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(12) **United States Patent**
Ohno

(10) **Patent No.: US 9,270,843 B2**
(45) **Date of Patent: Feb. 23, 2016**

(54) **INFORMATION PROCESSING DEVICE, METHOD, AND PROGRAM**

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(22) Filed: **Dec. 8, 2004**

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Nov. 30, 2004 (JP) 2004-346344

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G06K 15/00 (2006.01)
G06F 3/12 (2006.01)
H04N 1/00 (2006.01)

(52) **U.S. Cl.**
CPC ***H04N 1/00204*** (2013.01); ***H04N 1/00885*** (2013.01); ***H04N 1/00891*** (2013.01); ***H04N 1/00904*** (2013.01); *H04N 2201/0039* (2013.01); *H04N 2201/0074* (2013.01)

(58) **Field of Classification Search**
USPC 358/1.16, 1.15, 1.13, 1.9, 403, 497
See application file for complete search history.

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(57) **ABSTRACT**

An information processing device which can communicate over a network with a print control apparatus for activating a second interface unit when a print job is applied to a printer in a power-saving status which is to be activated by a specific packet, and when an first activation instruction including identification information specifying a print control apparatus to be activated is received through a first interface unit includes: first instruction control means for transmitting a first activation instruction to the print control apparatus when a print instruction is issued; and output control means for outputting a print job to the print control apparatus after establishing a communication facility of the second interface unit after transmitting the first activation instruction.

24 Claims, 22 Drawing Sheets

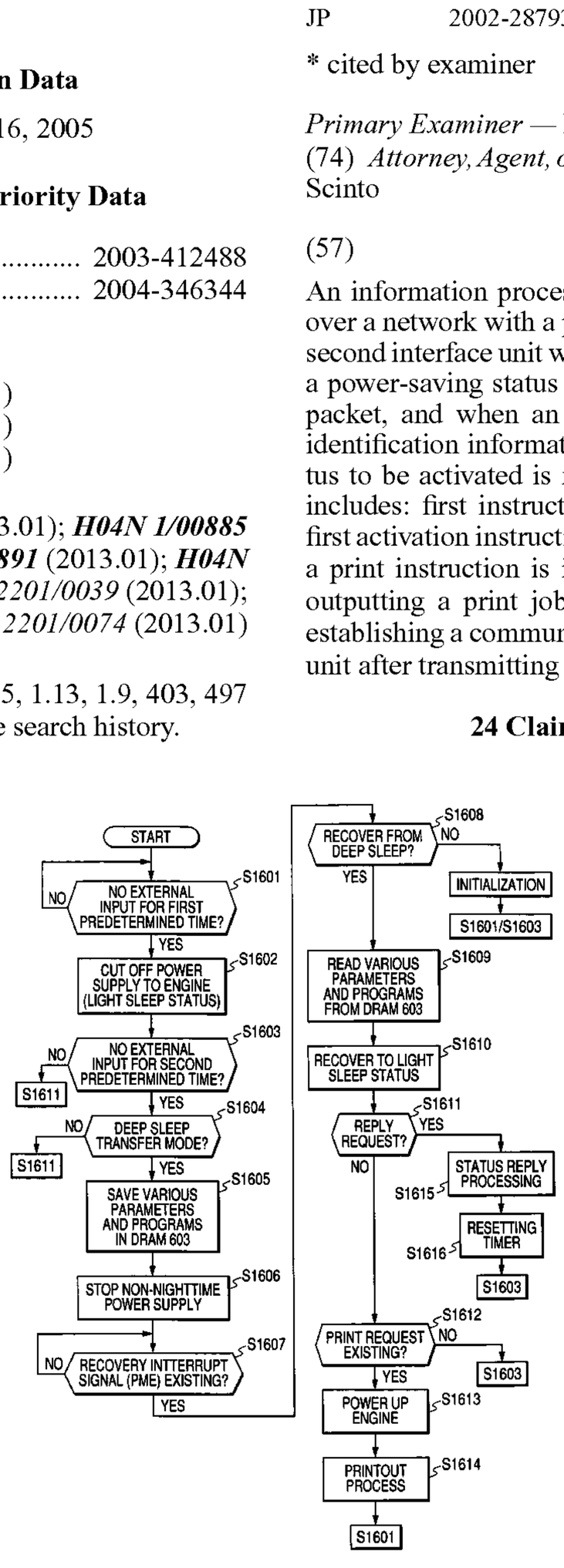


FIG. 1

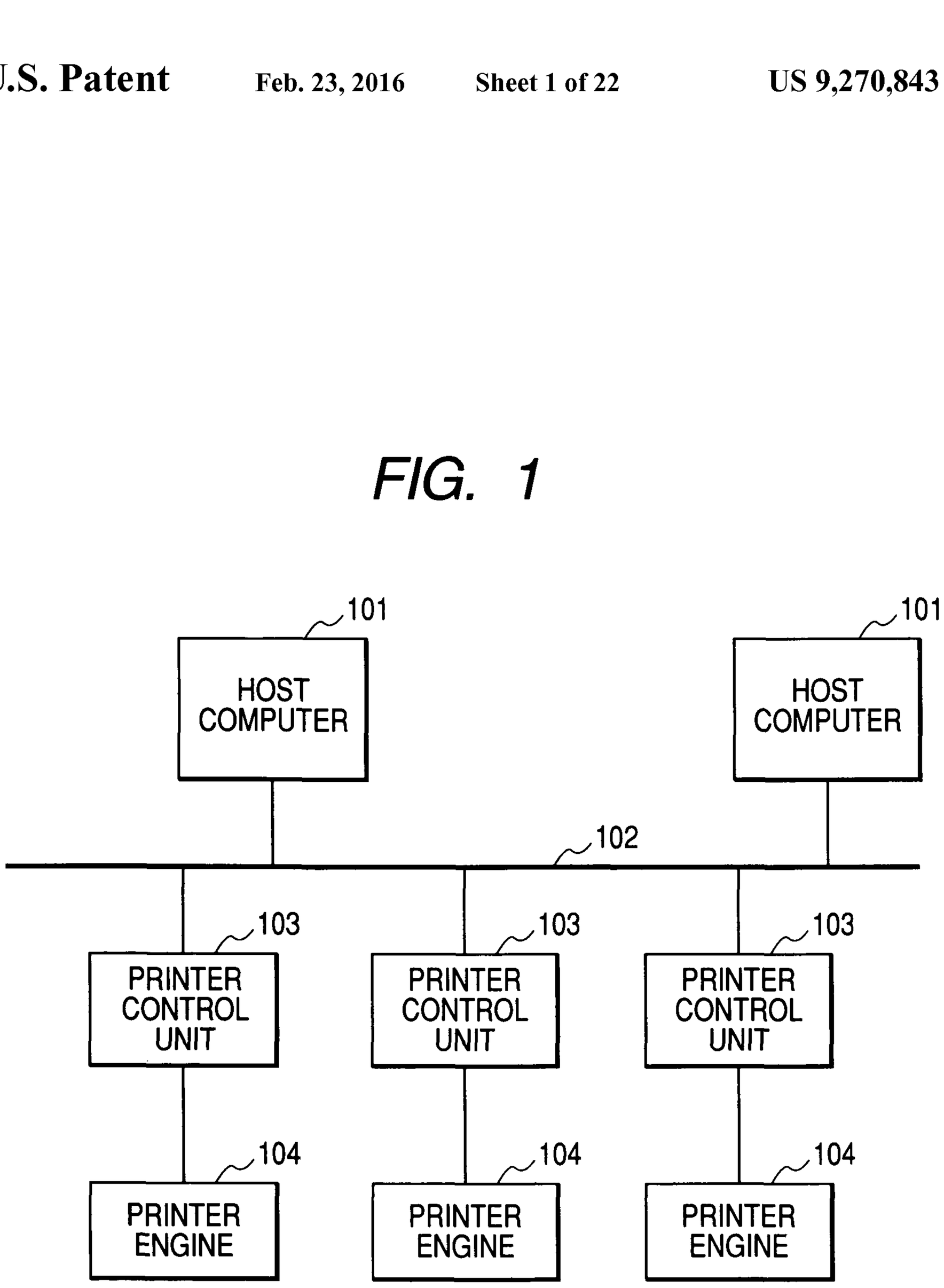

101
HOST COMPUTER
101
HOST COMPUTER
102
103
PRINTER CONTROL UNIT
103
PRINTER CONTROL UNIT
103
PRINTER CONTROL UNIT
104
PRINTER ENGINE
104
PRINTER ENGINE
104
PRINTER ENGINE

FIG. 2

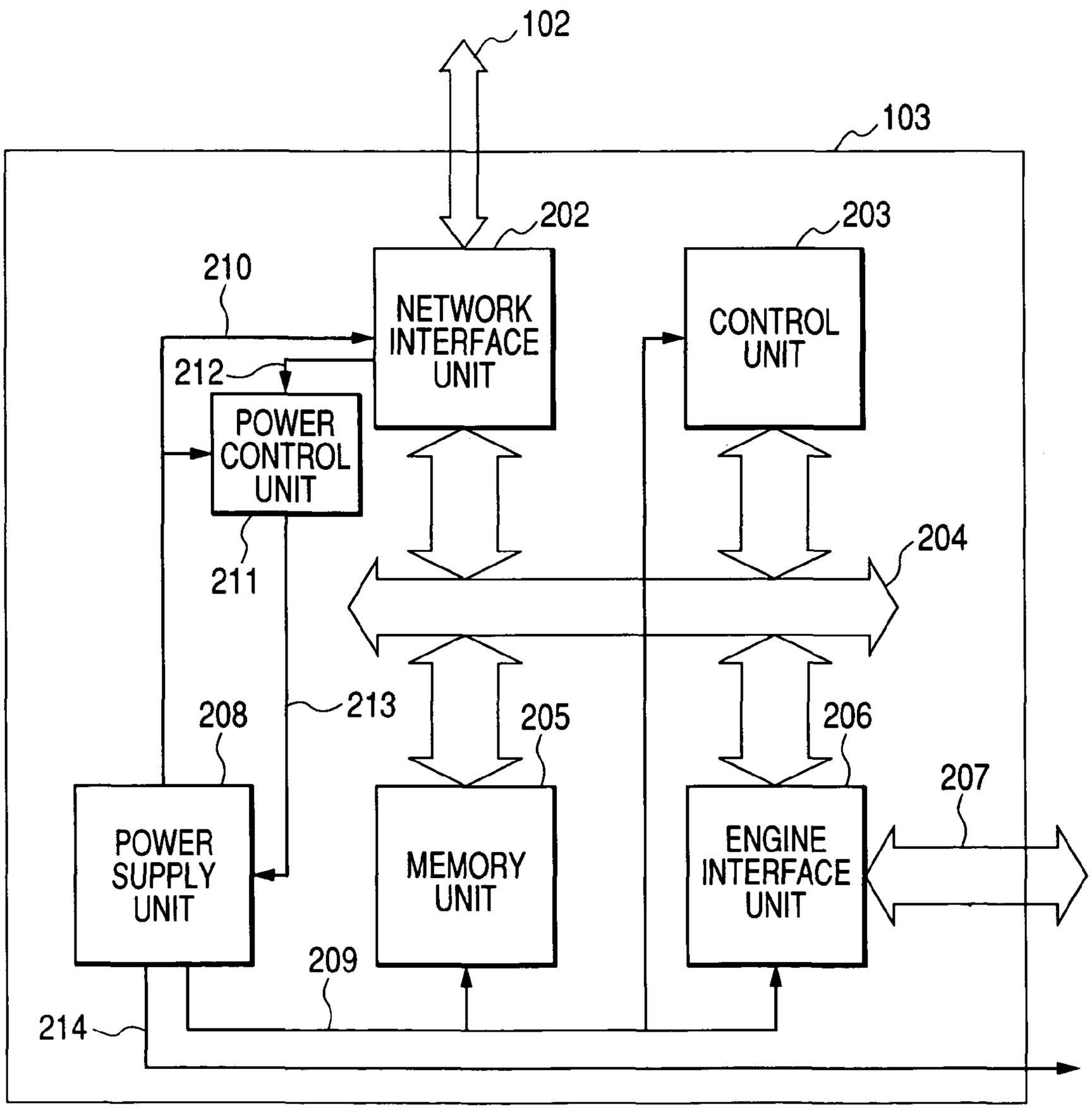

102
103
202
203
210
NETWORK INTERFACE UNIT
CONTROL UNIT
212
POWER CONTROL UNIT
211
204
208
213
205
206
207
POWER SUPPLY UNIT
MEMORY UNIT
ENGINE INTERFACE UNIT
209
214

FIG. 3

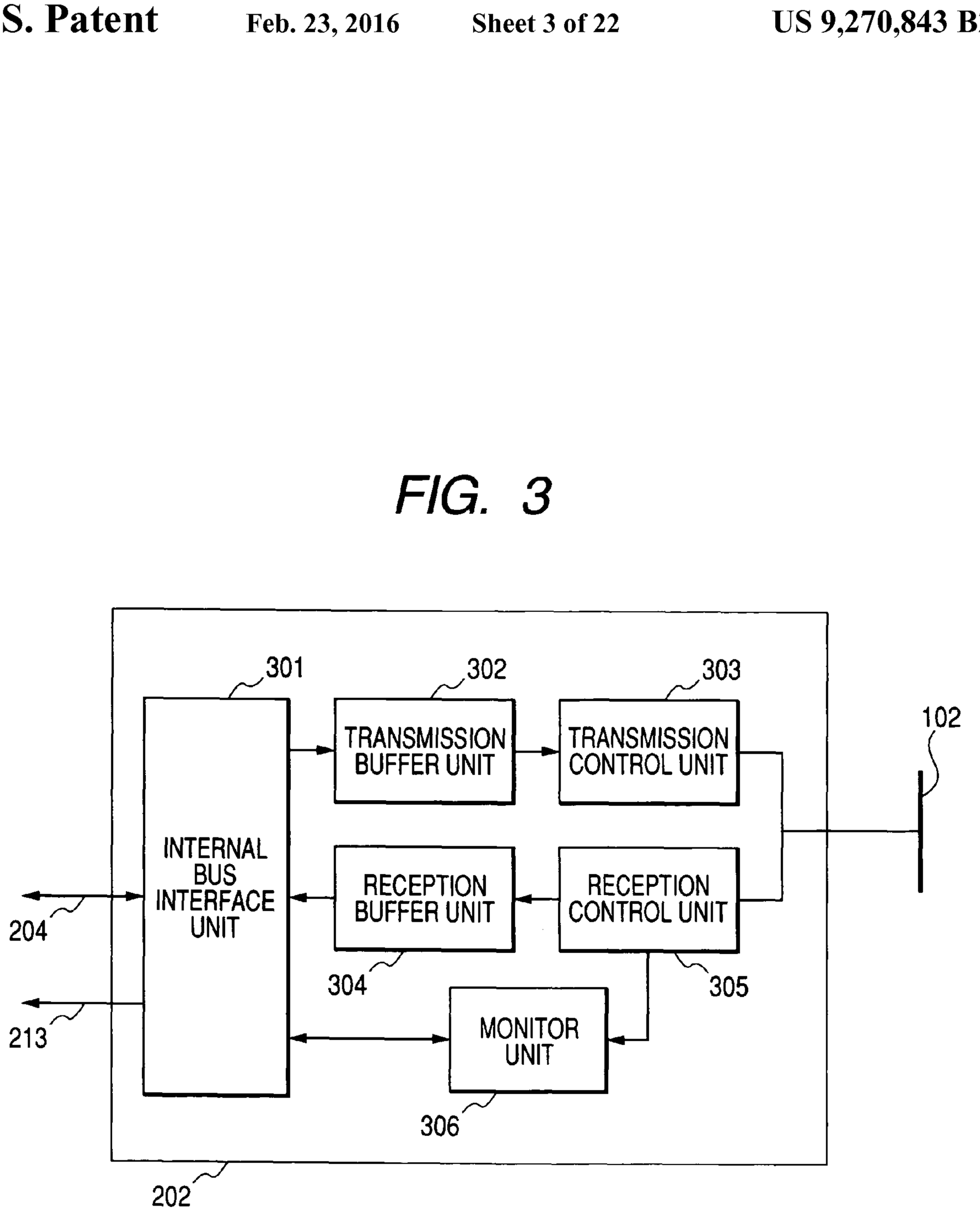

301
302
303
102
TRANSMISSION BUFFER UNIT
TRANSMISSION CONTROL UNIT
INTERNAL BUS INTERFACE UNIT
RECEPTION BUFFER UNIT
RECEPTION CONTROL UNIT
204
213
304
305
MONITOR UNIT
306
202

FIG. 4

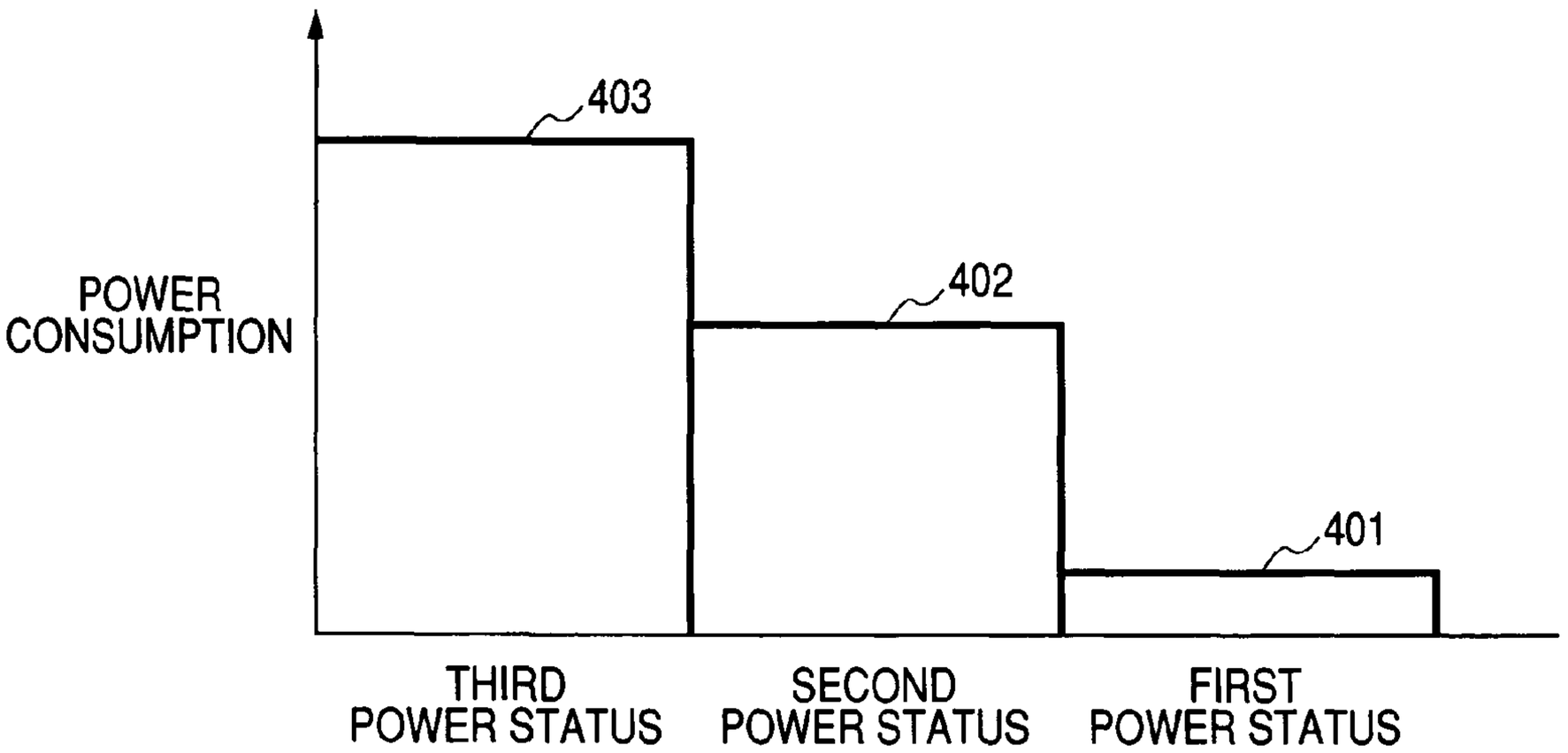

403
402
401
POWER CONSUMPTION
THIRD POWER STATUS
SECOND POWER STATUS
FIRST POWER STATUS

FIG. 5

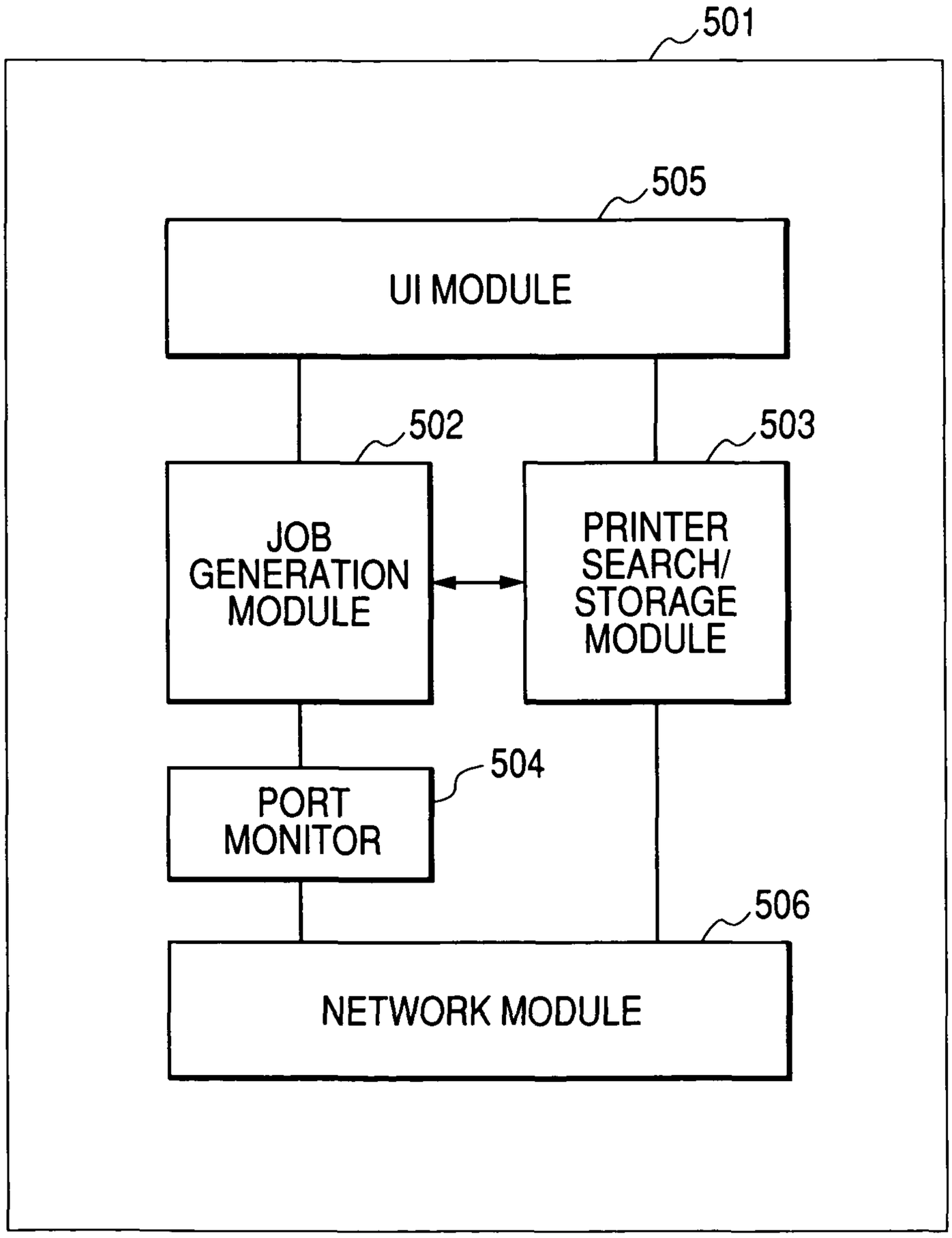

501
505
UI MODULE
502
503
JOB GENERATION MODULE
PRINTER SEARCH/ STORAGE MODULE
504
PORT MONITOR
506
NETWORK MODULE

FIG. 6

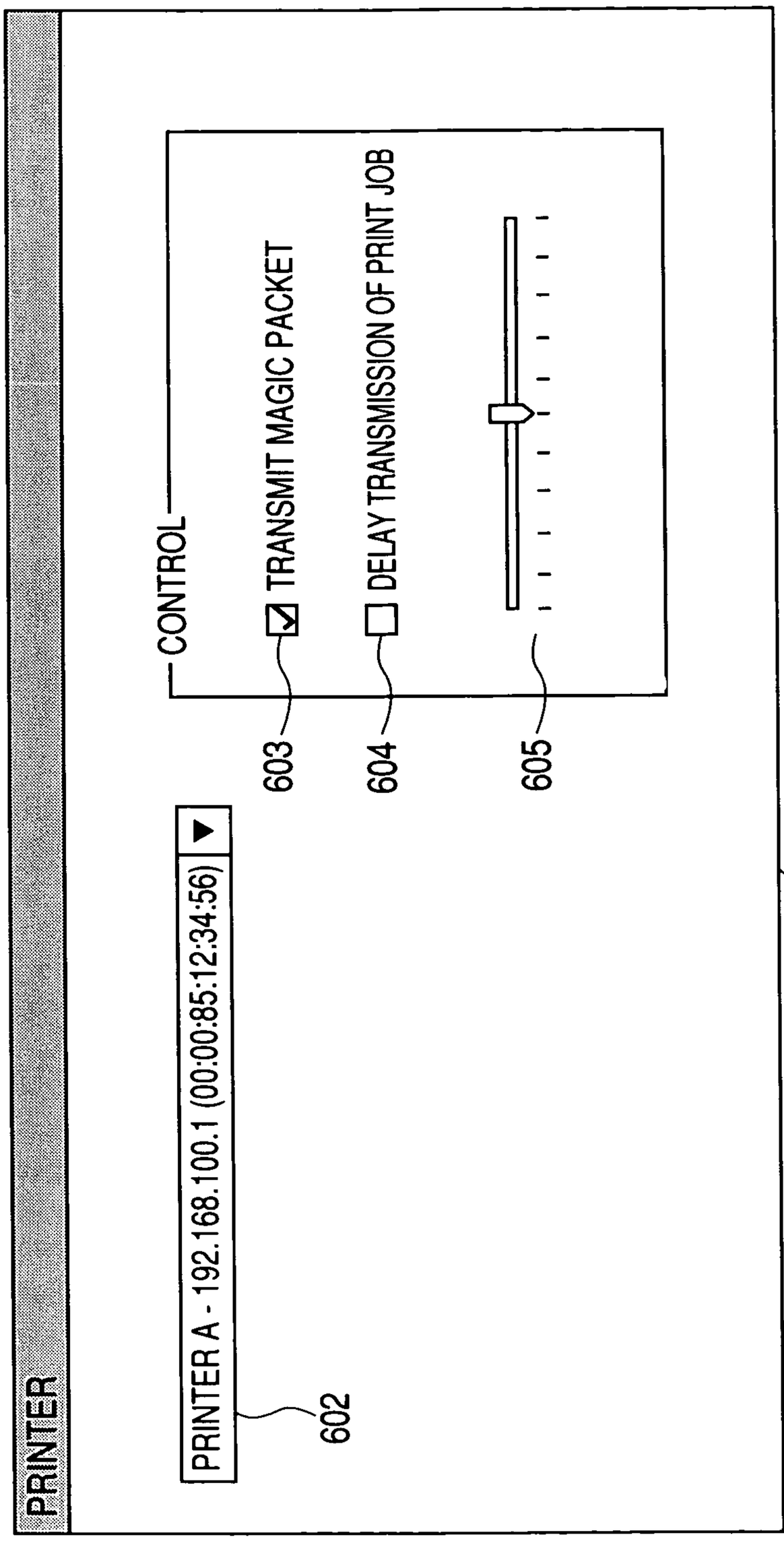

PRINTER
PRINTER A - 192.168.100.1 (00:00:85:12:34:56)
602
CONTROL
TRANSMIT MAGIC PACKET
DELAY TRANSMISSION OF PRINT JOB
603
604
605
601

FIG. 7

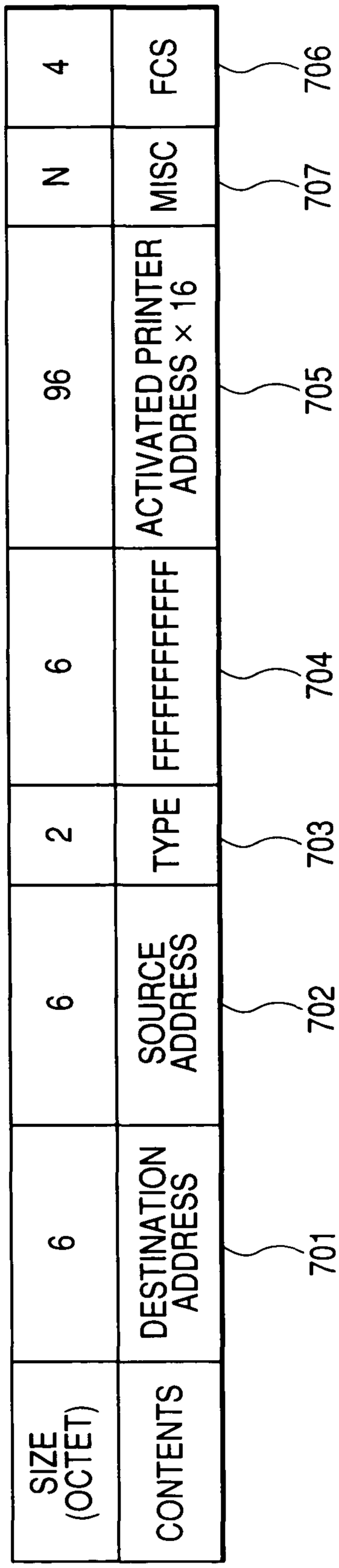

SIZE (OCTET)
CONTENTS
6
DESTINATION ADDRESS
701
6
SOURCE ADDRESS
702
2
TYPE
703
6
FFFFFFFFFFFF
704
96
ACTIVATED PRINTER ADDRESS × 16
705
4
FCS
706
N
MISC
707

FIG. 8

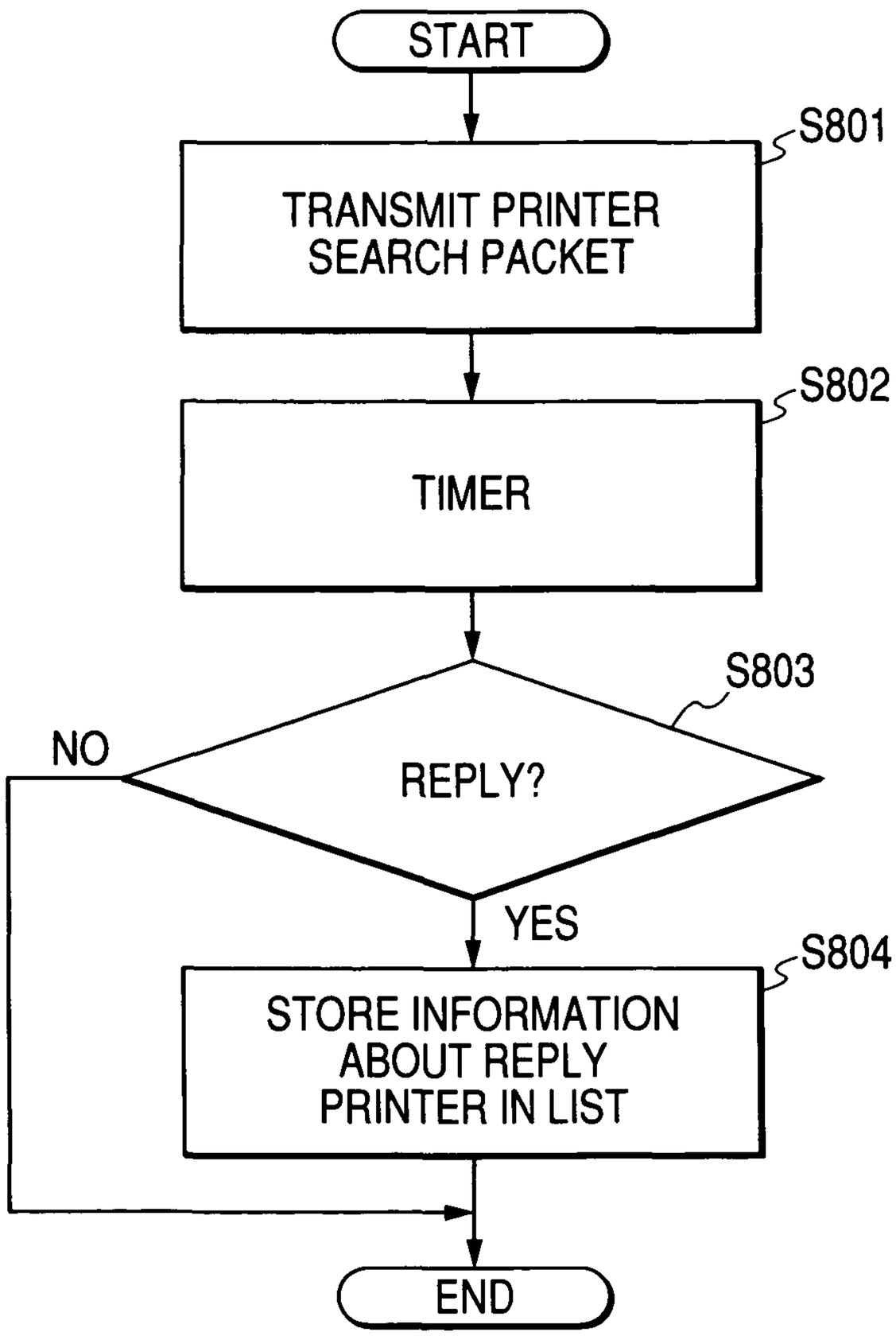

START
S801
TRANSMIT PRINTER SEARCH PACKET
S802
TIMER
S803
REPLY?
NO
YES
S804
STORE INFORMATION ABOUT REPLY PRINTER IN LIST
END

FIG. 9

SEARCH REPLY FLOW

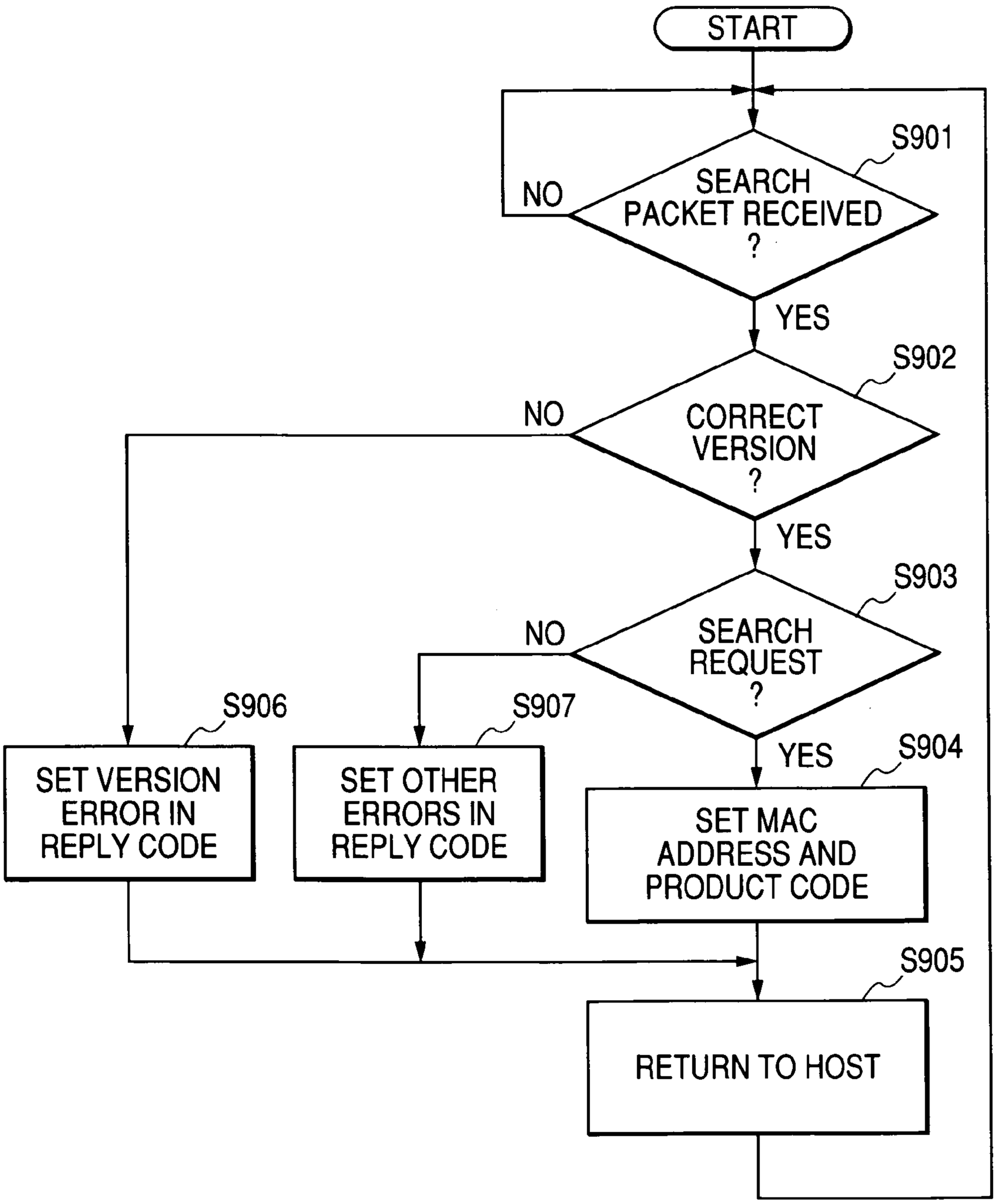


FIG. 10

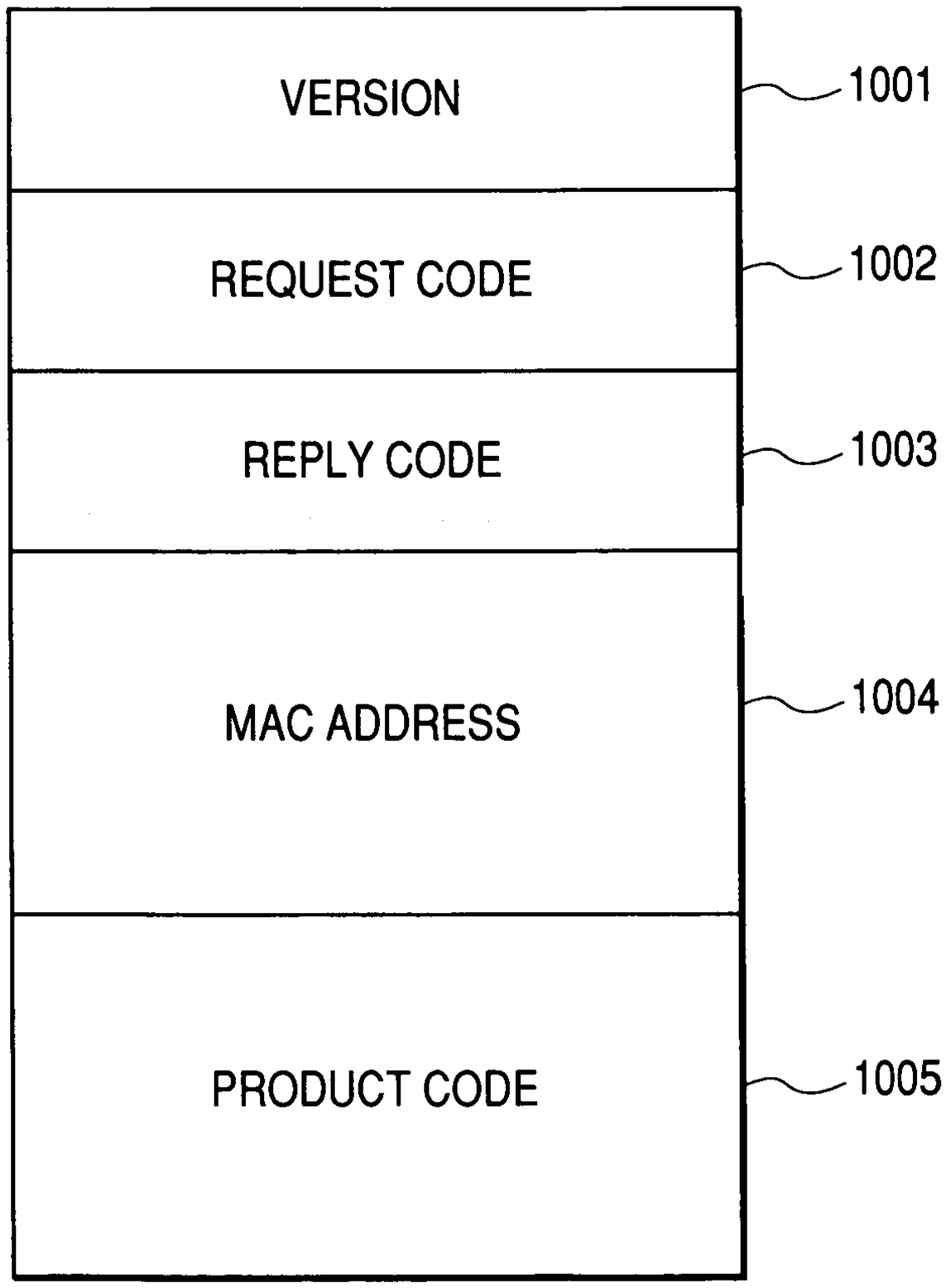

VERSION
1001
REQUEST CODE
1002
REPLY CODE
1003
MAC ADDRESS
1004
PRODUCT CODE
1005

FIG. 11

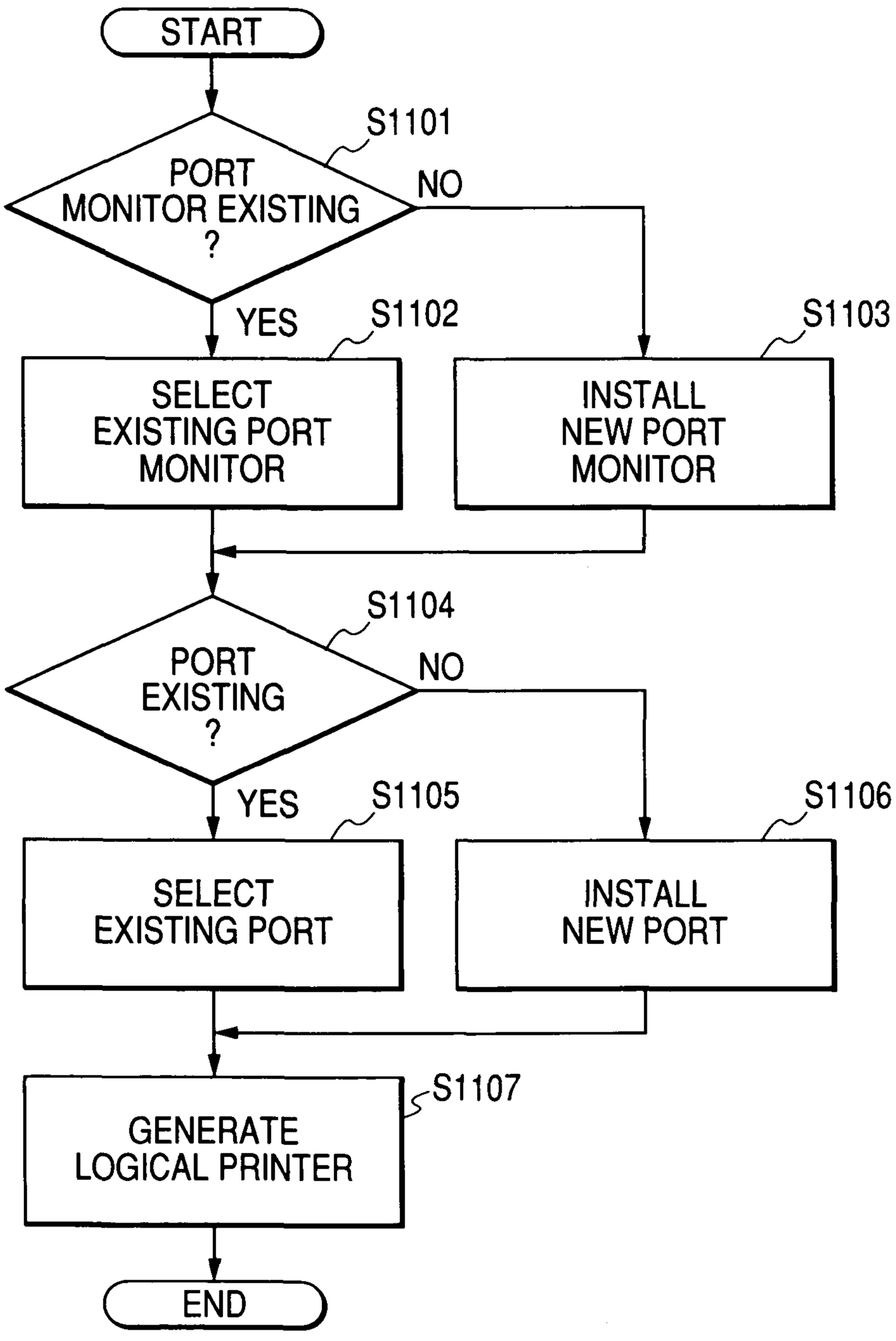

START
S1101
PORT MONITOR EXISTING ?
NO
YES
S1102
SELECT EXISTING PORT MONITOR
S1103
INSTALL NEW PORT MONITOR
S1104
PORT EXISTING ?
NO
YES
S1105
SELECT EXISTING PORT
S1106
INSTALL NEW PORT
S1107
GENERATE LOGICAL PRINTER
END

FIG. 12

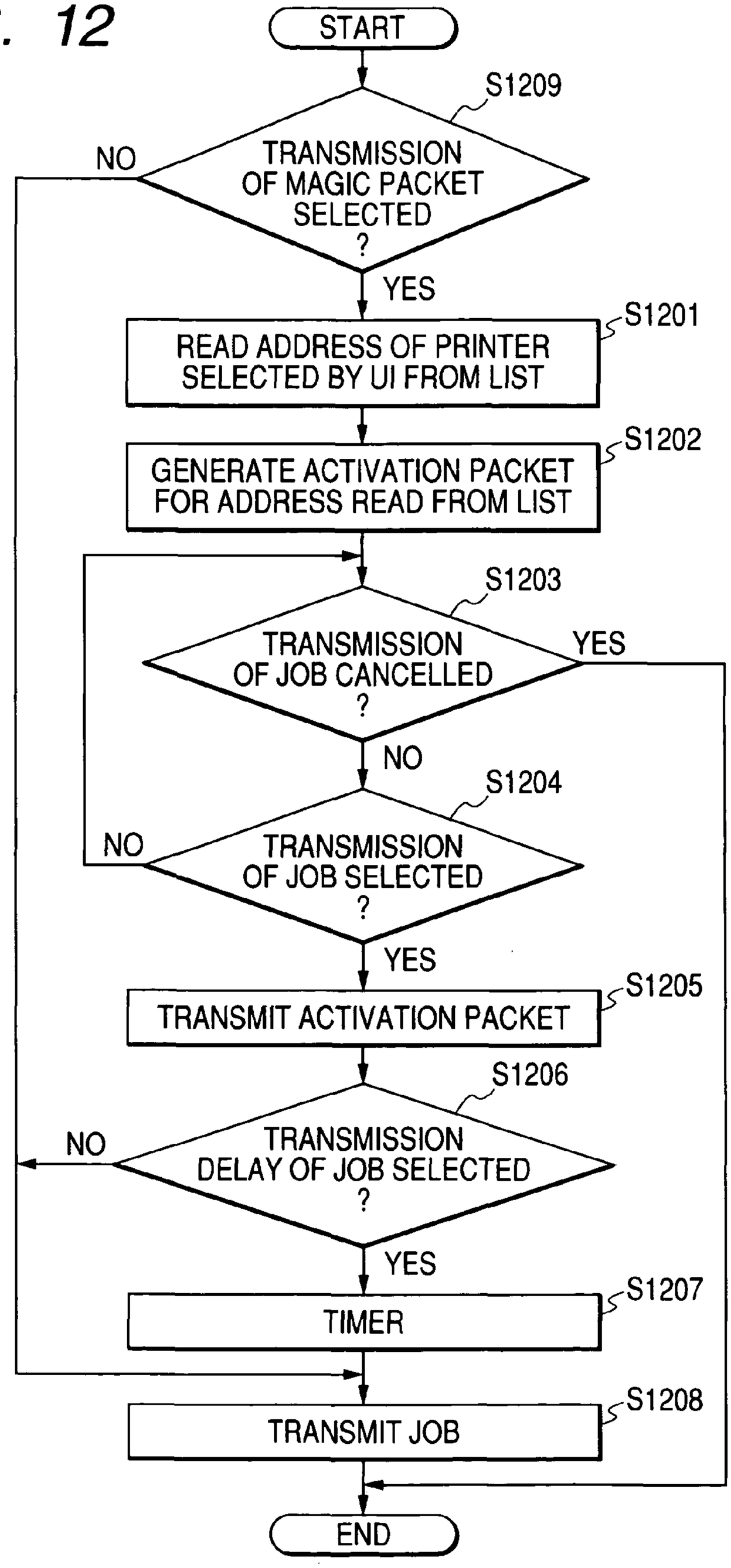

START
S1209
TRANSMISSION OF MAGIC PACKET SELECTED ?
NO
YES
S1201
READ ADDRESS OF PRINTER SELECTED BY UI FROM LIST
S1202
GENERATE ACTIVATION PACKET FOR ADDRESS READ FROM LIST
S1203
TRANSMISSION OF JOB CANCELLED ?
YES
NO
S1204
TRANSMISSION OF JOB SELECTED ?
NO
YES
S1205
TRANSMIT ACTIVATION PACKET
S1206
TRANSMISSION DELAY OF JOB SELECTED ?
NO
YES
S1207
TIMER
S1208
TRANSMIT JOB
END

FIG. 13

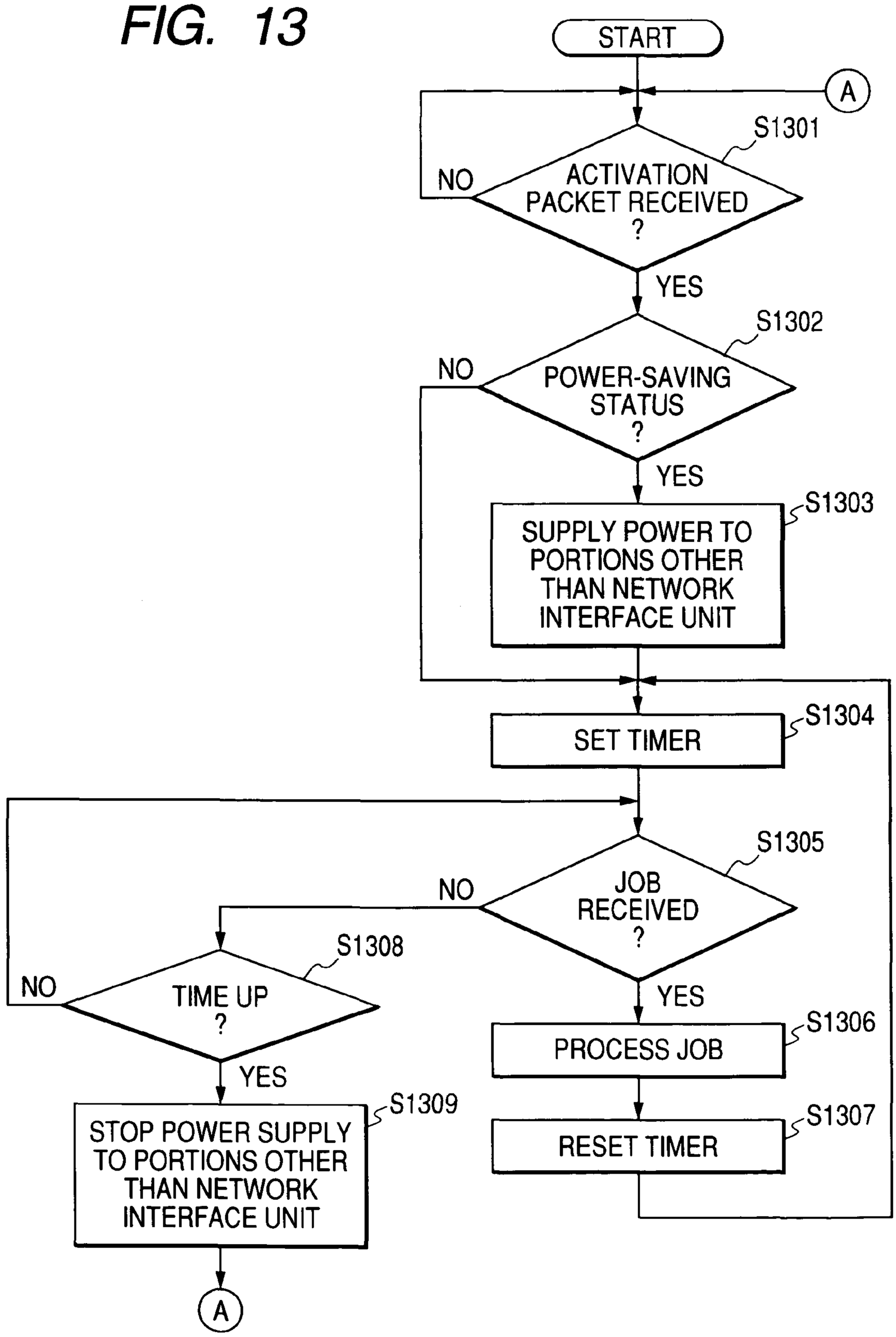
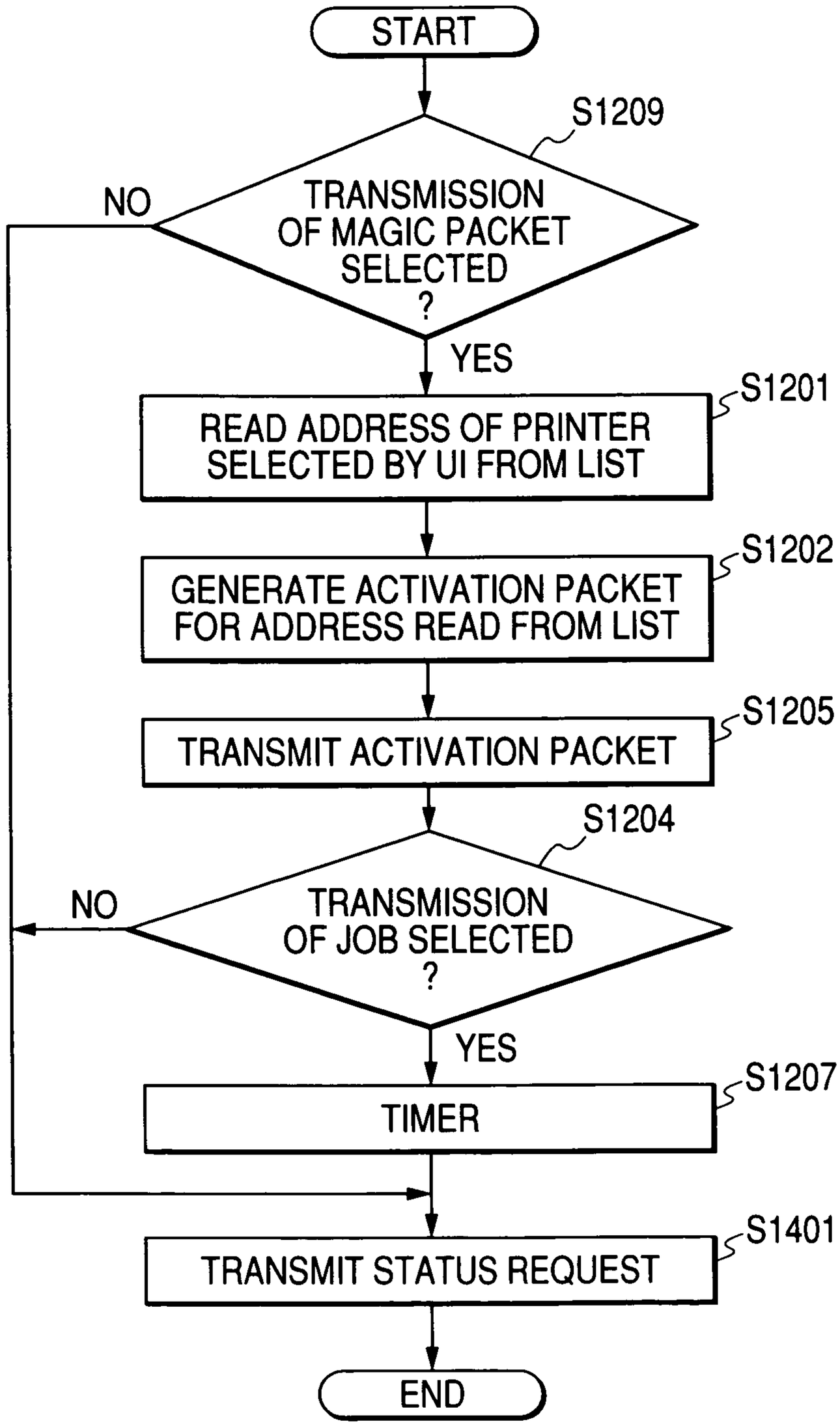

START
A
S1301
ACTIVATION PACKET RECEIVED ?
NO
YES
S1302
POWER-SAVING STATUS ?
NO
YES
S1303
SUPPLY POWER TO PORTIONS OTHER THAN NETWORK INTERFACE UNIT
S1304
SET TIMER
S1305
JOB RECEIVED ?
NO
YES
S1306
PROCESS JOB
S1307
RESET TIMER
S1308
TIME UP ?
NO
YES
S1309
STOP POWER SUPPLY TO PORTIONS OTHER THAN NETWORK INTERFACE UNIT
A

FIG. 14

STATUS REQUEST TRANSMISSION FLOW



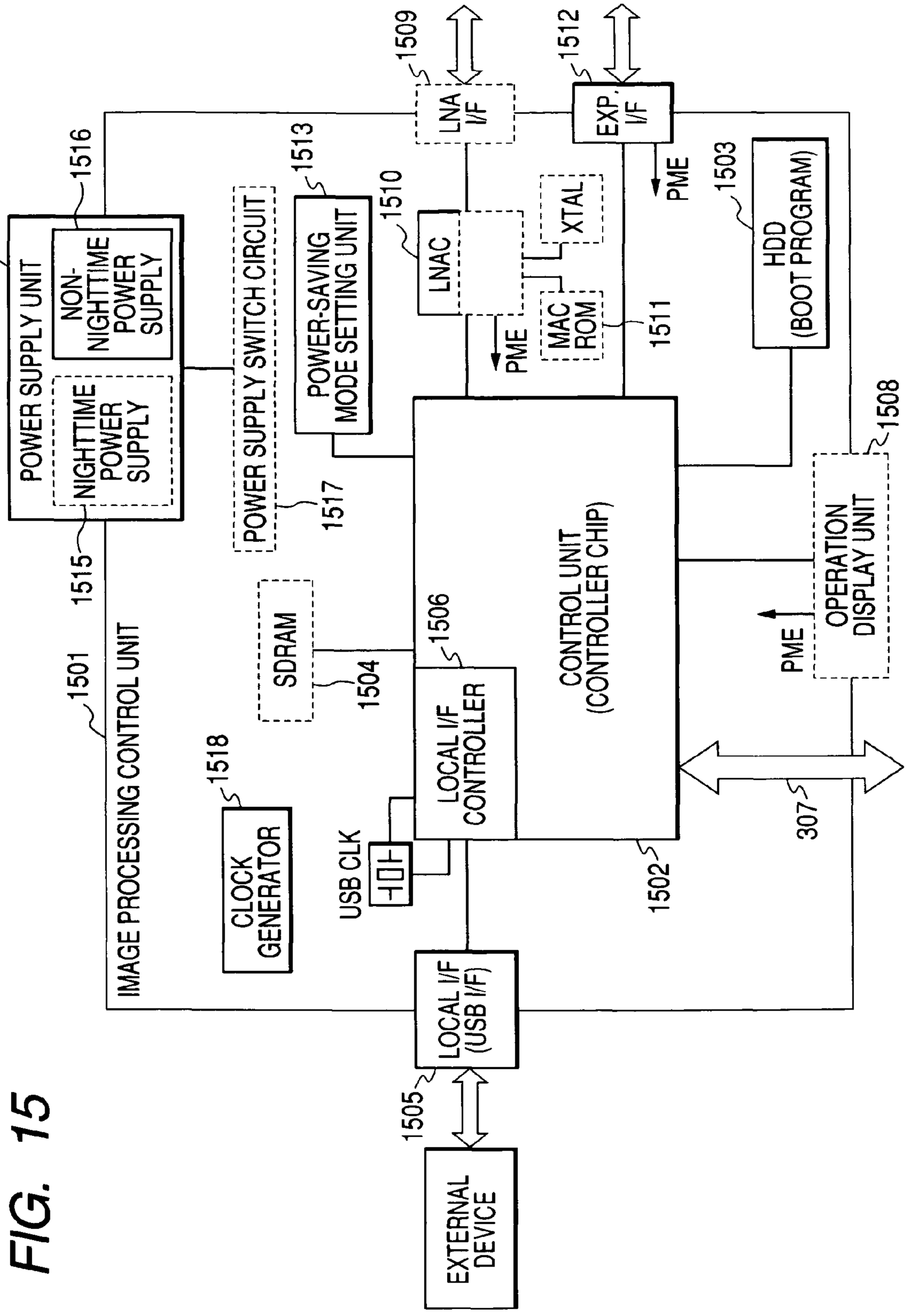


IMAGE PROCESSING CONTROL UNIT
1501
POWER SUPPLY UNIT
1514
NON-NIGHTTIME POWER SUPPLY
1516
NIGHTTIME POWER SUPPLY
1515
POWER SUPPLY SWITCH CIRCUIT
1517
POWER-SAVING MODE SETTING UNIT
1513
LNA I/F
1509
EXP. I/F
1512
LNAC
1510
XTAL
MAC ROM
PME
1511
HDD (BOOT PROGRAM)
1503
SDRAM
1504
CONTROL UNIT (CONTROLLER CHIP)
1502
LOCAL I/F CONTROLLER
1506
CLOCK GENERATOR
1518
USB CLK
OPERATION DISPLAY UNIT
1508
307
LOCAL I/F (USB I/F)
1505
EXTERNAL DEVICE

FIG. 15

FIG. 16

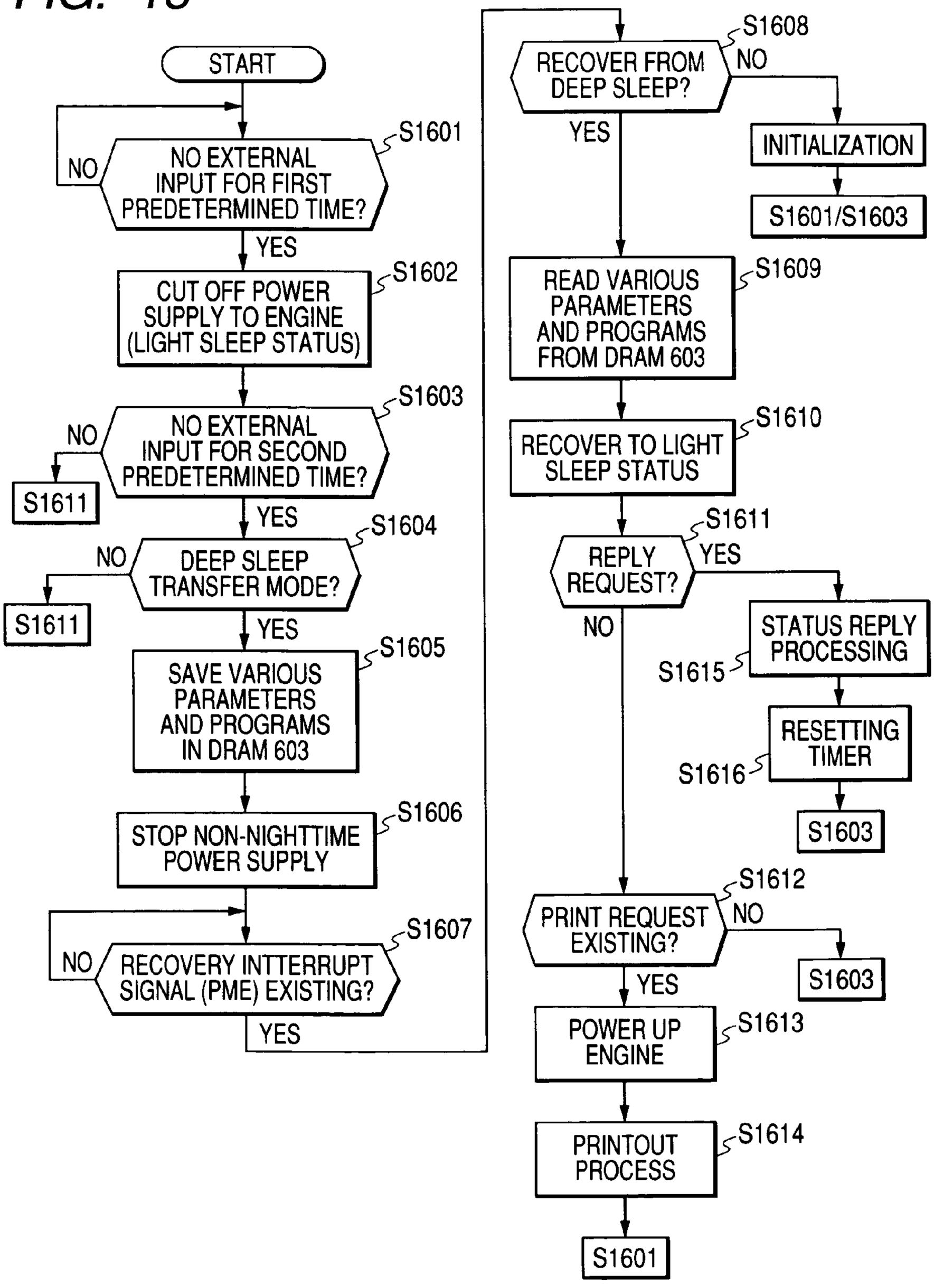

START
S1601
NO EXTERNAL INPUT FOR FIRST PREDETERMINED TIME?
NO
YES
S1602
CUT OFF POWER SUPPLY TO ENGINE (LIGHT SLEEP STATUS)
S1603
NO EXTERNAL INPUT FOR SECOND PREDETERMINED TIME?
NO
S1611
YES
S1604
DEEP SLEEP TRANSFER MODE?
NO
S1611
YES
S1605
SAVE VARIOUS PARAMETERS AND PROGRAMS IN DRAM 603
S1606
STOP NON-NIGHTTIME POWER SUPPLY
S1607
RECOVERY INTTERRUPT SIGNAL (PME) EXISTING?
NO
YES
S1608
RECOVER FROM DEEP SLEEP?
NO
YES
INITIALIZATION
S1601/S1603
S1609
READ VARIOUS PARAMETERS AND PROGRAMS FROM DRAM 603
S1610
RECOVER TO LIGHT SLEEP STATUS
S1611
REPLY REQUEST?
YES
NO
STATUS REPLY PROCESSING
S1615
RESETTING TIMER
S1616
S1603
S1612
PRINT REQUEST EXISTING?
NO
YES
S1603
S1613
POWER UP ENGINE
S1614
PRINTOUT PROCESS
S1601

FIG. 17

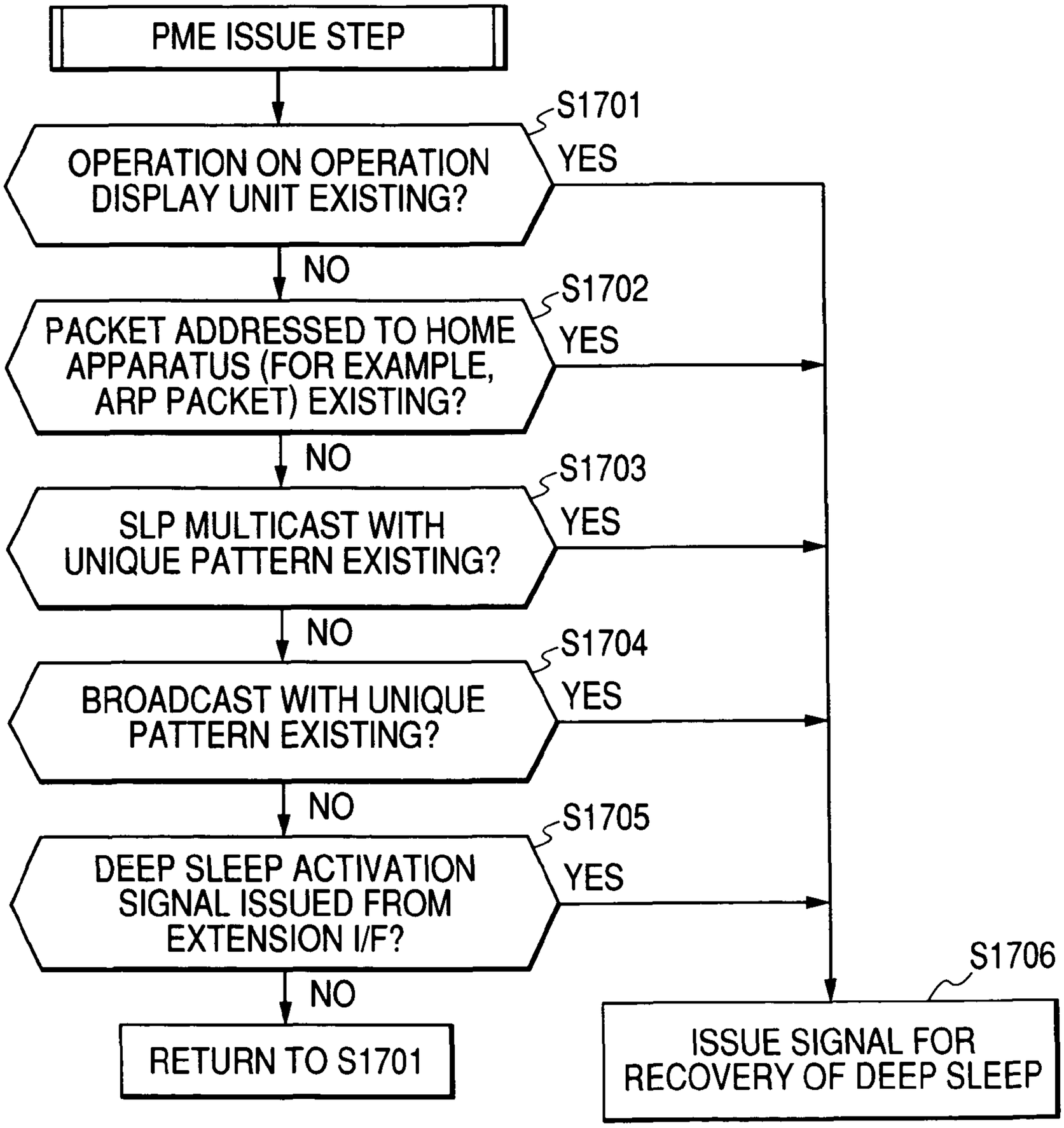

PME ISSUE STEP
S1701
OPERATION ON OPERATION DISPLAY UNIT EXISTING?
YES
NO
S1702
PACKET ADDRESSED TO HOME APPARATUS (FOR EXAMPLE, ARP PACKET) EXISTING?
YES
NO
S1703
SLP MULTICAST WITH UNIQUE PATTERN EXISTING?
YES
NO
S1704
BROADCAST WITH UNIQUE PATTERN EXISTING?
YES
NO
S1705
DEEP SLEEP ACTIVATION SIGNAL ISSUED FROM EXTENSION I/F?
YES
NO
RETURN TO S1701
S1706
ISSUE SIGNAL FOR RECOVERY OF DEEP SLEEP

FIG. 18

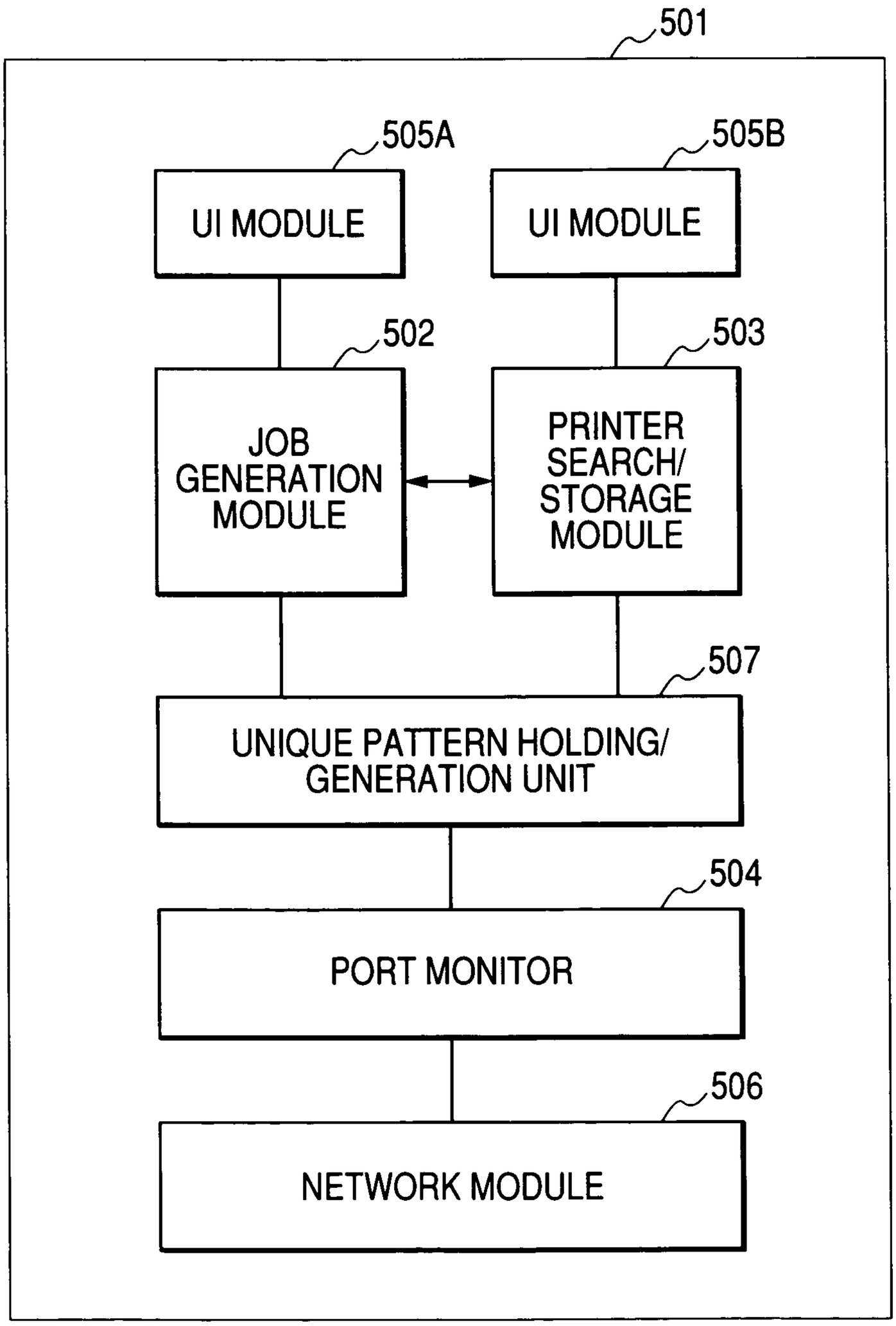

501
505A
505B
UI MODULE
UI MODULE
502
503
JOB GENERATION MODULE
PRINTER SEARCH/ STORAGE MODULE
507
UNIQUE PATTERN HOLDING/ GENERATION UNIT
504
PORT MONITOR
506
NETWORK MODULE

FIG. 19

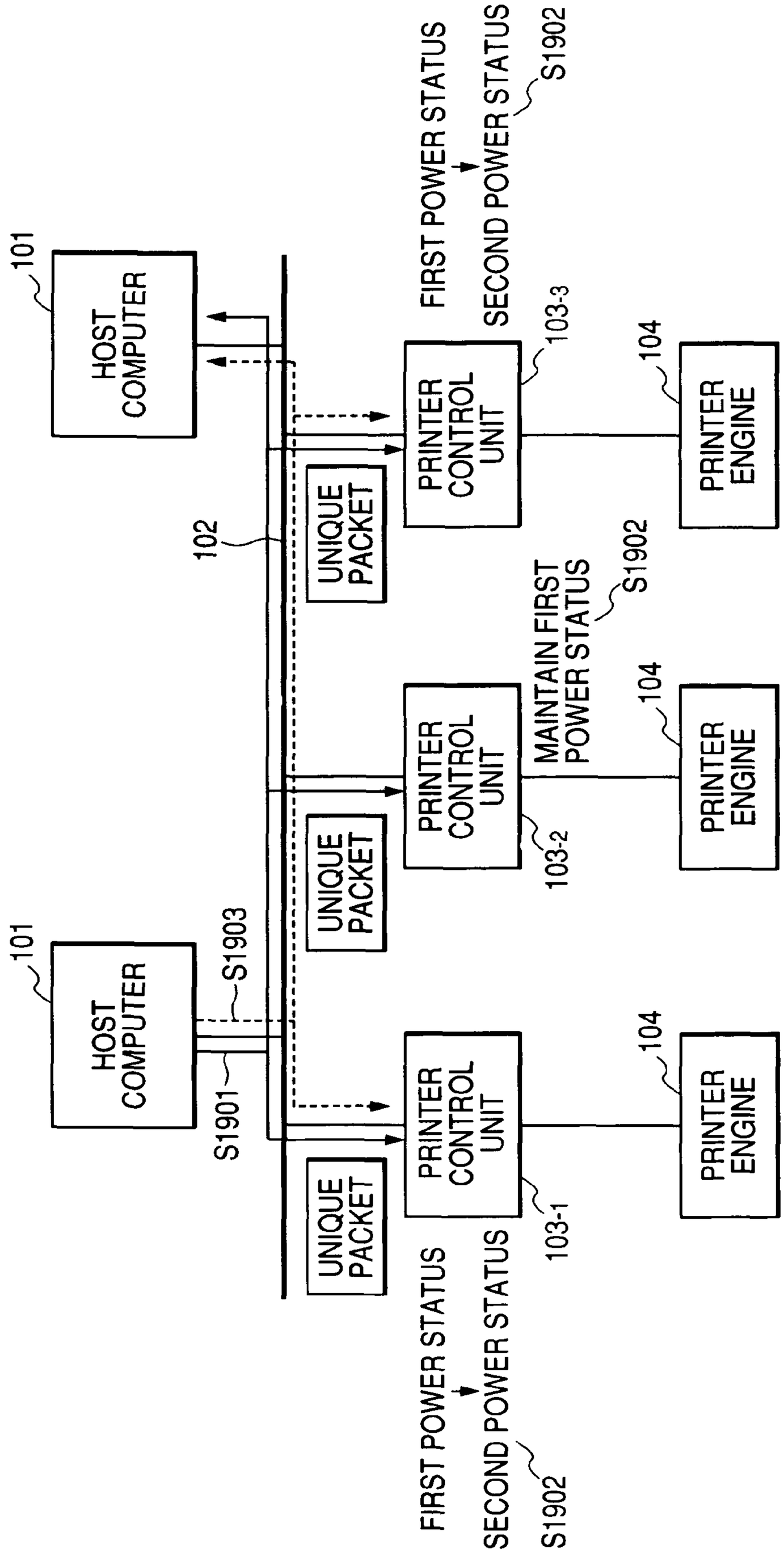

101
HOST COMPUTER
S1901
S1903
102
UNIQUE PACKET
UNIQUE PACKET
UNIQUE PACKET
PRINTER CONTROL UNIT
PRINTER CONTROL UNIT
PRINTER CONTROL UNIT
103-1
103-2
103-3
104
PRINTER ENGINE
PRINTER ENGINE
PRINTER ENGINE
FIRST POWER STATUS
SECOND POWER STATUS
S1902
MAINTAIN FIRST POWER STATUS
S1902
FIRST POWER STATUS
SECOND POWER STATUS
S1902

FIG. 20

ITEM	VALUE (HEX)	LENGTH	
ETHER FRAME			
DESTINATION ETHER ADDRESS	★01:00:5e:7f:ff:fd	6	2001
SOURCE ETHER ADDRESS	DON'T CARE	6	
FRAME TYPE	★0800 (IP)	2	2002
IP FRAME			
VERSION + DATA LENGTH	★45	1	2003
TOS	DON'T CARE	1	
DATA LENGTH	DON'T CARE	2	
ID	DON'T CARE	2	
FLAG	DON'T CARE	2	
TTL	DON'T CARE	1	
PROTOCOL ID	★11 (17)	1	2004
CHECK SUM	DON'T CARE	2	
SOURCE IP ADDRESS	DON'T CARE	4	
DESTINATION IP ADDRESS	239.255.255.253	4	2005
UDP FRAME			
SOURCE PORT NUMBER	DON'T CARE	2	
DESTINATION PORT NUMBER	★1ab (427)	2	2006
UDP DATA LENGTH	DON'T CARE	2	
UDP CHECK SUM	DON'T CARE	2	
SLP V2 FRAME			
UNIQUE FRAME PATTERN	★WAKEUP FROM DEEP SLEEP!		2007

FIG. 21A

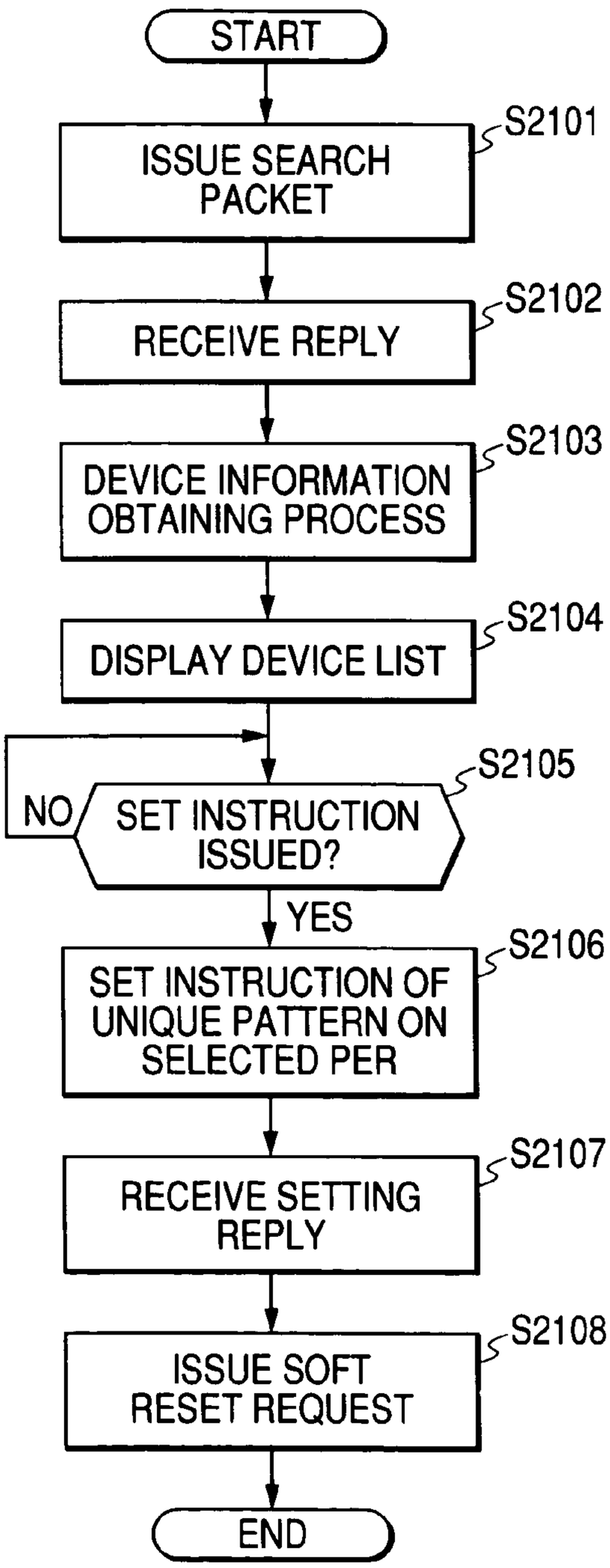


FIG. 21B

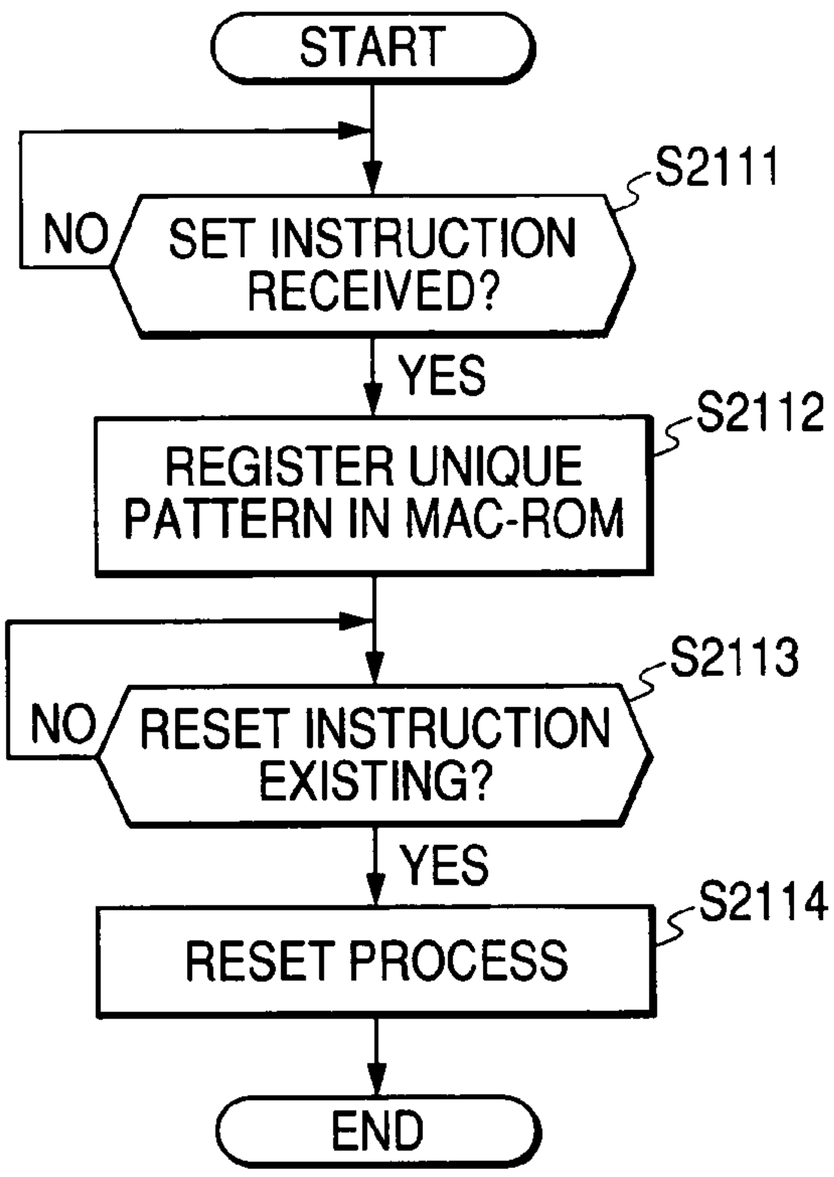
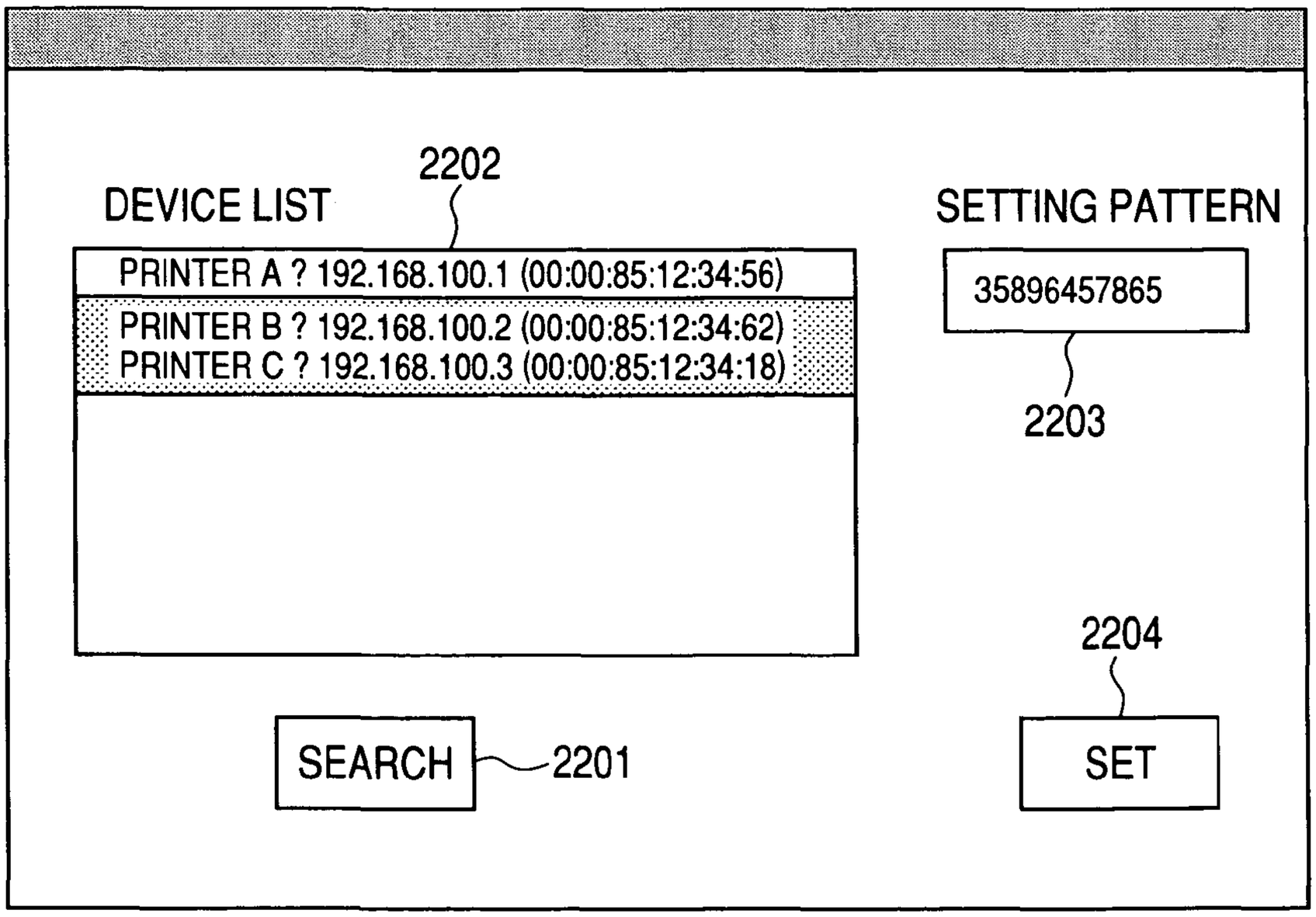


FIG. 22


2202
DEVICE LIST
PRINTER A ? 192.168.100.1 (00:00:85:12:34:56)
PRINTER B ? 192.168.100.2 (00:00:85:12:34:62)
PRINTER C ? 192.168.100.3 (00:00:85:12:34:18)
SETTING PATTERN
35896457865
2203
2204
SEARCH
2201
SET

INFORMATION PROCESSING DEVICE, METHOD, AND PROGRAM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an information processing device, method, and program, and more specifically to a system of releasing a power-saving mode in a printer connected to a network.

2. Related Background Art

Several power-saving techniques for a printer connected to a network have been conventionally proposed. For example, it can be a method of stopping power supply to a print engine unit having relatively high power consumption when a print job is not received for a predetermined time through a network interface of a printer.

In addition to the above-mentioned method, there has been a method of further improving the power-saving effect by stopping power supply to the CPU except the parts required to activate a network interface unit, etc. in the print controller unit. It can be realized by activating the CPU by issuing a signal when the network interface unit receives a predetermined packet. In this case, the activation can also be realized by a broadcast packet. Therefore, when the current apparatus is set as a destination in the packet which is an activation condition, the CPU is frequently activated in some connected networks, thereby unintentionally attenuating the power-saving effect.

Therefore, a method of setting an activation condition using a magic packet technique proposed by AMD has been suggested. For example, the technology of activating a printer from a status (status in which power is turned on) in which the printer cannot perform communications by transmitting a special packet (for example, a magic packet) from a PC to a printer **100** when a printing process is to be performed when the printer **100** is in a low power consumption status with the power saved including in the communications unit for receiving a print job is disclosed by, for example, Japanese Patent Application Laid-open No. 2002-287936.

However, by providing a proxy server with the conventional system maintained in the conventional host computer (job issuer), a special packet is communicated between a host computer and a printer. That is, in the system of directly setting a job from a host to a printer including print data, it is necessary that another apparatus or a system such as a proxy server, etc. is to be incorporated to support the host side as a special packet.

The present invention has been developed to solve the above-mentioned problems, and aims at providing a system of normally printing data by directly setting a job including print data from a job issuer to a printer device which can be activated in a state of performing various communications by receiving a specific packet.

SUMMARY OF THE INVENTION

Accordingly, the present invention is conceived as a response to the above-described disadvantages of the conventional art.

According to one aspect of the present invention, preferably, an image forming apparatus is an information processing device which performs communications over a network with a print control apparatus for activating a second interface unit when a first activation instruction including identification information specifying a print control apparatus to be activated is received through a first interface unit, and includes: a

first instruction control means for transmitting a first activation instruction to a print control apparatus upon input of a print instruction; and an output control means for outputting a print job to the print control apparatus after establishing a communications function of a second interface unit after transmission of first activation instruction.

Other features and advantages of the present invention will be apparent from the following description taken in conjunction with the accompanying drawings, in which like reference characters designate the same or similar parts throughout the figures there.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows an example of the configuration of the entire system;

FIG. **2** shows an example of the configuration of the control unit of a printer;

FIG. **3** shows an example of the configuration of the network interface unit in the control unit of the printer;

FIG. **4** is a graph for explanation of plural types of examples of power consumption in the printer control unit;

FIG. **5** shows an example of the configuration of the function block of the software operating on the host computer;

FIG. **6** shows an example of a user interface of the software operating on the host computer;

FIG. **7** shows an example of an activation packet for releasing a non-energized part of a printer control unit and establishing a communications function;

FIG. **8** is a flowchart showing an example of the operation of the print driver operating on the host computer in search of a printer;

FIG. **9** is a flowchart showing an example of the operation performed in response to a search packet of the printer control unit;

FIG. **10** shows an example of a block diagram of a search/reply packet;

FIG. **11** is a flowchart for explanation of an example of the procedure of generating a logical printer in a host computer;

FIG. **12** is a flowchart showing an example of the operation of transmitting a print job from a host computer;

FIG. **13** is a flowchart for explanation of an example of an operation performed on external access in the printer control unit;

FIG. **14** is a flowchart showing an example of an operation performed when the host computer issues a status request;

FIG. **15** shows an example of the configuration of the control unit in a printer;

FIG. **16** is a flowchart for explanation of an example of an operation performed on external access in the printer control unit;

FIG. **17** is a flowchart for explanation of an example of an operation performed on external access in the printer control unit;

FIG. **18** shows an example of the configuration of the functions of the software operating on the host computer;

FIG. **19** shows an example of the operation performed when a specific pattern is issued addressed to a non-specific device registered in the print control apparatus from the host computer in the printing system;

FIG. **20** shows an example of a specific pattern addressed to a non-specific device registered in the print control apparatus;

FIGS. **21**A and **21**B are flowcharts showing examples of the operation of the host computer and the printer control unit; and

FIG. **22** shows an example of a user interface of software operating on the host computer.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A preferred embodiment of the present invention will now be described in detail with reference to the drawings. It should be noted that the relative arrangement of the components, the numerical expressions and numerical values set forth in these embodiments do not limit the scope of the present invention unless it is specifically stated otherwise.

(First Embodiment)

FIG. **1** shows the configuration of an embodiment of the present invention. In FIG. **1**, a host computer **101** is connected to a network **102**, and performs various processes. The network **102** is indicated as a local area network in this embodiment, but it is not limited to this type of network, and can be any other networks capable of attaining the advantage of the present invention, for example, a wireless LAN, etc. A printer control unit **103** performs a received print job by connecting to the network **102**, and performs printing by a printer engine **104** connected to the printer control unit **103**.

Described below is a printing operation. In a normal printing operation, the host computer **101** generates a print job, and transmits it to a desired printer control unit **103** over the network **102**. Upon receipt of a print job from the host computer **101**, the printer control unit **103** issues an instruction to the printer engine **104** to perform printing according to a print job.

FIG. **2** shows the configuration of the printer control unit according to an embodiment of the present invention. In FIG. **2**, a network interface unit **202** is used for connection to the network **102**. A control unit **203** controls the printer control unit **103**, and is connected to an internal bus **204**, a memory unit **205** for temporarily storing a program operating on the control unit **203**, a print job, and information as a work area, an engine interface unit **206** connected to the printer engine **104**, and an engine interface bus **207** communicating image information with the printer engine **104**. A power supply unit **208** for supplying power to each unit provides power for the control unit **203**, the memory unit **205**, the engine interface unit **206**, and the printer engine **104**. A first power supply line **210** constantly supplies power to the network interface unit **202** and a power control unit **211**. A second power supply line **209** stops supplying power in the second power status and the third power status described later. A third power supply line **214** provides power for the printer engine unit when a print job is applied. They are controlled by a activation signal **212** from the network interface unit **202** and a power control signal **213** for controlling the power supply unit **208**.

In the first power status, the first power supply is performed, but the second power supply is not performed, thereby realizing the power-saving operation. In the power-saving operation, power is supplied only to the network interface unit **202** and the power control unit **211**, and an activation packet for return to the second power status is continuously awaited. When an activation packet is received, the activation signal **212** enters the power control unit **211**. Upon receipt of the activation signal **212**, the power control unit **211** issues to the power supply unit **208** an instruction to supply the second power supply line **210** using the power control signal **213**, and power is also supplied to each unit other than the network interface unit **202** and the power control unit **211**, and the second power status is restored. In the present embodiment, each unit shown in the attached drawings is provided with power and activated, but it is also possible to activate only necessary portion to attain the advantage of the present invention and enhance the power-saving effect. When it is determined in the second power status that the data of a print job is externally received, the power control is performed to enter the third power status. On the other hand, if only the status such as the remainder of toner, etc. is externally received without receiving the data of the print job in the second power status, then it is not necessary to necessarily pass control to the third power status, but a status reply can be made with the second power status maintained.

In the third power status, at least the second power status and the third power status are supplied, and the subsequent normal operations are performed. That is, upon receipt of a packetized print job from the network **102**, the network interface unit **202** writes it to the work area of the memory unit **205**. After restoring the packetized print job to a print job based on the network protocol, the control unit **203** expands it into image data, transmits it to the printer engine **104** through the engine interface unit **206** and the engine interface bus **207**, and prints the data.

FIG. **3** shows the configuration of the network interface unit **202** on the printer according to the first embodiment of the present invention. In FIG. **3**, an internal bus interface unit **301** is connected to the internal bus **204**, and a transmission buffer unit **302** temporarily stores the transmission data. A transmission control unit **303** controls the transmission of a packet to a network, and a reception buffer unit **304** temporarily stores the received data. A reception control unit **305** controls the reception of a packet from a network. A monitor unit **306** monitors whether or not a received packet in the reception control unit matches a predetermined condition.

Described below are the operations. In the transmission of data in the third power status, the data packetized through the internal bus interface unit **301** is stored in the transmission buffer unit **302**, and the transmission control unit **303** transmits the packet data to the network **102** based on the network protocol. Similarly, in the reception of data, the reception control unit **305** stores the packet data received based on the network protocol from the network **102** in the reception buffer unit **304**, and writes it to the memory unit **205** through the internal bus interface unit **301**.

In the first power status, only the function on the reception side is effective (the portion engaged in the transmission of data is not energized, thereby improving the power-saving effect), and the monitor unit **306** monitors the packet data received by the reception control unit **305** whether or not it matches a predetermined condition. If they match, it is informed to the power control unit **211** by the power control signal **213** through the internal bus interface unit **301**.

FIG. **4** is a graph for explanation of the phase of the power consumption of the printer control unit **103** according to the present invention. A first power status **401** indicates the power consumption status (power supply status) corresponding to the case in which only the activation of the network interface unit **202** which is the first network unit is performed, and the second highest power-saving effect after the case in which the power is turned off can be obtained.

A second power status **402** indicates the power consumption status (power supply status) when the printer controller (second interface unit) is activated in cooperation with the activation of the network interface unit **202** (first interface unit). By the activation of the printer controller, various communications with the external information processing device can be established. For example, a job can be received including the print data, and various statuses can be communicated. When the printer controller is considered with reference to FIG. **2**, the network interface unit **202**, the control unit **203**,

the memory unit **205**, etc. required in the communications function correspond to it, but portions capable of communicating various statuses and print jobs can also be included.

The printer controller in the present embodiment can be divided into a communications control unit and a print processing unit for interpreting and expanding print data. Assuming that the power consumption of the second power status **402** is required when the communications control unit except the print processing unit is activated, the power consumption can be further reduced. Especially, when a request for a status from an external device, etc. is received, only the communications control unit can be activated.

A third power status **403** indicates the power consumption status (power supply status) required in the recording operation based on the job including print data, and corresponding to the preparing operation (for example, power supply to a fixer, and start of drive of a polygon motor) for a recording operation.

FIG. **5** shows the configuration of the print processing module including the print driver operating on the host computer **101**. In FIG. **5**, a print processing module **501** operates on the host computer **101**. A job generation module **502** generates a print job, and a port monitor **504** interfaces between a printing service in which print data generated by the job generation module is processed and an actual printer. The port monitor **504** is assumed to store the settings of the output port associated with an IP address and a MAC address for each logical printer set for a client. That is, generating a port monitor **504** refers to making settings for an output port only or settings including an output port. An output port refers to a port on the software formed for a client for connection between a logical printer and an actual printer.

A printer search/storage module **503** transmits a search packet of the printer control unit **103** at the time of installation or with any timing, and stores the printer control unit **103** in the internal list. Although a search target is the printer control unit **103**, the printer control unit **103** can be a printer including the printer control unit **103** and the printer engine **104**.

A network module **506** communicates data with the job generation module **502** and the printer search/storage module **503** connected to a network. The network module **506** can transmit a magic packet as an Ethernet (registered trademark) frame by having the communication facility at a TCP/IP level using a socket interface and the function of directly controlling a link layer driver. The function of the network module **506** can be independently provided, the function of an operating system such as Windows (registered trademark) can be conveniently used, or the function of an operating system and an independent function can be cooperatively used.

A UI module **505** inputs an instruction of a user by displaying the driver dialog screen **601** shown in FIG. **6**. The UI module **505** also has the function of display the management utility screen for monitor of various statuses of the printer itself and the status of the print job in the printer.

FIG. **6** shows an example of a user interface of a print driver operating on the host computer. In FIG. **6**, a driver dialog screen **601** is displayed when the user prints data, and a printer for printing data is selected on a printer selection pull-down menu **602**. A magic packet transmission check box **603** is used in selecting whether or not a magic packet is transmitted when a print job is transmitted. A print job delay check box **604** is used in selecting whether or not a print job is delayed and transmitted after transmitting a magic packet. A time selection slider **605** is used in selecting a time delayed when the print job delay check box **604** is selected.

The user selects the printer control unit **103** for controlling the printer to be used from the printer selection pull-down menu **602**. In the embodiments other than the present embodiment, an item for input of information about the printer control unit **103** can be used in directly inputting the information from the keyboard. The information to be input can be an IP address, a printer name, a product name, a product code, a MAC address, the URL of a printer, etc.

FIG. **7** shows the format of a magic packet which is an example of an activation packet according to the present invention. In FIG. **7**, a destination address field **701** indicates the MAC address of a destination, and a source address field **702** indicates the MAC address of a source. A type field **703** indicates an upper protocol, and data fields **704** and **705** indicate data specific to a magic packet. The data field **704** contains a synchronized stream "FFFFFFFFFFFF", and the data field **705** contains the value indicating the MAC address of the activated printer 16 times continuously. A data field **707** is a misc field, and its value and size are not determined. A data field **706** is an FCS field indicating the value of a CRC (cyclic redundancy check).

The activation packet is not limited to the packet in the above-mentioned format. For example, the present invention can also be realized by a packet in an independently prescribed format. It is also possible to simultaneously activate a plurality of printer control units **103** by setting the value indicating the MAC address of the activated printer in the data field **705** as a broadcast address. In this case, a broadcast address can be set as an activation condition in the monitor unit **306** of the network interface unit **202**. In the present embodiment, a magic packet is used as an activation packet, but it is not limited to this packet, and any packet having the similar function can be used.

FIG. **8** is a flowchart of the operation performed when a printer of the print driver operating on the host computer **101** of the present invention is searched for. It is obvious that not only a print driver, but also another software module can takes over the process.

The search packet described later as shown in FIG. **8** is transmitted to a printer on a network by a broadcast (S**801**), and the second interface unit of the plurality of printer control units **103** connected to the network can be activated according to an instruction from the host computer.

For example, it is determined that there is a reply (S**803**) after the passage of a predetermined time set by the time selection slider **605** (S**802**). When there are replies from all or a part of a plurality of printers, the identification information (MAC address and other information) about each printer which returns a reply is stored in an internal list (S**804**). When no reply is obtained, the process terminates.

By using a UDP (user datagram protocol) in the transmission of a search packet, in transmitting a search packet, the search can be made although the host computer **101** and the printer control unit **103** are in a network over each subnet.

When the IP address of the printer control unit **103** is determined by any method, the MAC address of the corresponding printer control unit **103** can be obtained by transmitting an ARP (address resolution protocol) packet to the printer control unit **103** in the subnet, and receiving the reply packet.

However, the printer control unit **103** in the power-saving status when a search packet is transmitted cannot return a reply in response to the search packet. Therefore, before transmitting a search packet, a magic packet whose address of an activated printer is set as a broadcast address is set as a second activation instruction, transmitted by a broadcast, and a plurality of printer control units **103** are returned to the second power status, and then a search packet is transmitted, thereby obtaining a reply. Furthermore, since synchronized

stream data **704** of a magic packet and the data field **705** indicating the MAC address of an activated printer can be arranged anywhere. Therefore, the activation and the search can be simultaneously performed by including them in a part of the search packet.

When the printer control unit **103** which is turned off when a search packet is transmitted is turned on later, it cannot obtain the information about the printer control unit **103** as is. However, there is the possibility that the printer control unit **103** can transmit a cold start trap packet of the SNMP (simple network management protocol) to the network at the time of power-up and reset. Using this function, the host computer **101** can determine that the printer control unit **103** has been activated. Therefore, the information about the printer control unit **103** can be obtained by transmitting a search packet to the printer control unit **103**.

Thus, according to the present embodiment, not only the first activation instruction to transfer the status from the first power status in which only the network interface unit of the printer control unit **103** is activated to the second power status, but also the second activation instruction can be issued to a plurality of printer control units **103**. Therefore, although the identification information about a fixed item, for example, a MAC address, etc. is not held on the host side, the printer control unit **103** can be activated from the first power status to the second power status.

FIG. **9** is a flowchart of the operation in response to a search packet of the printer control unit **103** according to the present invention. In FIG. **9**, control enters the loop (S**901**) until the search packet transmitted from the host computer **101** is received. Upon receipt of the packet, it is determined whether or not the value of a version field **1001** (FIG. **10**) matches the corresponding version of the home apparatus (S**902**). If they do not match each other, then a reply code field **1003** is set to 1 (version error) (S**906**), and control is returned (S**905**) to the start of the process. On the other hand, when they match each other, it is determined whether or not the value of a request code field **1002** matches 0 (search) (S**903**). If they do not match, the reply code field **1003** is set to 2 (other errors) (S**907**), and control is returned (S**905**) to the start of the process. If they match each other, the reply code field **1003** is set to 0 (success in matching), and the identification information (MAC address, product code field **1005**, product code of the home apparatus, etc.) about the home apparatus is set in a MAC address field **1004** (S**904**), and the set identification information is returned to the search requester (S**905**), thereby returning control to the start of step S**901**.

FIG. **10** is a block diagram of a search/reply packet according to the present invention. In FIG. **10**, the version field **1001** indicates a version of a packet, the request code field **1002** indicates a request code, and the reply code field **1003** indicates a reply code. The value of a request code can be, for example, 0 set by the host computer **101**. The MAC address field **1004** indicates the MAC address of the printer control unit **103** which returns a reply, and the product code field **1005** indicates a product code of the printer control unit **103**. In addition, for example, more detailed information can be obtained from the printer control unit **103** by adding the information about the IP address, a product name, an installation position, an administrator name, etc.

A request code can be 0 (search) indicating a request to return a reply to the printer control unit **103**, and 1 (status reply) indicating a request to return a reply to the printer control unit **103**.

Request Code:

0: search 1: status reply

A reply code can be 0 (success) indicating a request normally accepted (normally, the code is returned), and 1 (version error) indicating no matching with the version information about the version field **1001** of a request packet. 2 (other errors) indicates that other errors occur and the request cannot be accepted.

Reply Code:

0: success 1: version error 2: other errors

FIG. **11** is a flowchart of the procedure of generating a logical printer in the host computer **101** according to the present invention, and corresponds to the process performed for the print control unit selected in response to an instruction of a user from a plurality of print control units which return a reply based on the flowcharts shown in FIGS. **8** and **10**.

In FIG. **11**, it is determined whether or not there is a port monitor mapped on the communications protocol of the printer control unit selected by the host computer **101** (S**1101**). If there is a port, an existing port monitor is selected (S**1102**). If not, a port monitor is newly installed (S**1103**).

Then, it is determined whether or not there is a physical interface on the host computer **101** and an output port for mapping a print driver (S**1104**). If there is an output port, the existing port is selected (S**1105**). If not, an output port is newly installed (S**1106**). In S**1105** and S**1106**, the identification information about the print control unit selected in response to the user instruction is extracted from the identification information (MAC address, IP address, and other information) about a plurality of printer control units obtained according to the flowchart shown in FIG. **8**, and the extracted identification information is associated with an output port. Then, a logical printer for mapping a port with the print driver is generated (S**1107**).

Through a logical printer including the generated output port, the print driver can transmit a print job with an instruction of the identification information to activate the second interface unit to the printer control unit which is a target of the process shown in FIG. **11**.

The processes in steps S**1105** and S**1106** are explained below in more detail. That is, the identification information (MAC address and other information) about a plurality of printer control units obtained in response to a search packet issued in the host computer **101** is stored in the internal list (S**804**). The printer list indicating the printer control unit which returns a reply is displayed on the display unit. The identification information corresponding to the printer control unit **103** selected in response to the user operation through the printer list is read from the internal list, and associated with the output port generated according to the flowchart shown in FIG. **11**.

It is assumed that there is a logical printer for which the port monitor associated with the IP address and output port are generated. In the internal list, the MAC address and the IP address are stored as the identification information. If there is already a logical printer having a matching IP address, then the logical printer is selected for association with the identification information about the MAC address. It is also pos-

sible to associate the identification information depending on the manual operation on a desired printer selected through a user interface. In the above-mentioned process, a logical printer for instructing the printer control unit to activate the second interface unit can be easily generated when a print job is transmitted.

FIG. **12** is a flowchart of the operations of transmitting a print job from the host computer **101** according to the present invention. In FIG. **12**, the process terminates when a permission to transmit a magic packet is not selected on the driver dialog screen **601** in FIG. **12**. If it is not selected, the process in S**1201** is performed (S**1209**). A print job refers to a process unit enclosed by a job language (Job Language: JL), etc. such as a PDL, etc.

When the user reads a MAC address corresponding to a selected printer from the internal list (S**1201**), inserts it into the data field **705** and the destination address field **701** of a magic packet, and an activation packet corresponding to a printer selected by a user is generated (S**1202**). That is, it is assumed that the host computer **101** stores a plurality of MAC addresses corresponding to a plurality of printer control units **103**. When the transmission of a print job is stopped, the process terminates (S**1203**), and control enters a loop until the transmission of a print job is selected (S**1204**). When the transmission of a print job is selected, an activation packet is selected (S**1205**). In the process in S**1205**, the first activation instruction including the identification information (for example, a MAC address) specifying the printer to be activated is indicated to the printer. The printer receives the first activation instruction through the network interface unit **202**, supplies power to the control unit **203**, the memory unit **205**, etc., thereby establishing the communication facility for communications of print data and status information. The portion for controlling the communication facility for communications of print data and status information in the printer control unit **103** is referred to as the second interface unit. As a second interface unit, a print data interpreting unit for expanding the print data written in the page description language into bit map data can be included. The network interface unit **202** is referred to as a first interface unit as compared with the second interface unit.

When the driver dialog screen **601** selects the print job delay check box **604** (S**1206**), a print job is transmitted (S**1208**) after the passage of time selected by the time selection slider **605** (S**1207**). The process can be performed by outputting a print job on a printer after establishing the communication facility of a printer.

When the printer control unit **103** connected to a network does not permit the power-saving status, it is not necessary to transmit a magic packet. Therefore, the process performed before transmitting the print job can be omitted by selection by the magic packet transmission check box **603**. When it takes a long time from reception of an activation packet to reception of a print job, a print job can be transmitted without fail by delaying the transmission of a print job.

When the printer control unit **103** enters the status of receiving a print job after activation, a packet informing of it is transmitted to the host computer **101**, and the host computer **101** can transmit a print job after receiving the information, thereby reducing the time taken to wait for the transmission of the print job.

It is also possible to specify the model of the printer control unit **103** from the information contained in the reply packet in response to the search packet, and set a transmission time predetermined for each model.

FIG. **13** is a flowchart for explanation of the operation of receiving a print job of the printer control unit **103** according to the present invention.

First, in FIG. **13**, a loop is entered (S**1301**) until an activation packet is received, and when an activation packet is received, it is determined (S**1302**) whether or not the power-saving status is entered. The reception of an activation packet corresponds to the reception of an activation packet in S**1205** shown in FIG. **12**.

In the determination in S**1302**, when the power-saving status is entered, the power supply unit **208** is controlled and the second power supply line **209** is supplied (S**1303**), thereby restoring the second power status. It the power-saving status is not entered, the power supply unit **208** is not controlled.

Then, the timer is set (S**1304**), it is determined whether or not a print job is received (S**1305**), control is passed to the third power status when the print job is received, and the print job is processed. For example, the PDL is interpreted in the display list, the display list is expanded into bit map data (S**1306**), the timer is reset (S**1307**), and control is returned to S**1304**.

Unless a print job is received, it is determined (S**1308**) whether or not a time set on the timer has passed. If it has not yet passed, the power supply unit **208** is controlled to stop (S**1309**) the supply of the second power supply line **209**, and the power-saving status is entered, thereby returning control to the start of the process. Unless the time set by the timer has passed, control is returned to S**1305**.

As explained above, according to the present embodiment, it is not necessary for a user to be aware of the activation of a printer, and the printer can be activated by a magic packet having a high power-saving effect.

(Second Embodiment)

FIG. **14** is a flowchart for explanation of an embodiment of the present invention. In FIG. **14**, the processes in S**1201**, S**1202**, S**1204**, S**1205**, S**1207**, S**1209** are almost the same as the operations according to the first embodiment. The feature of the present embodiment is that, after transmitting the activation packet for activating the second interface unit, a status request packet requesting status information indicating the status of the printer control unit **103** is transmitted (S**1202**).

The request for status information can include a request for the status as to whether or not the communication facility of the second interface unit has been established, and a request for the status of the printer as to whether or not the status (no paper, no toner, etc.) of normally printing is entered.

As described above, it is possibly necessary for the printer control unit **103** to confirm whether or not the status indicates a normal condition of the printer control unit before transmitting a print job from the host computer, or whether or not a print job can be input. However, although the printer is in the first power status, the printer control unit can be activated without a user being aware of the status, and the print job can be normally input and allowing the printer (including the printer control unit) to print data.

(Third Embodiment)

In the third embodiment, the power-saving system according to the first and second embodiments is described further in detail. The system of designating the user-desired network power control performed externally (a host computer, an operation panel of a printer) is explained below. In the third embodiment, the basic configurations and functions are similar to those in the first and second embodiment, and the explanation of the similar portions is omitted here.

FIG. **15** shows the details of the printer control unit **103** according to the first and second embodiments of the present

invention, and an image processing control unit **1501** corresponds to the printer control unit **103** according to the first and second embodiments.

The image processing control unit **1501** includes a control unit (controller chip) **1502** (corresponding to the control unit **203** shown in FIG. **2**) realized on one chip for controlling the entire control unit. The control unit **1502** is configured by a ROM I/F storing various programs not shown in the attached drawings, an RMA (including DRAM) I/F, a PCI bus I/F, a Video I/F function, expanding hardware for a printing description language transferred from any external device, and an ASIC including compressing and decompressing functions of various data.

The control unit **1502** has the function of performing initializing process on print data received from the external device through a network and a LAN controller **1510** (corresponding to the network interface unit **202** shown in FIG. **2**), and the function of processing data passed through the LAN controller **1510**. The control unit **1502** applies to the control unit **203** and can correspond to the second interface explained in the first and second embodiments.

A hard disk **1503** is a hard disk (corresponding to the memory unit **205** in FIG. **2**) which is non-volatile storage means continuously holding data although main power is not supplied.

The hard disk **1503** stores an initialization program for each unit of the image processing control unit **1501**, an initial value (parameter) relating to image processing, communications, display, etc., and a program defining various operations of image processing, communications, display, etc. According to the present embodiment, the data relating to the initialization stored in a hard disk can be referred to as initialization data or setting data.

When the main power switch is turned on for the body of the printer, the execution of the boot program stored in the hard disk **1503** is started, and a initialization program, an initial value (parameter), and a main program are read from the hard disk **1503** by the image processing control unit **1501** including the control unit **1502**, thereby performing the initializing process.

SDRAM **1504** (corresponding to the memory unit **205**) temporarily stores expanded print data by the control unit **1502**, and temporarily saves various initial values and various programs read from the hard disk **1503** when the initializing process is performed depending on the transfer to the deep sleep described later. Various saved initial values and programs are reused by each unit when the deep sleep is restored, and a high-speed restoration can be performed when power is applied again to each unit.

The SDRAM **1504** can also be replaced with DDR-SDRAM, SRAM, etc. Generally, as compared with non-volatile storage means such as a hard disk, EEPROM, flash memory, etc. volatile storage means is higher in data reading/writing speed, and it is desired that the volatile storage means is assigned to the print job delay check box **604**. Especially, when a program is large in data size, it is necessary to store the program in the hard disk due to the restriction on the data size in the ROM. In this case, a high-speed process by volatile storage means is emphasized.

A USB interface **1505** is connected to a local I/F controller **1506** contained in the control unit **1502** through a bus, and the local I/F controller **1506** is built in the control unit **1502**. The local I/F controller functions as local communications control for performing a receiving process of data transmitted from an external device through a local interface.

Since the power supply to the local I/F controller **1506** depends on the control unit **1502**, the power supply to the local I/F controller **1506** is cut off when the control unit **1502** itself is turned off. The local I/F controller **1506** also has the function of recognizing whether or not the external device is connected such that it can communicate data through the USB interface **1505**. It is also possible to provide the local I/F controller **1506** outside the control unit **1502**.

A nighttime power supply is applied to an operation display unit **1508** of a printer so that a user can confirm the status of a printer including the image processing control unit **1501** and can change the settings relating to various image processing. A nighttime power supply refers to a power supply functioning as what is called a secondary power supply (corresponding to the first power supply line **210** shown in FIG. **2**) which is not cut off in the deep sleep status described later when the main power supply is turned on by a hard switch. On the other hand, a non-nighttime power supply refers to a power supply functioning as what is called a main power supply (corresponding to the second power supply lines **209**, **214**, etc. shown in FIG. **2**) which is cut off under a predetermined condition in the deep sleep status described later although the main power supply is turned on. For example, when the image processing is performed by the control unit **1502**, the main power supply (non-nighttime power supply) is used.

An activation signal (PME in FIG. **15**) for recovery of the image processing control unit **1501** from the deep sleep status explained in detail later depending on the operation on the operation display unit **1508** is issued. The PME is short for power management event, and is used in indicating the power-up of a system. The PME can be received by a system loaded with a bus in accordance with the PCI2.2 standards. However, the present invention is not limited to this PME, but can be applied to any instruction signal capable of indicating power-up. The PME can correspond to the activation signal **212** explained above by referring to the first and second embodiments.

The LAN (local area network) I/F **1509** is interface means for performing various data communications with a plurality of external devices (can be referred to as a host computer or an information processing device), and can adopt, for example, a 10/100 BASE-T connector.

The reference numeral **1510** designates a LAN controller (corresponding to the network interface unit **202** shown in FIG. **2**), and controls the communications with an external device through the LAN I/F **1509**. The LAN controller **1510** comprises dotted line portions (the internal bus interface unit **301**, the reception buffer unit **304**, the reception control unit **305**, the monitor unit **306**, or those corresponding to a part of them shown in FIG. **2**) to which nighttime power supply is applied, and non-dotted-line portions (corresponding to, for example, the transmission buffer unit **302**, the reception control unit **305**, etc.) to which non-nighttime power supply is applied.

The dotted line portion in the LAN controller **1510** functions as a monitor unit (corresponding to the reception control unit **305** and the monitor unit **306** shown in FIG. **2**) for monitoring whether or not data of any of a plurality of patterns has been received in response to an inquiry from an external unit through the LAN I/F **1509**. The plurality of patterns include at least the first activation instruction including the identification information specifying the print control apparatus explained by referring to the first and second embodiments.

The non-dotted-line portion in the LAN controller **1510** functions as a communications unit. When any pattern is recognized by the monitor unit, an activation signal (the PME signal shown in FIG. **15**) is issued for recovery of the control

unit **1502** from the deep sleep status. When the PME activation signal is issued, the non-nighttime power supply is applied, and control is passed to the second power supply status. Then, the dotted line portion in the LAN controller **1510** is made to correspond to the first interface in the first and second embodiments, and the non-dotted-line portions of the LAN controller together with the other portions correspond to the second interface.

The plurality of patterns are registered in MAC ROM **1511** (corresponding to the settings of the activation condition to the monitor unit **306**), and is read by the LAN controller **1510** when the initializing process is performed. The non-nighttime power supply can be applied to the MAC ROM **1511**. The MAC ROM **1511** can store a plurality of specific data patterns as monitor targets so far as a predetermined capacity is not exceeded.

As practical examples of an activation condition registered in the monitor unit explained above by referring to the first and second embodiments, as a plurality of patterns, for example, there can be (1) a pattern of an ARP (address resolution protocol) packet whose target IP address is the IP address of the home apparatus, (2) a multicast packet, a broadcast packet, etc. having a pattern including communications information addressed to a non-specific device, a unique identifier for use in power supply control. That is, a non-specific device as a destination refers to a plurality of printers as destinations by adopting a multicast address, a broadcast address, etc.

The explanation is given below by referring to the correspondence with the first and second embodiments. The destination IP address in the ARP packet in (1) is made to correspond to the destination address field **701** shown in FIG. **7**, and the pattern of the ARP packet (a combination of a frame time, a protocol ID, and a destination port number) can correspond to the data pattern of the **704** and **705**. The communications information using a non-specific device in (2) as a destination can make the destination **701** explained by referring to FIG. **7** correspond to the broadcast address, and the unique identifier used in power supply control correspond to the data pattern **704** and **705**.

Described below is the deep sleep according to the present embodiment. The image processing control unit **1501** having the configuration shown in FIG. **15** applies nighttime power supply to the minimal portions required to recover from the status in which print data cannot be received from an external device in each block in the image processing control unit **1501** such as the SDRAM **1504**, the operation display unit operation display unit **1508**, an extension interface **1512**, the LAN controller **1510**, the LAN I/F **1509**, a power supply switch circuit **1517**, etc., or processed, or in which no reply can be made to a status request unless an interrupt signal is detected for a predetermined time after a timer is activated, and cuts off the power supply to other function blocks. This corresponds to the first power status **401** explained by referring to FIG. **4** according to the first and second embodiments. In the present embodiment, the first power status in the first and second embodiments is referred to as the deep sleep status and explained below.

The communications information can be, for example, the information for data communications such as a destination Ether address of Ether Frame, a destination IP address of IP Frame, a source port number, a destination port number, etc.

A unique identifier for use in power supply control can be, for example, what can be interpreted as a pattern of a trigger for recovery of a printer from the deep sleep such as an operation code, a specific character string, etc.

Not only a printer but also a host computer is provided with a generation unit (an application, a communications module, a printer driver, etc.) for generating a unique pattern.

A power supply unit **1514** includes nighttime power supply **1515** and non-nighttime power supply **1516**. The nighttime power supply **1515** is a supply to a dotted line block shown in FIG. **16** in the deep sleep status described later. When the image processing control unit **1501** recovers from the deep sleep status, power is supplied to the non-dotted-line block shown in FIG. **15** from the non-nighttime power supply **1516**.

The power supply switch circuit **1517** has the function of controlling the supply of power to each block from the nighttime power supply **1515** or the non-nighttime power supply **1516** included in the power supply **1514**. For example, a configuration of supplying power when a deep sleep activation signal is input using an FET (field effect transistor) IC chip can realize an operation with lower power supply.

Switching process is performed such that power can be applied to each non-dotted-line block shown in FIG. **15** from the nighttime power supply **1515** when the power supply activation instruction signal (PME) issued from the operation display unit **1508**, the extension interface **1512**, the LAN controller **1510**, etc. is input to the power supply switch circuit **1517**, and a power supply activation signal is applied from any block to a power supply switch circuit.

FIG. **16** is a flowchart of the process performed by the control unit **1502**, and corresponds to the detailed process of the network interface unit **202** according to the first and second embodiments.

First, in step S**1601**, it is determined whether or not there is any external input for a first predetermined time (for example, for 5 minutes). External input can be, for example, print data (print request), etc. If it is determined "NO", the determining process in step S**1601** is repeated until the first predetermined time has passed.

The determining process in step S**1601** can be the process of monitoring the occurrence of an event. That is, an event issued when the first predetermined time passes is monitored.

As a case in which it is determined "YES" in step S**1601**, there is an issue of a command to forcibly pass control from the **1508** and the extension interface **1512** to light sleep (explained later in detail), and various conditions can be applied.

If YES in step S**1601**, the power supply to a printer engine is suppressed in step S**1602**. The power saving to the printer engine can be cutoff or reduction in power supply to an extent of maintaining preheat of a printer engine. The power status attained in step S**1602** is referred to as light sleep. For example, the second power supply status in the first and second embodiments corresponds to the light sleep.

In step S**1603**, it is determined whether or not there is external input for a second predetermined time (for example, for another 5 minutes after the passage of the first predetermined time). External input can be, for example, a request for various statuses of a printer, print data, instruction input, etc. through an operation display unit.

As a case in which it is determined "YES" in step S**1603**, there is an issue of a command to forcibly pass control from the **1508** and the extension interface **612** to deep sleep.

When it is determined YES in step S**1603**, it is determined in step S**1604** whether or not the setting are made to pass control to the deep sleep mode. The determination is realized by any block of the control unit **1502** or the image processing control unit **1501** referring to a flag stored in the power-saving mode setting unit **1513**. A power-saving mode setting unit **1513** holds the setting as to whether or not control is passed to the deep sleep mode.

On the other hand, if it is determined NO in steps S**1603** and S**1604**, control is passed to step S **1611**, and external access is monitored by the LAN controller **1510**.

On the other hand, if it is determined YES in step S**1604**, then various parameters and the initialization data of various main programs, etc. read by the image processing control unit **1501** (or the control unit **1502**) during the initializing process are saved in the SDRAM **1504** for a high-speed recovery in step S**1605**. When power supply control is performed to stop the local I/F controller **1506** (local communications control means), the setting data to the local communications control means is also temporarily saved by saving means in storage means.

When the saving process in the SDRAM **1504** is completed, the power supply from the non-nighttime power supply **1516** is cut off in step S**1606**. Practically, a switching signal is transmitted to the power supply switch circuit **1517** to cut off the power supply from the non-nighttime power supply, the power supply switch circuit **1517** operates, and the power supply from the non-nighttime power supply is stopped. Thus, the power supply to the non-dotted-line portion shown in FIG. **15** is cut off, and the image processing control unit **1501** enters the deep sleep status with the standby power of 1 W or less. Power saving is performed to stop the function of not only the control unit **1502**, but also the non-dotted-line portion (communications control unit which passes external data to the control unit **1502**) of the LAN controller **1510**, thereby realizing a higher power-saving effect than by a communications unit.

In step S**1607**, event input to indicate the recovery from the deep sleep is monitored. Practically, the PME in FIG. **15** is input to the power supply switch circuit **1517**, and it is determined YES in step S**1607**. The event monitoring process in step S**1607** can be realized by the hardware configuration as the power supply switch circuit **1517**, and by software.

When it is determined YES in step S**1607**, it is determined in step S**1608** whether or not a recovery from deep sleep can be performed. As compared with the first and second embodiments, the recovery from deep sleep in step S**1608** corresponds to the process in step S**1303**.

If it is determined YES in step S**1608**, various parameters saved in the SDRAM **1504** and the main program are read from the control unit **1502** in step S**1609**.

In step S**1609**, the read parameters include the configuration information written to the register unit of the local I/F controller **1506**. For example, the USB version information, etc. is included. Thus, while saving the power supply of the local I/F (USB) controller **1506**, it is not read again the initialization data from the HDD, etc. when the deep sleep is restored, thereby realizing a high-speed recovery.

In step S**1610** after the process in step S**1609**, the power status is restored to the status of light sleep. In the light sleep status, communications can be performed with an external device through the LAN and the USB without operating the hard disk **1503** and the printer engine. At this time, power is applied also to the non-dotted-line portion (communications control unit for passing external data to the control unit **1502**) of the LAN controller **1510**.

The recovery to the light sleep in step S**1610** corresponds to the transfer to the status in which a reply can be made upon receipt of print data or in response to an external inquiry. After recovery to light sleep, the process after transfer to the subsequent step in step S**1611** is performed at various commands from the external device. It is also possible to include a status request or a search and reply request instruction in a unique frame pattern explained by referring to FIG. **20**.

In step S**1611**, it is determined whether or not a reply about the status of the printer has been received from an external device. If it is determined YES, then after performing the replying process in step S**1615**, the time is reset in step S**1616**, and control is returned to S**1603**. Depending on the reading speed and the amount of read data in the SDRAM, it may require several seconds to restore from deep sleep to light sleep. In this case, it is assumed that an external request cannot be immediately answered. However, by allowing an external device to retry the request or adopting the time explained by referring to FIGS. **12** and **14** according to the first and second embodiments, a status reply can be made from the external device to the printer as a result. As compared with the first and second embodiments, the determination YES in step S**1611** corresponds to steps S**901** and S**903** shown in FIG. **9**.

On the other hand, if it is determined NO in step S**1611**, it is further determined in step S**1612** whether or not a print request has been received. If it is determined NO in step S**1612**, control is returned to S**1603**.

If it is determined YES in step S**1612**, power supply is controlled to supply power to the printer engine in step S**1613**, and various printout processing is performed in step S**1614**. After completing the printout processing in step S**1614**, control is returned to S**1601** again. As compared with the first and second embodiments, the process of determining in step S**1612** that there is a print request corresponds to the determination YES in step S**1305** shown in FIG. **13**. In FIG. **16**, the timer is set in step S**1304** as shown in FIG. **13**, and a process can be performed based on the timer value although not explained above.

By referring to FIG. **17**, the monitoring process up to the occurrence of a recovery signal from deep sleep including the monitoring process by the monitor unit of the LAN controller **1510** for monitoring the reception of data of any of plural types of patterns in response to an external inquiry is explained below. The flowchart shown in FIG. **17** can be performed in synchronization with the process in step S**1607** shown in FIG. **16**, and can also be concurrently performed as an independent routine. The process in each step in FIG. **17** is performed when an image processing control unit **1801** is in the deep sleep status. The step S**1701** is performed depending on the operation on the operation display unit **1508** shown in FIG. **15**. The processes in steps S**1702** to S**1705** correspond to the process performed by the LAN controller **1510** shown in FIG. **15**. When a signal is issued in the process in step S**1706**, it is determined YES in step S**1607** shown in FIG. **16**. Each step is described below in detail.

First, in step S**1701**, it is determined whether or not any operation has been performed on the operation display unit. An operation on the operation display unit can be, a press of a button provided for the operation display unit, and a contact on the liquid crystal screen when the operation display unit is a liquid display panel.

If it is determined YES in the determining process in step S**1701**, power is supplied to the local I/F controller **1506** as a result. An external device connected through the local I/F **1505** is positioned near a printer, and it is not necessary to energize the local I/F controller **1506** for connection to the local interface without reducing usability, thereby further improving the power-saving effect.

In step S**1702**, it is determined whether or not a packet addressed to the home apparatus has been received. Whether or not it is addressed to the home apparatus depends on the IP address, the MAC address, the device serial number, the device name contained in a packet. A packet addressed to the home apparatus can be an ARP packet.

In step S1703, it is determined whether or not there is an SLP multicast packet including a unique pattern has been received. A unique pattern is described in the extended portion of an SLP multicast packet, and data with an embedded unique pattern can appropriately be target data in step S1703. The destination address of the SLP packet shown in FIG. 20 can be a broadcast address.

In step S1704 it is determined whether or not there is a broadcast data containing a unique pattern has been received. In this case, broadcast data with an embedded unique pattern can be target data in step S1704.

In step S1705, it is determined whether or not there has been a PME signal issued through the extension interface 1512. For example, when a network interface card (not shown in the attached drawings) is connected through the extension interface 1512, a PME signal can be issued from the extension interface 1512 by providing the function similar to the 1509 and the LAN controller 1510 shown in FIG. 15. An INT signal from the network interface card (not shown in the attached drawings) can be a monitor target.

In step S1706, a recovery signal from the deep sleep is issued. By performing the process in step S1706, it is determined YES in step S1607 shown in FIG. 16.

Thus, according to the flowchart shown in FIG. 17, in response to an external inquiry, the reception of data of any pattern in plural types of patterns including a pattern containing the communications information having a non-specific device as a destination (having a multicast address or a broadcast address) and an identifier used in power supply control is monitored, and when data of any pattern is received through the LAN I/F 1509 and the LAN controller 1510 (first interface means), power can be supplied to the control unit 1502.

FIG. 18 is an explanatory view of an example of a variation of a print processing module shown in FIG. 5 explained by referring to the first and second embodiments. In the first and second embodiments, a magic packet as shown in FIG. 7 and a magic packet including the destination of a broadcast as an example of the activation instruction including the identification information specifying a printer to be created in the network module 506 are explained. FIG. 18 shows an example of a variation.

A function block having the same reference numeral has at least the function explained by referring to the first and second embodiments. The differences from the contents shown in FIG. 5 are mainly explained below.

In FIG. 18, the UI module 505A managing the UI display control of the job generation module and the UI module 5B managing the UI display control of the printer search/storage module are configured as different modules. It is obvious that, as in the first and second embodiments, one UI module can be designed.

A unique pattern holding/generation unit 507 holds information based on which a pattern determined in steps S1702 to S1704 shown in FIG. 17 is generated, and according to the held information, an activation instruction received on the printer in steps S1702 to S1704 is executed by the network module 506, and data based on a predetermined communications protocol is output.

As another example of a variation, a unique pattern holding/generation unit instruction unit can be included in the job generation module 502 and the printer search/storage module 503, and also in a port monitor and a network module.

By referring to FIG. 19, the application process using a packet having a unique pattern as explained by referring to step S1703 shown in FIG. 17 is explained.

First, in step S1901, a packet (unique packet in FIG. 19) including a unique pattern having a non-specific device registered in advance in the printer control unit 103 as a destination, which is described later in detail by referring to FIG. 20, is issued from the host computer 101 over a network. The unique pattern shown in FIG. 19 can be user-customized, and is described in detail by referring to FIGS. 21 and 22.

When it is issued, the printer control unit 103 (corresponding to the image processing control unit 1501 shown in FIG. 15) performs the process explained by referring to FIGS. 16 and 17. That is, in step S1901, if a unique pattern contained in an issued packet has been registered in the MAC ROM 1511 in advance, then it is determined YES in step S1703 shown in FIG. 17.

In step S1902, the reception of data of any pattern in plural types of patterns including a pattern containing the communications information having a non-specific device as a destination and an identifier used in power supply control is monitored by each of the printer control units 103 as described in FIG. 17. When the data of any pattern is received through the LAN controller 1510 (corresponding to a part of the network interface unit 202 according to the first and second embodiments excluding the communications unit required for a status reply, etc.), power is supplied to a control unit 106 and the non-energized part of the network controller.

As a result, in each printer control unit 103, in the printer control unit determined YES in step S1703 shown in FIG. 17, power control is performed from the deep sleep status (first power status) to the light sleep (second power status). Then, as described above, by passing control to the light sleep as described above, a reply can be made in response to various requests from the host computer.

In step S1903, a well-known status request (request or various information) is made for each printer control unit. When the status request is made in a broadcast, the reply from the printer control unit 103 which has changed into the light sleep status (second power status) is transmitted to the host computer, and no reply is obtained from the printer control unit which maintains the deep sleep.

By performing the flowchart shown in FIG. 19, various well-known instructions can be issued from the host computer to a printer which has changed into the light sleep status (second power status), that is, a plurality of specific printers.

As well-known various instructions, input of a print job, registration of resource information such as font, etc., a change in settings of a printer device, the detailed status of a printer device, etc. can be assumed.

FIG. 20 shows an example of a pattern issued by a host computer and monitored by the LAN controller 1510 on the printer side in step S1901 shown in FIG. 19. FIG. 20 shows an example of a specific pattern using a non-specific device registered in advance in a print control apparatus as a destination.

In FIG. 20, reference numerals 2001 to 2006 refer to parameter items marked with stars designate service request packets of SLP (service location protocol) and a plurality of devices are destinations. Especially, an SLP packet can be identified by a destination port number 2006, but a pattern capable of identifying an SLP can be included in a frame pattern 2007. The reference numeral 2007 designates a unique frame pattern which is an identifier for use in power supply control in the printer. The unique frame pattern can be optionally set by a printer providing side or a user side, and a device group assumed by the printer providing side or the user can be collectively used for recovery from the deep sleep. Thus, only necessary equipment can be searched for over the network, and a network can be searched when a printer driver is set up. Although only one item is indicated in the unique

frame pattern **2007** shown in FIG. **20**, a plurality of items are included in forming a unique frame pattern.

An external device can collectively activate a plurality of printers capable of interpreting the unique frame pattern **2007** by a simpler operation by an inquiry using the data as shown in FIG. **20** through a multicast to a plurality of printers.

A pattern including the communications information using a non-specific device as a destination and an identifier used in power supply control is not limited to an example of a pattern of an SLP packet example shown in FIG. **20**, but can include a uniquely created unique identifier (unique frame pattern). In addition, for example, an identifier used in power supply control can be included in an item for identifying an SLP packet (communications information using a non-specific device as a destination). For example, the printer can be restored from the deep sleep status based on the interpretation of an imaginary value by setting the imaginary value as a "source port number" shown in FIG. **20**.

Thus, by allowing the monitor unit of the LAN controller **1510** to monitor a plurality patterns, various instructions relating to the printing from an external device can be used. For example, by issuing an ARP packet when a print job is input to the printer using a printer driver, etc. from the external device loaded with Windows (registered trademark), the printer can be restored from the deep sleep in advance. When a plurality of printers are searched for in an external device over a network, the printer can be restored from the deep sleep and the search can be performed by issuing a broadcast and a multicast packet including unique data pattern. As a result, the power-saving effect can be improved on the control unit **1502** and the communications control unit (a part of the LAN controller **1510**), and the usability of the printer can be maintained for the user.

FIGS. **21**A and **21**B show examples of flowcharts for explanation of the process of registering in the printer control unit **103** (MAC ROM **1511** shown in FIG. **15**) the pattern including the communications information and an identifier for power supply control using a user desired non-specific device as a destination as explained above by referring to FIGS. **19** and **20**. FIG. **21**A shows the process on the host computer, and FIG. **21**B shows the process on the printer.

First, the process on the host computer shown in FIG. **21**A is explained. In response to the search instruction in the host computer (for example, corresponding to the press of a search button **2204** shown in FIG. **22**), the host computer **101** issues a search packet including a unique frame pattern commonly registered in the MAC ROM **1511** of a plurality of printer over a network in step S**2101**. For example, when the unique frame pattern **2007** explained by referring to FIG. **20** is commonly registered in a plurality of printers, the host computer can issue data shown in FIG. **20** in step S**2101**.

In response to the issue of a search packet in step S**2101**, the status of each per changes from the first power status to the second power status.

In step S**2102**, a reply of a search packet issued in step S**2101** from the printer control unit **103** of any of the plurality of printers is received. One or more printers which makes a reply.

In step S**2103**, a printer attribute such as a printer name and the status are obtained for each printer in the reply. The obtaining process in step S**2103** can be realized by including a device information obtain request in the search packet in step S **2101**.

In step S**2104**, the display control on the display unit is performed according to the device information obtained in step S**2103**. FIG. **22** shows an example of display on a display unit. In FIG. **22**, three printers return replies, and three printers obtain device information.

In step S**2104**, it is determined whether or not a set instruction has been issued for the search button **2204** shown in FIG. **22**. When it is determined YES in step S**2104**, a pattern input in a setting pattern input unit **2203** is transmit and set to one or more devices selected from a device list in step S**2106**.

In step S**2107**, a soft reset request is issued to one or more printers to which a reply indicating that the settings are accepted is received and the reply is made in response to the reception from one or more printers which issue a set instruction of a unique pattern in step S**2106**.

The process of the printer shown in FIG. **21**B is explained. The important point is that the process shown in FIG. **21**B is performed by each of the plurality of printers.

In step S**2111**, based on the process in step S**2106**, it is determined whether or not a set instruction of a unique pattern issued by the host computer has been received.

If it is determined YES in step S**2111**, the MAC ROM **1511** sets and registers the received unique pattern in step S**2112**.

In step S**2113**, it is determined whether or not there is a reset instruction. The reset instruction here corresponds to an issue of the soft reset request of S**2108**.

If it is determined YES in step S**2114**, a reset process is performed, and an initializing process is performed, and new settings become effective later.

In the case shown in FIG. **19**, according to the flowchart shown in FIG. **21**, a unique pattern is registered in advance in the printer control units **1301-1** and **1301-3**.

On the other hand, a unique pattern issued by the host computer **102** is not registered in advance in the printer control unit **1301-2**, and deep sleep (first power status) is maintained. As a result, a printer not desired by the user can be protected against useless recovery from deep sleep to light sleep, thereby realizing more efficient power-saving process.

Furthermore, by the process of the flowchart shown in FIG. **21**, the printer control unit **103-2** shown in FIG. **19** can be restored from deep sleep to light sleep. That is, a unique pattern contained in a packet and issued in S**1901** shown in FIG. **19** and contained in a packet, can be input through the user interface shown in FIG. **22**, and the process of the flowchart shown in FIG. **21** can be performed.

FIG. **22** shows an example of the user interface for registration of a unique pattern in each printer control unit **103**, and shows the display by the UI module **505**B shown in FIG. **18**.

In FIG. **22**, a search button **2201** searches the printer control unit **103** on the network **102**, and corresponds to the issue of a search packet in step S**2101** shown in FIG. **21**.

A printer list window **2202** displays a list of the printer control units **103** detected as a result of the search, and a set instruction of a unique pattern is issued by the host computer in step S**2106** to a printer selected through a pointing device such as a mouse, etc.

A setting pattern input unit **2203** inputs a unique pattern, and an input unique pattern is set by the host computer to each printer.

In FIGS. **21** and **22**, the host computer registers a unique pattern to the MAC ROM **1511** of the printer (printer control unit **103**). However, the present invention is not limited to this application. For example, a unique pattern is input from an operation unit of each printer and can be registered in the MAC ROM **1511**.

This application claims priority from Japanese Patent Applications No. 2003-412488 filed Dec. 10, 2003 and No. 2004-346344 filed on Nov. 30, 2004, which is hereby incorporated by reference herein.

What is claimed is:

1. An information processing apparatus for performing a communication via a network with a print control apparatus which activates a second interface unit in response to reception of a first activation instruction through a first interface unit, said information processing apparatus comprising:

a first instruction control unit configured to transmit, via the network, upon input of a print instruction via a printer driver by a user, the first activation instruction to the print control apparatus for shifting the print control apparatus from a first power status in which no print job can be received to a second power status in which a print job can be received but cannot be processed;

a reception unit configured to receive, from the print control apparatus via the network, information indicating that the print control apparatus has activated a communication function of the second interface in response to the first activation instruction transmitted by said first instruction control unit; and

an output control unit configured to output, via the network without an instruction by the user, a print job to the print control apparatus for shifting the print control apparatus from the second power status to a third power status in which the print job can be processed and for controlling the print control apparatus to process the print job, after the reception unit receives the information from the print control apparatus,

wherein power consumed in the second power status is larger than power in the first power status and power consumed in the third power status is larger than power in the second power status.

2. The information processing apparatus according to claim **1**, wherein the output control unit does not output the print job for a predetermined time after transmitting the first activation instruction.

3. The information processing apparatus according to claim **1**, further comprising:

a confirmation unit configured to confirm a notification of establishment of a communication facility of the second interface unit from the print control apparatus after the first activation instruction, wherein

after confirming the notification of the establishment of the communication facility of the second interface unit by the confirmation unit, the output control unit outputs the print job.

4. The information processing apparatus according to claim **1**, further comprising:

a second instruction control unit configured to issue a second activation instruction to activate a second interface unit of a print control apparatus connected to the network;

a search unit configured to search for identification information about the print control apparatus after issuing the second activation instruction; and

an obtaining unit configured to obtain identification information from the print control apparatus in response to the search by the search means, wherein the first instruction control unit transmits the identification information obtained by the obtaining unit in the first activation instruction.

5. The information processing apparatus according to claim **4**, further comprising:

a first setting control unit configured to set and associate the identification information obtained by the obtaining unit with an output port of a logical printer corresponding to the information processing apparatus device.

6. The information processing apparatus according to claim **4**, wherein the second instruction control unit transmits the second activation instruction to a plurality of print control apparatuses, and the first setting control unit sets identification information about a print control apparatus specified from among the plurality of print control apparatuses as associated with an output port of a logical printer corresponding to the specified print control apparatus.

7. The information processing apparatus according to claim **1**, further comprising:

a display control unit configured to display a setting screen for setting the identification information and inputting the identification information; and

a second setting control unit configured to set the identification information input through the setting screen displayed by the display control means as identification information to be transmitted as included in first activation instruction.

8. The information processing apparatus according to claim **1**, further comprising:

an issue control unit configured to issue a specific pattern using a non-specific device registered in a print control apparatus as a destination, and when the specific pattern registered in advance is identified, the second interface unit is energized in the print control apparatus, and a specific pattern using the non-specific device as a destination is changed and registered.

9. An information processing method for performing communications via a network with a print control apparatus which activates a second interface unit in response to reception of a first activation instruction through a first interface unit, comprising:

a first instruction control step of transmitting, via the network, upon input of a print instruction via a printer driver by a user, the first activation instruction to the print control apparatus for shifting the print control apparatus from a first power status in which no print job can be received to a second power status in which a print job can be received but cannot be processed;

a reception control step of receiving, from the print control apparatus via the network, information indicating that the print control apparatus has activated a communication function of the second interface in response to the first activation instruction transmitted by said first instruction control step; and

an output control step of outputting, via the network without an instruction by the user, a print job to the print control apparatus for shifting the print control apparatus from the second power status to a third power status in which the print job can be processed and for controlling the print control apparatus to process the print job, after the reception step receives the information from the print control apparatus,

wherein power consumed in the second power status is larger than power in the first power status and power consumed in the third power status is larger than power in the second power status.

10. The information processing method according to claim **9**, wherein the output control step does not output the print job for a predetermined time after transmitting the first activation instruction.

11. The information processing method according to claim **9**, further comprising:

confirmation step of confirming a notification of establishment of a communication facility of the second interface unit from the print control apparatus after the first activation instruction, wherein

after confirming the notification of the establishment of the communication facility of the second interface unit by the confirmation step, the output control step outputs the print job.

12. The information processing method according to claim **9**, further comprising:

a second instruction control step of issuing a second activation instruction to activate a second interface unit of a print control apparatus connected to the network;

a search step of searching for identification information about the print control apparatus after issuing the second activation instruction; and

an obtaining step of obtaining identification information from the print control apparatus in response to the search by the search means, wherein

the first instruction control step transmits the identification information obtained by the obtaining step in the first activation instruction.

13. The information processing method according to claim **12**, further comprising:

a first setting control step of setting and associating the identification information obtained by the obtaining step with an output port of a logical printer corresponding to the information processing device.

14. The information processing method according to claim **12**, wherein the second instruction control step transmits the second activation instruction to a plurality of print control apparatuses, and the first setting control step sets identification information about print control apparatus specified from among the plurality of print control apparatuses as associated with an output port of a logical printer corresponding to the specified print control apparatus.

15. The information processing method according to claim **9**, further comprising:

a display control step of allowing a display unit to display a setting screen for setting the identification information and inputting the identification information; and

a second setting control step of setting the identification information input through the setting screen displayed by the display control step as identification information to be transmitted as included in first activation instruction.

16. The information processing method according to claim **9**, further comprising an issue control step of issuing a specific pattern using a non-specific device registered in a print control apparatus as a destination, and when the specific pattern registered in advance is identified, the second interface unit is energized in the print control apparatus, and a specific pattern using the non-specific device as a destination is changed and registered.

17. A non-transitory computer-readable medium storing a computer-executable program used to direct an information processing apparatus for performing communications via a network with a print control apparatus which activates a second interface unit in response to reception of a first activation instruction through a first interface unit, comprising:

a first instruction control step of transmitting, via the network, upon input of a print instruction via a printer driver by a user, a first activation instruction to the print control apparatus for shifting the print control apparatus from a first power status in which no print job can be received to a second power status in which a print job can be received but can be processed;

a reception control of receiving, from the print control apparatus via the network, information indicating that the print control apparatus has activated a communication function of the second interface in response to the first activation instruction transmitted by said first instruction control step; and

an output control step configured to output, via the network without an instruction by the user, a print job to the print control apparatus for shifting the print control apparatus from the second power status to a third power status in which the print job can be processed and for controlling the print control apparatus to process the print job, after the reception step receives the information from the print control apparatus,

wherein power consumed in the second power status is larger than power in the first power status and power consumed in the third power status is larger than power in the second power status.

18. The non-transitory computer-readable medium storing a computer-executable program according to claim **17**, wherein the output control step does not output the print job for a predetermined time after transmitting the first activation instruction.

19. The non-transitory computer-readable medium storing a computer-executable program according to claim **17**, further comprising:

confirmation step of confirming a notification of establishment of a communication facility of the second interface unit from the print control apparatus after the first activation instruction, wherein

after confirming the notification of the establishment of the communication facility of the second interface unit by the confirmation step, the output control step outputs the print job.

20. The non-transitory computer-readable medium storing a computer-executable program according to claim **17**, further comprising:

a second instruction control step of issuing a second activation instruction to activate a second interface unit of a print control apparatus connected to the network;

a search step of searching for identification information about the print control apparatus after issuing the second activation instruction; and

an obtaining step of obtaining identification information from the print control apparatus in response to the search by the search means,

wherein the first instruction control step transmits the identification information obtained by the obtaining step in the first activation instruction.

21. The non-transitory computer-readable medium storing a computer-executable program according to claim **20**, further comprising a first setting control step of setting and associating the identification information obtained by the obtaining step with an output port of a logical printer corresponding to the information processing device.

22. The non-transitory computer-readable medium storing a computer-executable program according to claim **20**, wherein the second instruction control step transmits the second activation instruction to a plurality of print control apparatuses, and the first setting control step sets identification information about print control apparatus specified from among the plurality of print control apparatuses as associated with an output port of a logical printer corresponding to the specified print control apparatus.

23. The non-transitory computer-readable medium storing a computer-executable program according to claim **17**, further comprising:

a display control step of allowing a display unit to display a setting screen for setting the identification information and inputting the identification information; and

a second setting control step of setting the identification information input through the setting screen displayed by the display control step as identification information to be transmitted as included in first activation instruction.

24. The non-transitory computer-readable medium storing a computer-executable program according to claim **17**, further comprising an issue control step of issuing a specific pattern using a non-specific device registered in a print control apparatus as a destination, and when the specific pattern registered in advance is identified, the second interface unit is energized in the print control apparatus, and a specific pattern using the non-specific device as a destination is changed and registered.

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