIT 200
MEMORY CARD 100
CARRY OUT THE LOADING OF THE FILE CONTROL SYSTEM, AND OBTAIN PAGE SIZES
S201
HAS THE AP ISSUED A COMMAND?
S202
N
Y
HAS THE MEMORY CARD BEEN REPLACED?
S203
N
Y
CARRY OUT THE RELOADING OF THE FILE CONTROL SYSTEM, AND REOBTAIN THE PAGE SIZES
S204
S101
GENERATE AN ADDRESS SETTING COMMAND AND TRANSMIT THE SAME
S205
SET AN ADDRESS
ARE THE DATA SIZES NOT LARGER THAN THE PAGE SIZES ?
S206
Y
N
DETERMINE THE SIZES OF TRANSMISSION-RECEPTION DATA
S207
S102
GENERATE AND TRANSMIT TRAN SMISSION-RECEPTION COMMANDS
S208
READ DATA, AND WRITE DATA
ARE THERE ANY REMAINING DATA?
S209
Y
N
S103
GENERATE AND TRANSMIT EXECUTION COMMANDS
S210
EXECUTE THE WRITING OF DATA AND FINISH READING DATA


200
INFORMATION PROCESSING UNIT
250
220
DISK DRIVE
POWER SOURCE CIRCUIT
210
CONNECTING TERMINAL
MAIN CONTROLLER
CPU
231
EXTERNAL STORAGE
MAIN STORAGE
232
240
230
100
MEMORY CARD
130
CLOCK GENERATING CIRCUIT
140
CONNECTING TERMINAL
CONTROL CIRCUIT
FLASH ROM
IDENTIFICATION NUMBER
142
110
ROM SIZE TABLE
FILE MANAGEMENT SYSTEM
121
120
141