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Hamada et al.

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(54) **RADIO COMMUNICATION APPARATUS AND RADIO COMMUNICATION METHOD, RADIO COMMUNICATION SYSTEM, RECORDING MEDIUM, AND COMPUTER PROGRAM**

(58) **Field of Classification Search**
USPC 455/41.2, 421; 370/338
See application file for complete search history.

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Reissue of:
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Issued: **Apr. 8, 2008**
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Filed: **Jan. 3, 2007**

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(74) *Attorney, Agent, or Firm* — Wolf, Greenfield & Sacks, P.C.

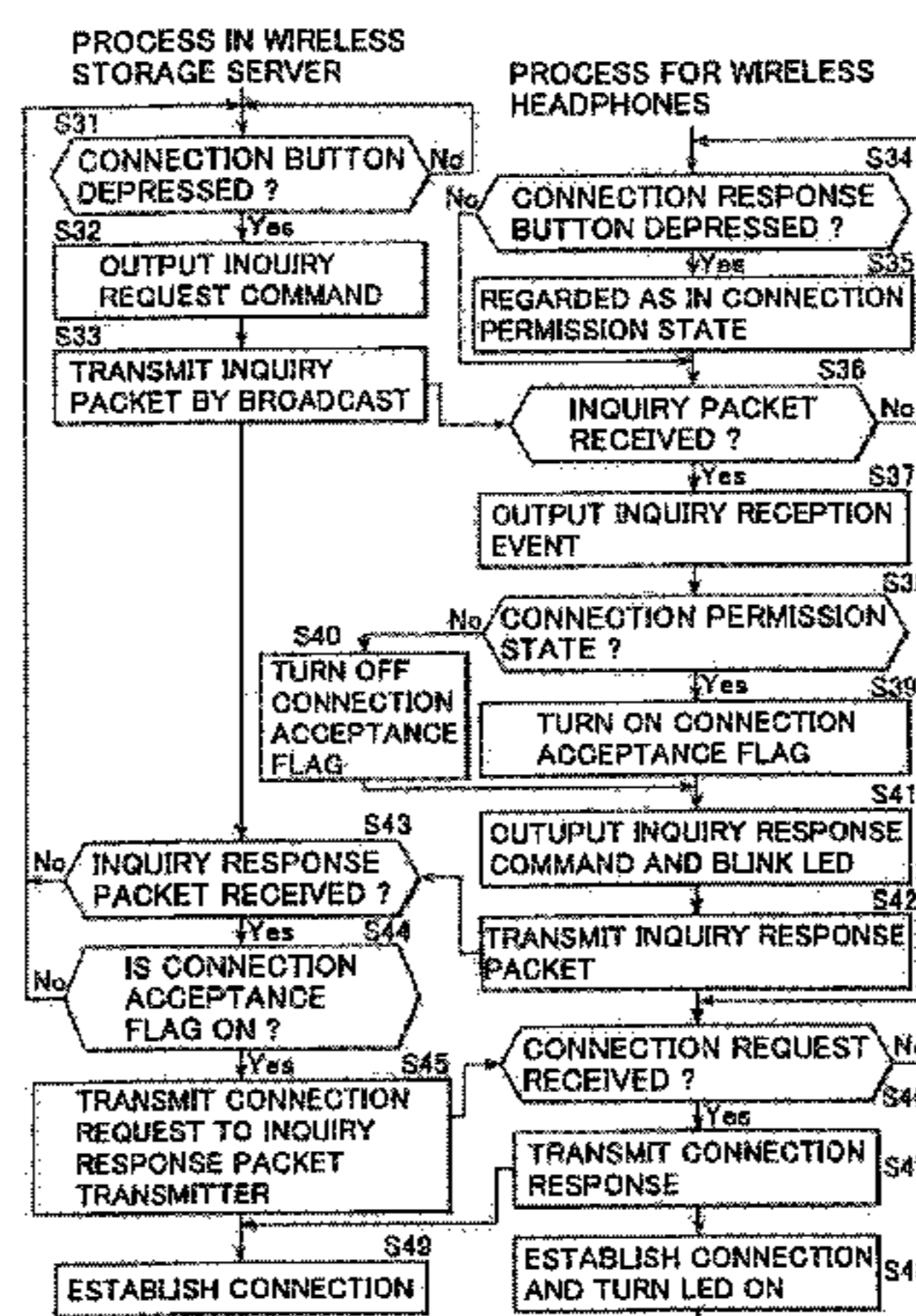
U.S. Applications:
(63) Continuation of application No. 12/756,024, filed on Apr. 7, 2010, now Pat. No. Re. 44,185, which is an application for the reissue of Pat. No. 7,356,308, which is a continuation of application No. 10/485,978, filed as application No. PCT/JP03/06505 on May 26, 2003, now Pat. No. 7,177,595.

(57) **ABSTRACT**
The present invention relates to a radio communication apparatus and a radio communications method, a radio communication system, a recording medium, and a computer program in which a response signal to an inquiry is returned to a master only when instructions to perform radio communications are issued. A CPU 51 blinks LED 56 when an inquiry signal is received, and transmits a response to the inquiry signal when a user who has referred to lighting of the LED 56 operates a connection response button 53. The connection response button 53 is operated when the user issues radio communications instructions with respect to the inquiry signal. In other words, even when wireless headphones 2 are within an area capable of radio communications with the master, only if the connection response button 53 is operated by the user, it sends to the master a response to the inquiry, and establishes connection. The present invention may be applied to a wireless storage server, wireless headphones, and audio reproduction apparatuses.

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H04W 4/00 (2009.01)
(52) **U.S. Cl.**
USPC **455/421; 455/41.2; 455/426.1; 455/550.1; 455/556.1; 455/565; 455/39; 370/328; 370/338; 340/539.1; 340/539.11**

54 Claims, 13 Drawing Sheets



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FIG. 1

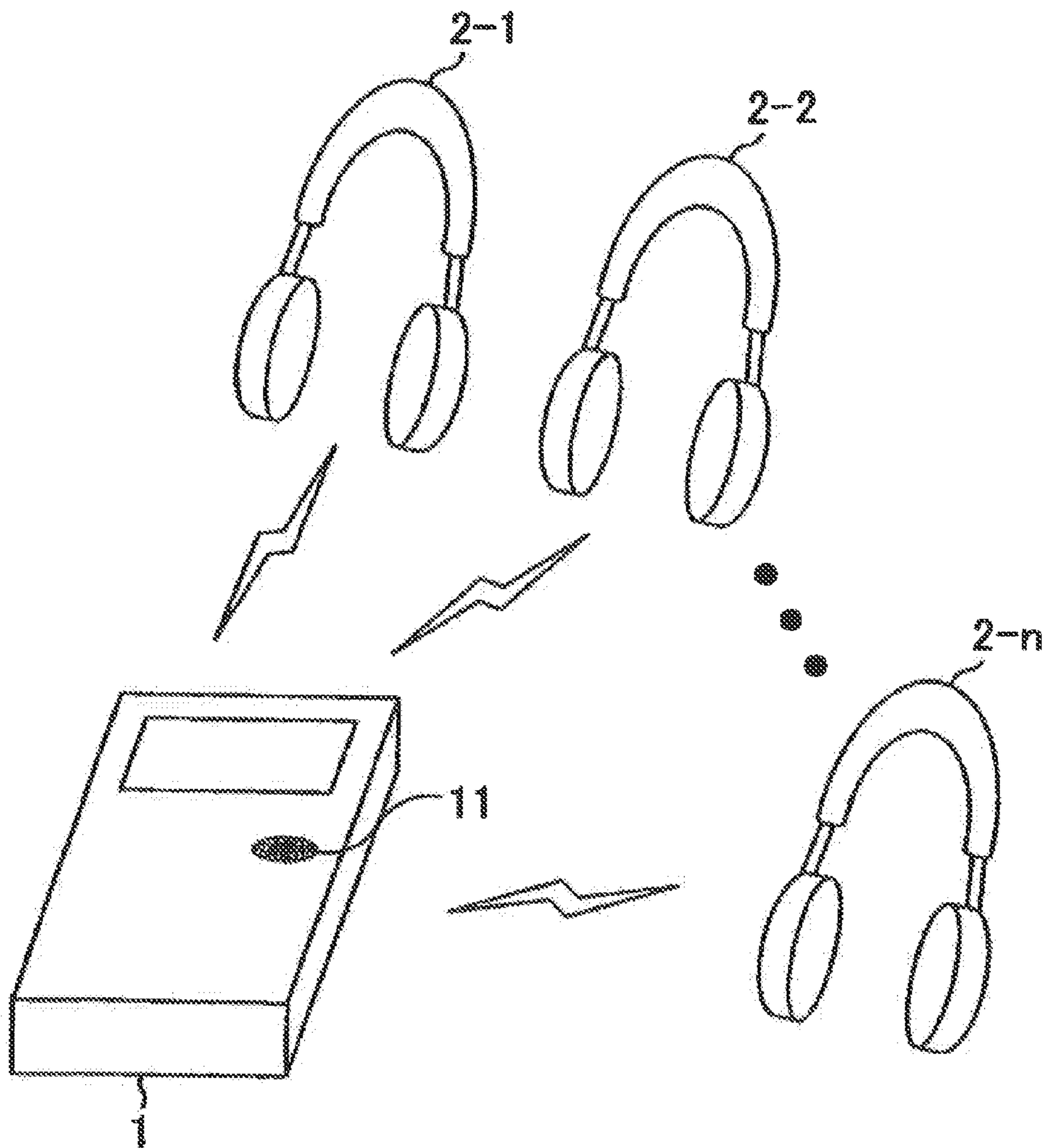


FIG.2

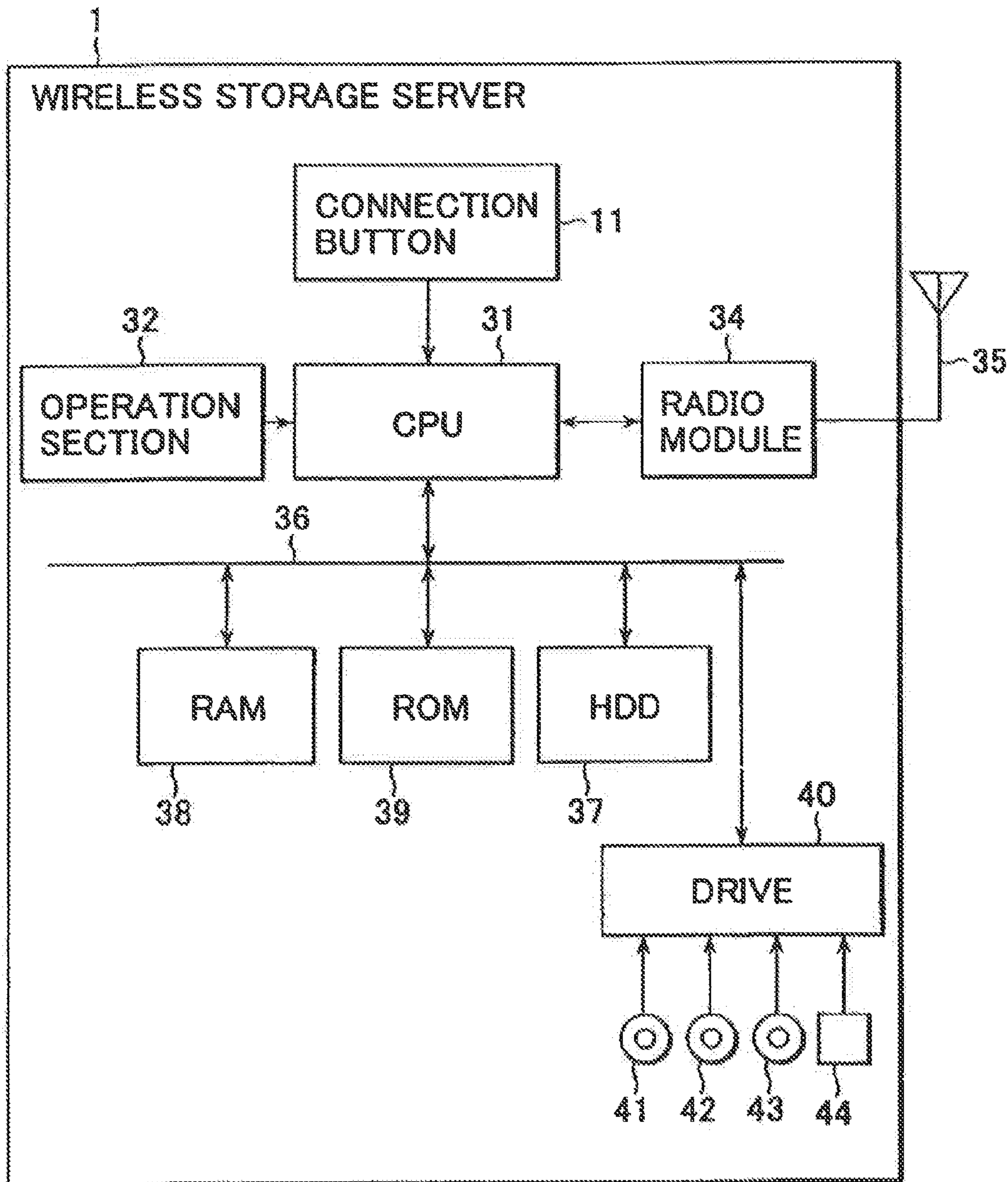


FIG. 3

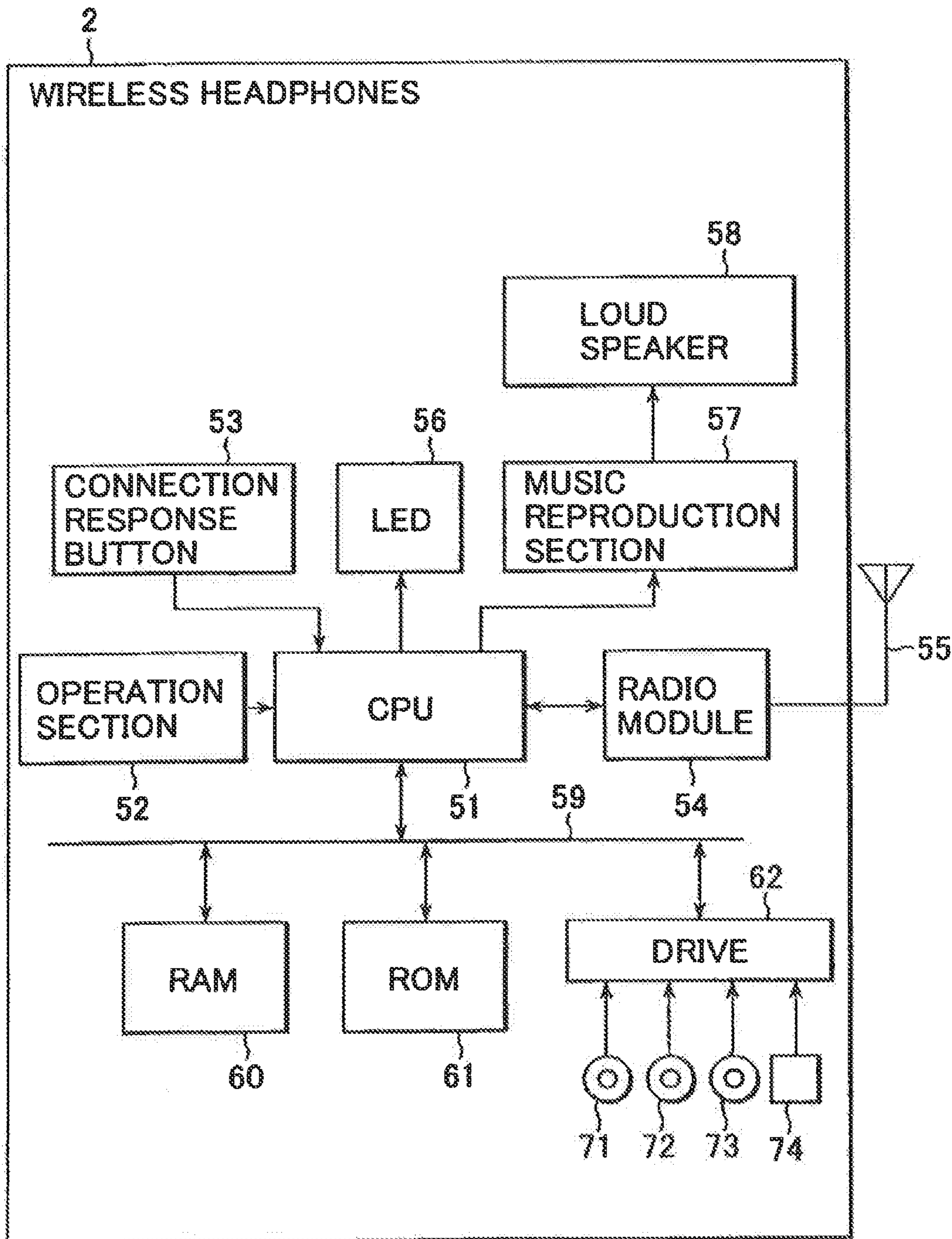


FIG.4

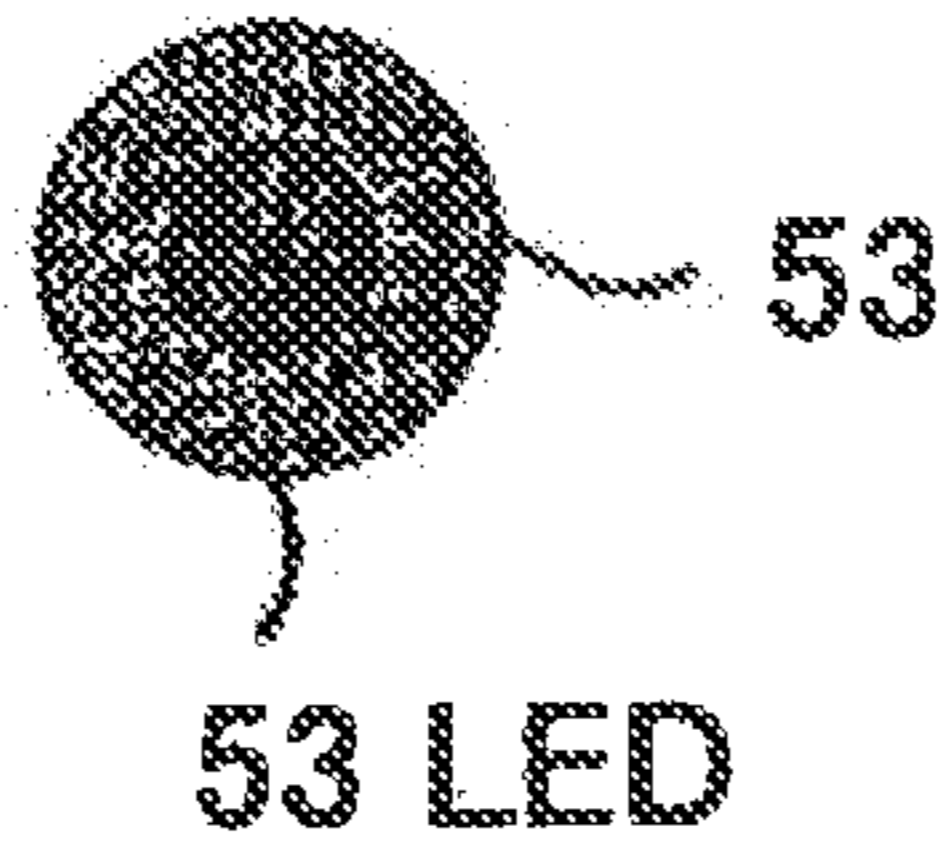


FIG.5

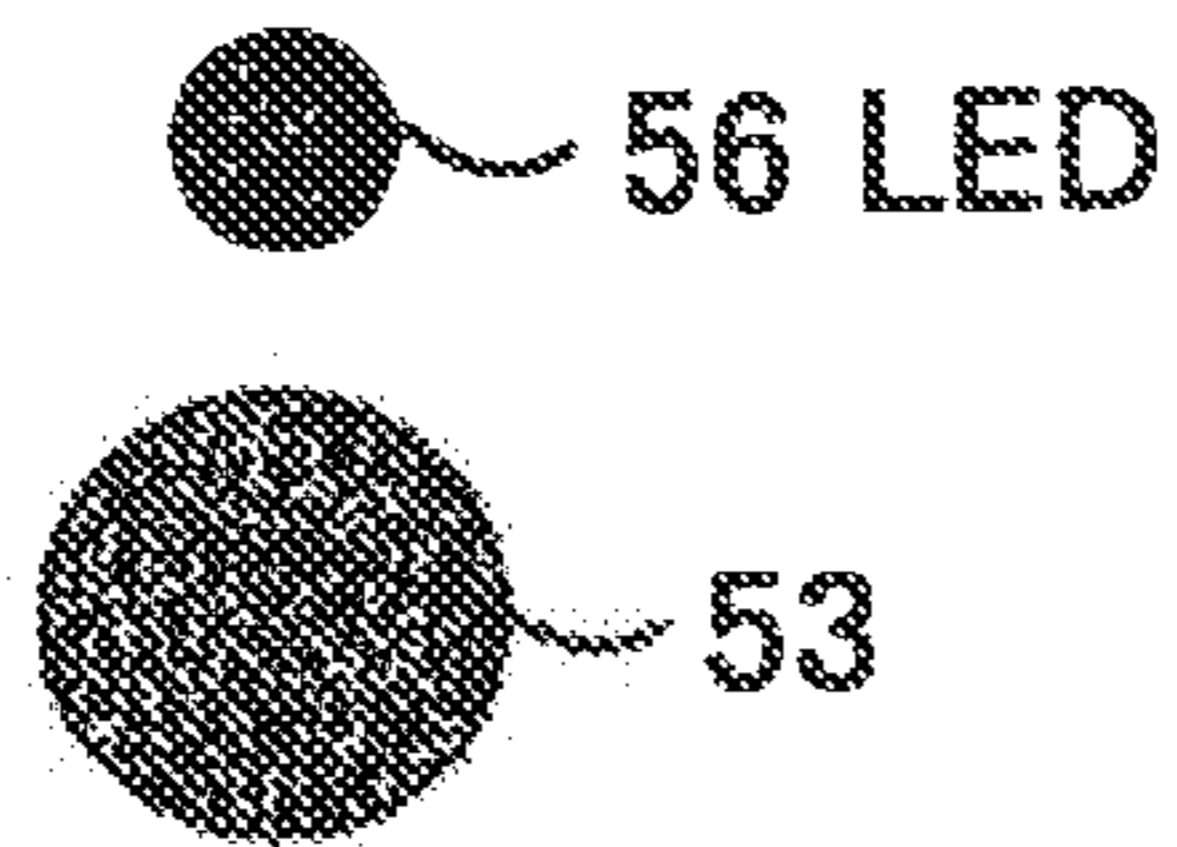


FIG.6

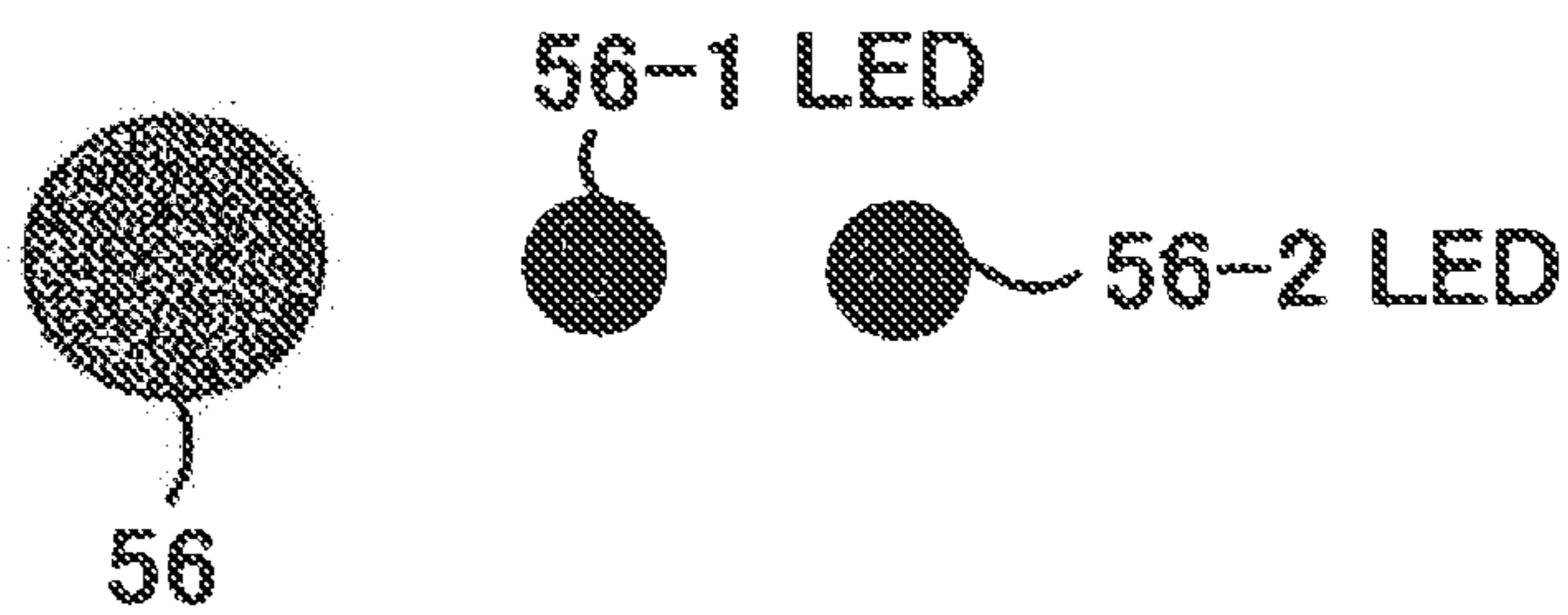


FIG. 7

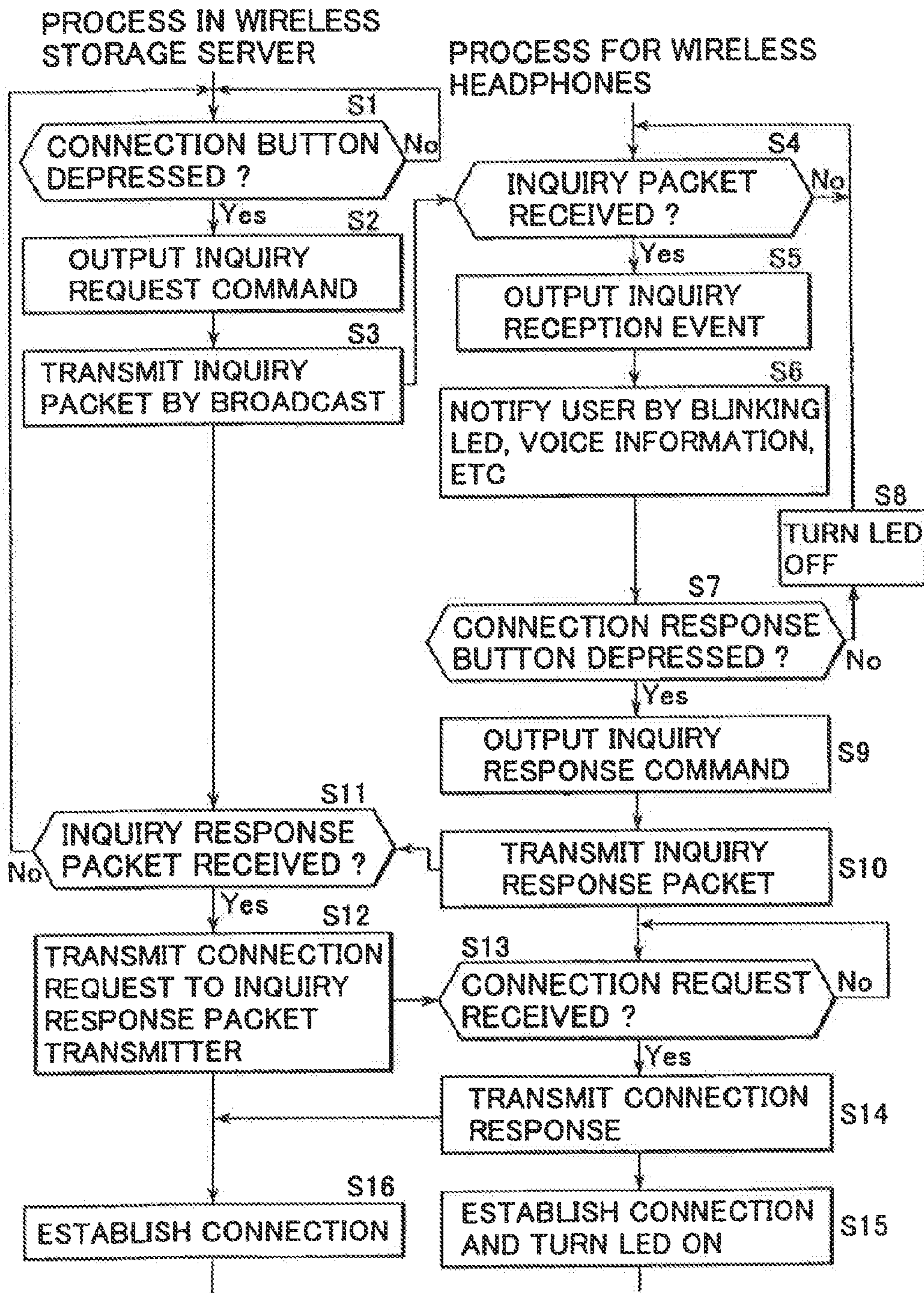


FIG.8

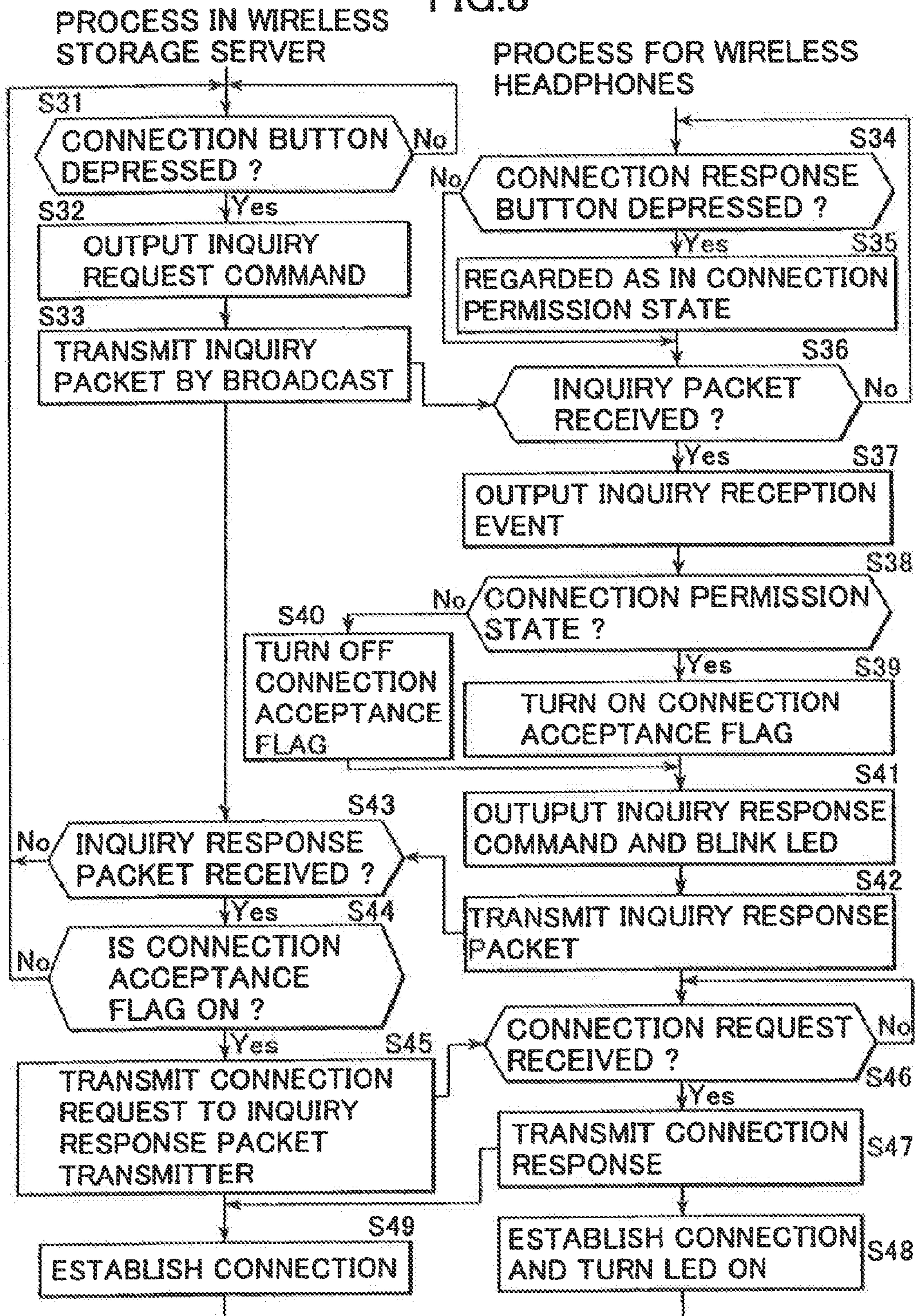


FIG.9

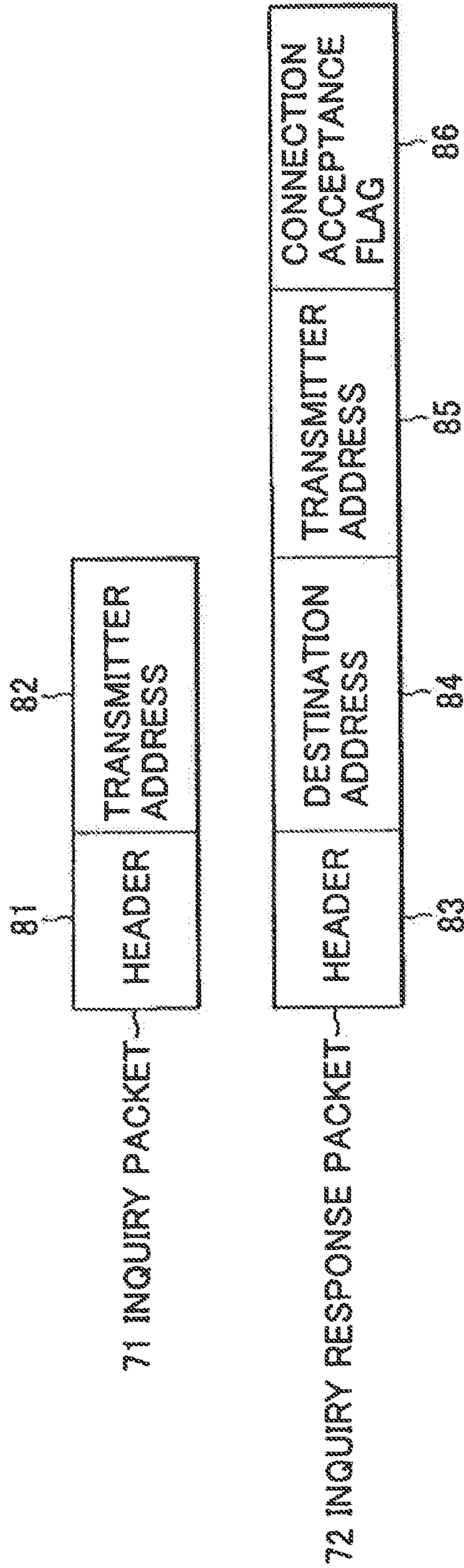


FIG. 10

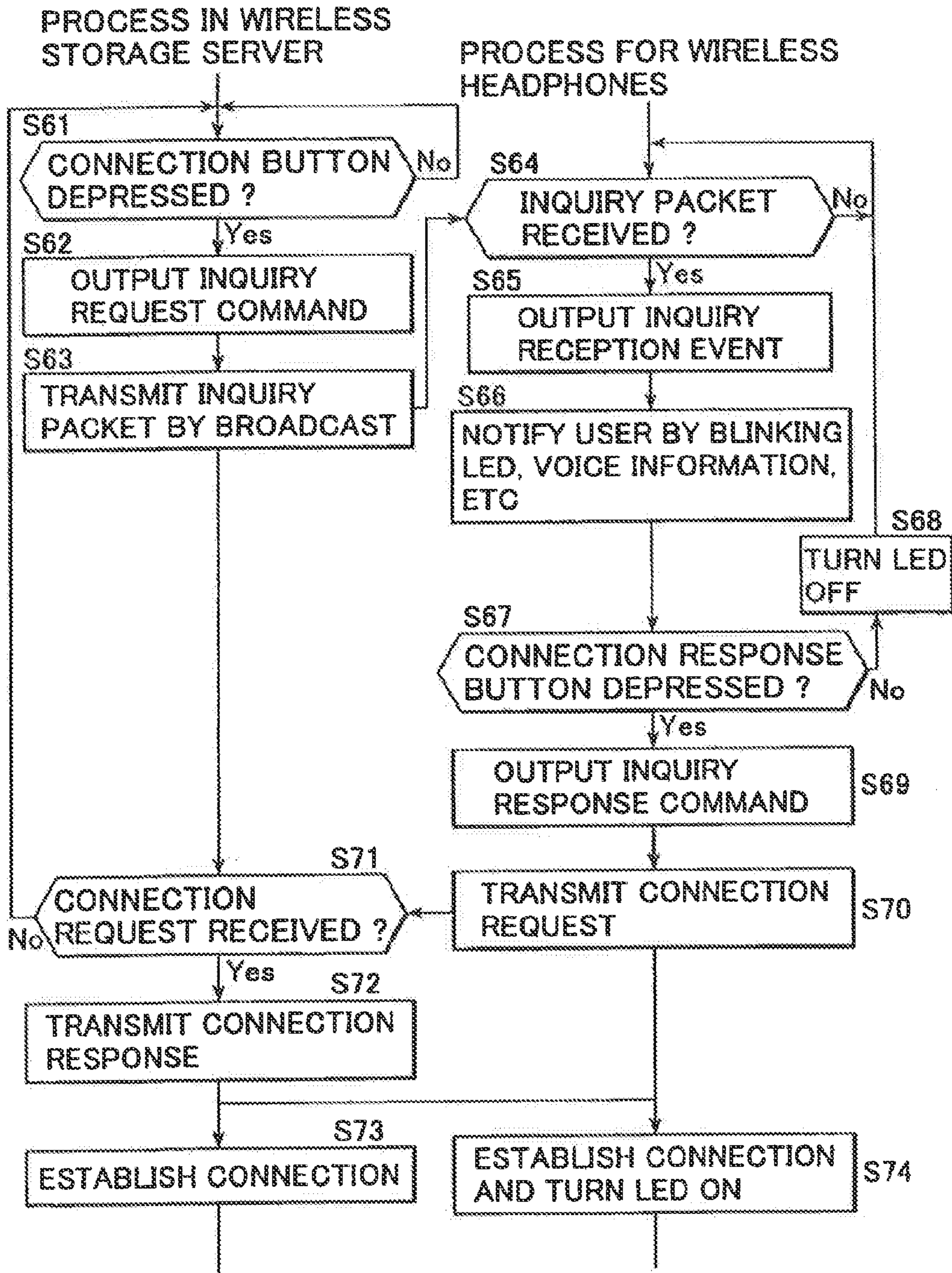


FIG.11

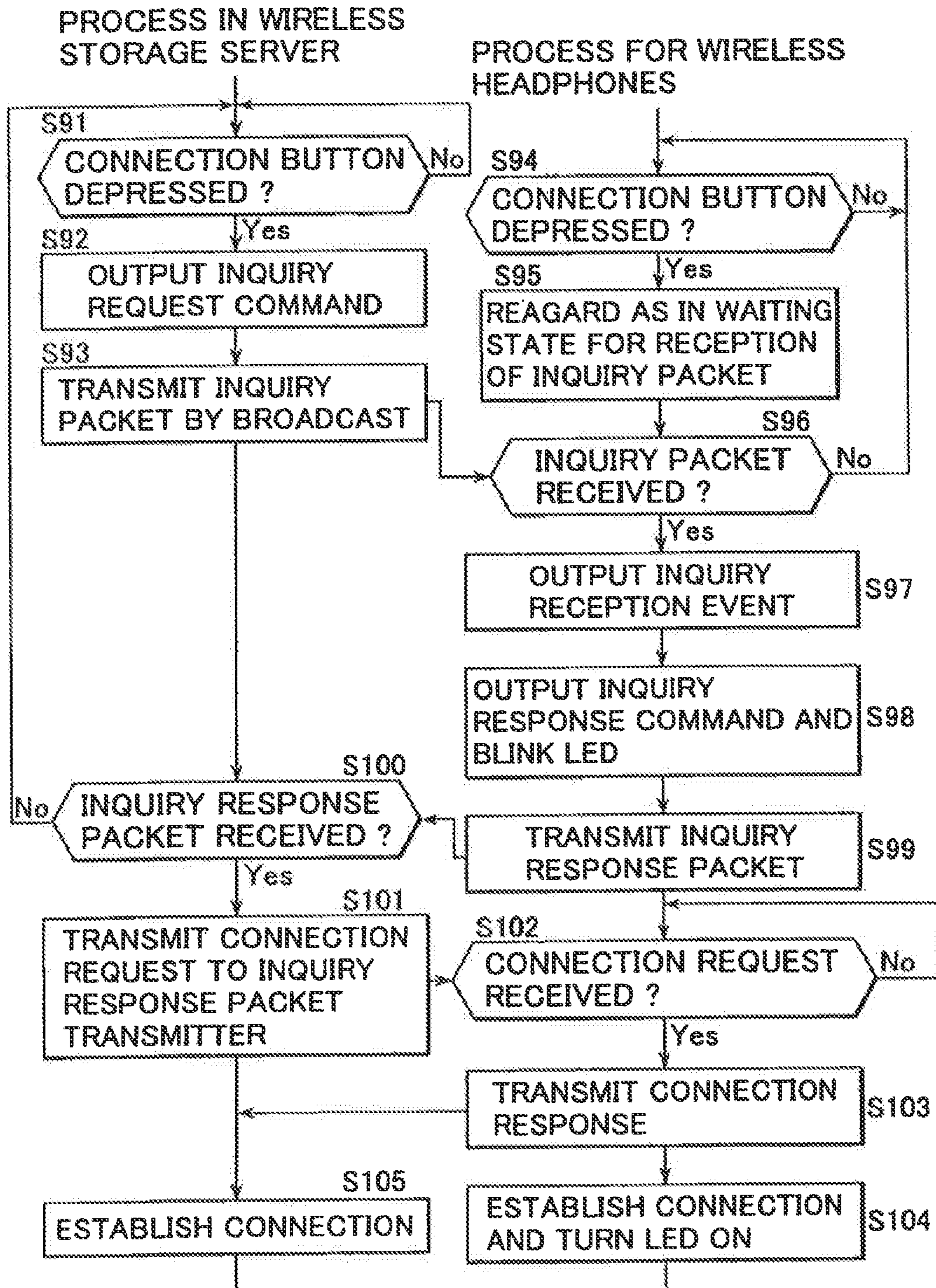


FIG.12

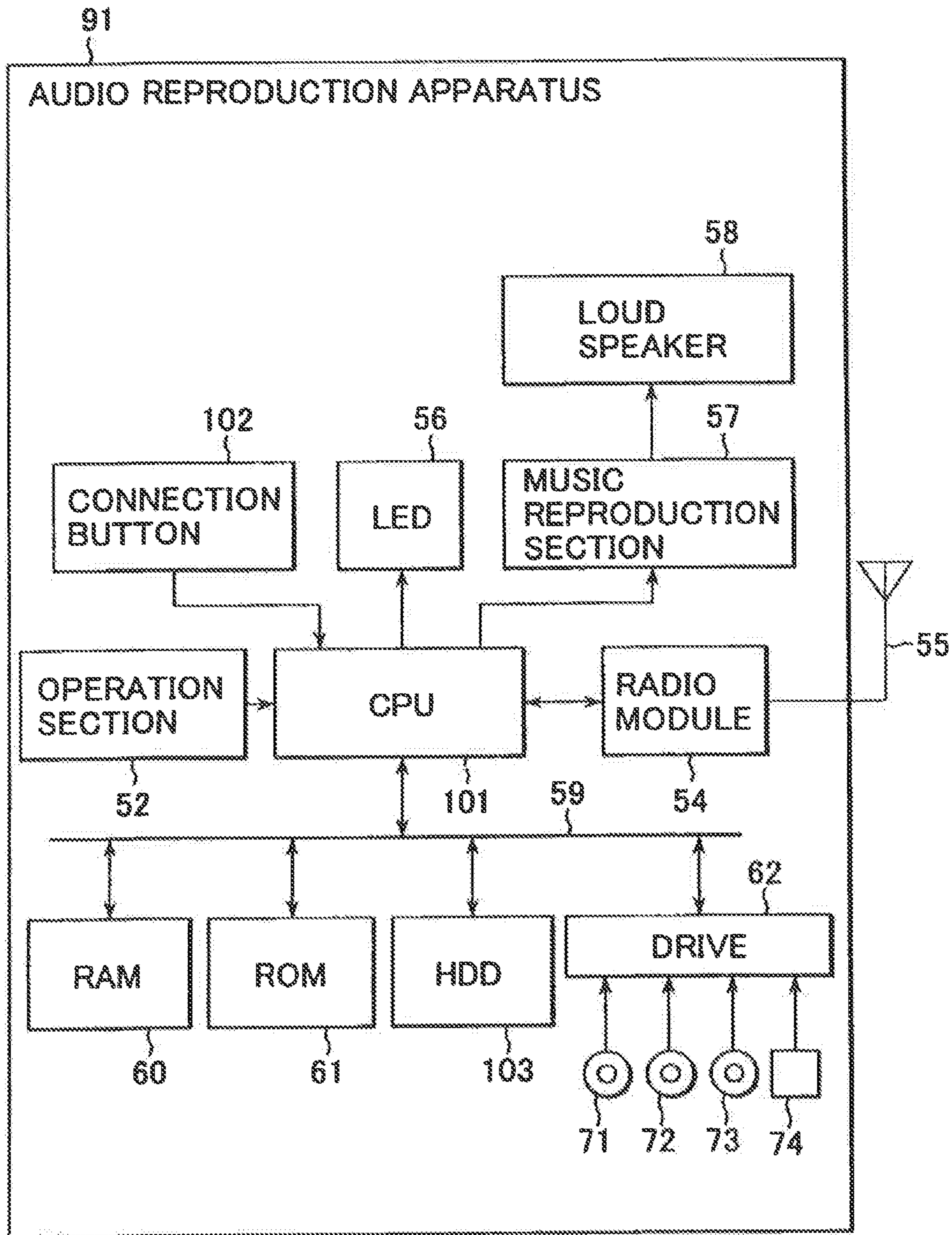


FIG. 13

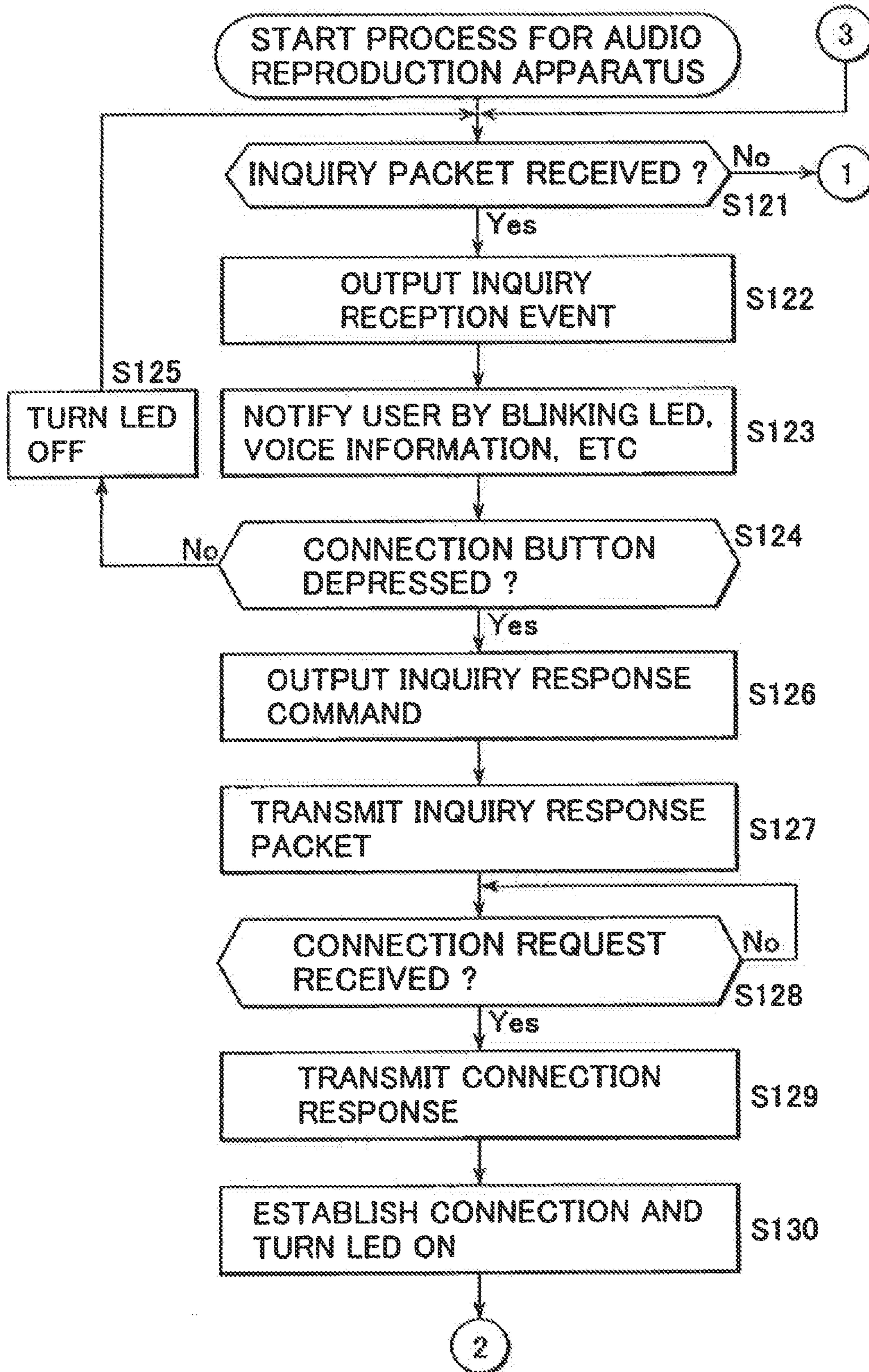


FIG. 14

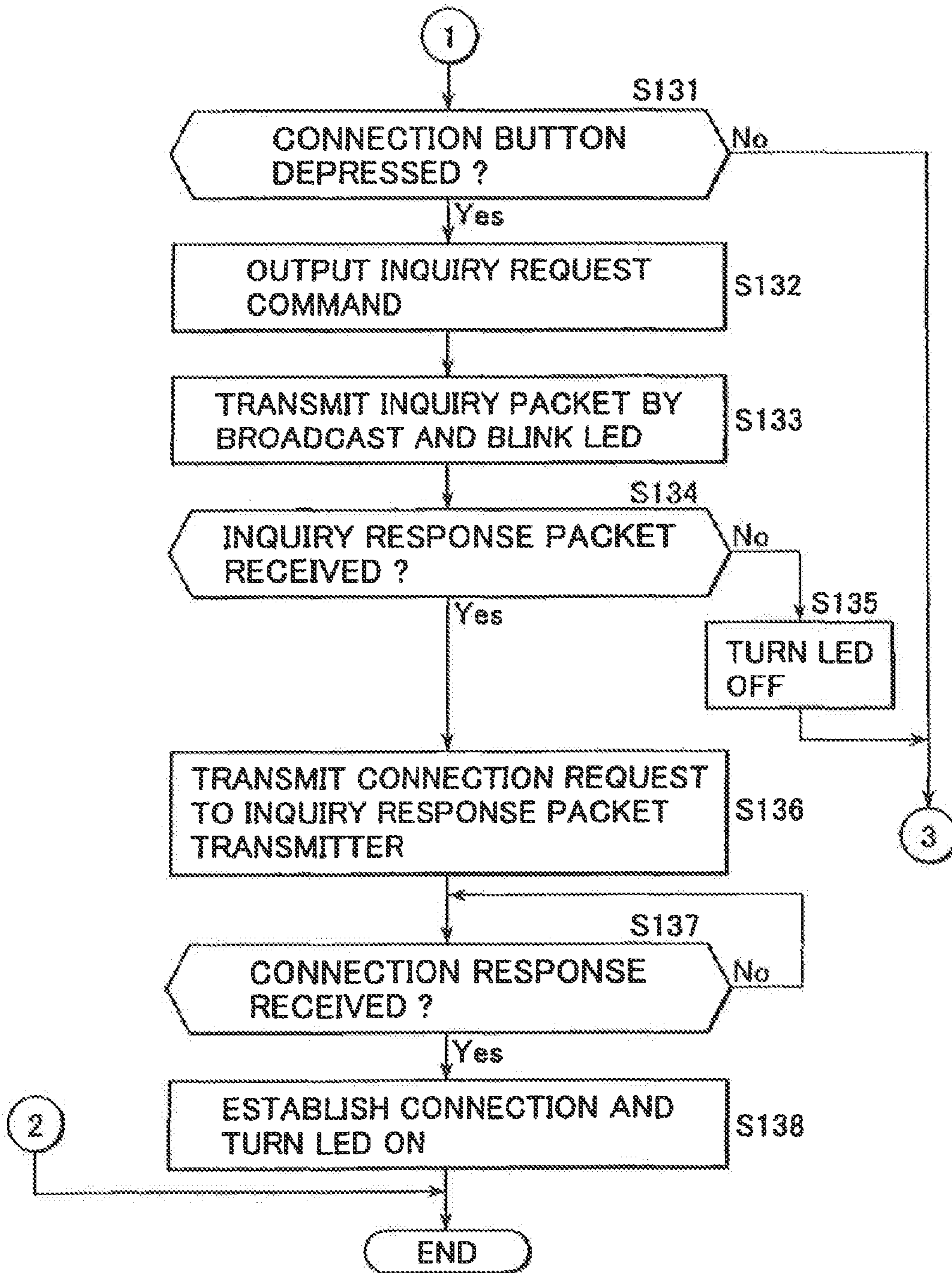
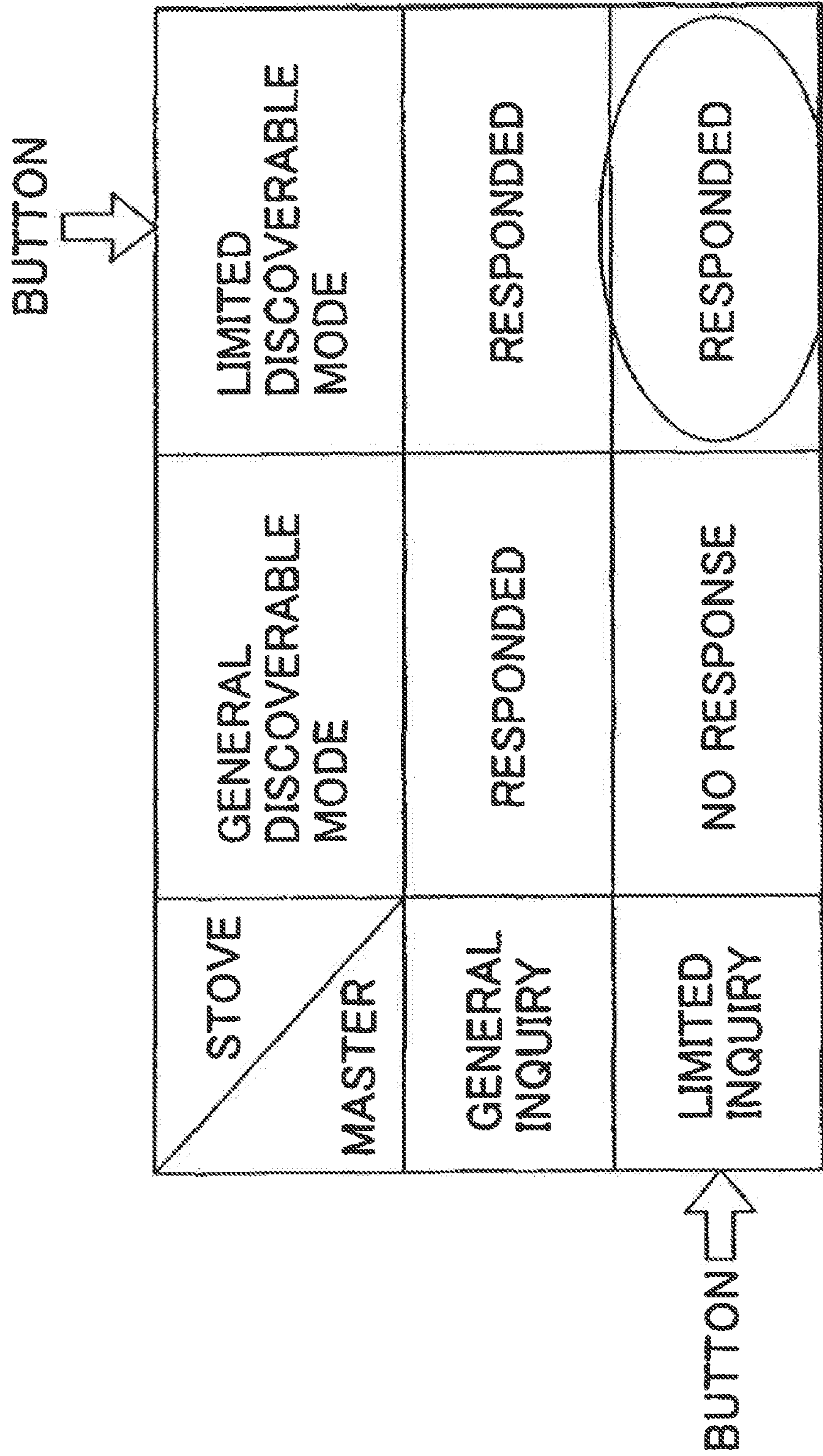


FIG. 15



**RADIO COMMUNICATION APPARATUS AND
RADIO COMMUNICATION METHOD,
RADIO COMMUNICATION SYSTEM,
RECORDING MEDIUM, AND COMPUTER
PROGRAM**

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

This is a continuation of application Ser. No. 12/756,024, filed Apr. 7, 2010 (allowed), which is a reissue of U.S. Pat. No. 7,356,308, which issued from application Ser. No. 11/648,613, filed Jan. 3, 2007, which is a continuation of application Ser. No. 10/485,978, filed Sep. 20, 2004, now U.S. Pat. No. 7,177,595 the contents of which are incorporated herein by reference. Application Ser. No. 10/485,978 is the U.S. national stage of International Application No. PCT/JP03/06505, filed on May 26, 2003, and claims priority to Japanese Patent Application No. P2002-166849, filed Jun. 7, 2002.

TECHNICAL FIELD

The present invention relates to a radio communication apparatus and a radio communication method, a radio communication system, a recording medium, and a computer program, in particular to a radio communication apparatus and a radio communications method, a radio communication system, a recording medium, and a computer program, which are capable of easily establishing radio connection in radio communications.

BACKGROUND ART

In recent years, short-distance radio communication technologies, such as IrDA (InfraRed Data Association) and Bluetooth (registered trademark) communication, have spread widely.

IrDA is a radio communication technology using infrared rays, permitting communication at 1.152 Mbps and 4 Mbps by only set up of software.

On the other hand, the Bluetooth communication is a radio transmission system which uses a 2.4 GHz zone, and does not have directivity but high permeability, unlike a case where infrared is used. The Bluetooth communication is expected to be an interface which realizes a data exchange regardless of devices, such as a personal computer, a peripheral apparatus, a household appliance, and a portable phone.

As for Bluetooth compliant devices, there are a "master" which determines a frequency hopping pattern and a "slave" which communicates with and follows the master, and a network comprises one master and a plurality of (seven sets, at most) slaves. The slaves perform communication between the master and the slaves, synchronizing with the frequency hopping pattern determined by the master. Communications between the devices are always performed through the master, so that no direct communication is performed between the slaves.

When choosing a communication counterpart's device in the Bluetooth communications, it is common that the master transmits an inquiry signal (Inquiry), by broadcasting, to devices which exist around itself so as to search for a possible device to be communicated, collect responses from the slaves, display, on a display screen, a list of model names,

device ID's, etc. of devices which may be communicated, and have a user to choose a communication counterpart's device out of them.

However, with this method, there are many devices which allow radio communication within an area where communications are available and, even if most of the devices do not desire communication, all devices will be listed and displayed on a display section of the master. For example, when the list is displayed on the display screen by means of device ID's, it is difficult for the user to choose a desired one out of the displayed list including the plurality of apparatus ID's which cannot be grasped intuitively. Similarly, when the list on the display screen is displayed by means of model names and a plurality of more apparatuses of the same type are included in the apparatuses which can communicate, it is difficult to determine which device the user to choose.

In particular as for a short-distance radio communication technology which does not have directivity, such as the Bluetooth communication, unlike the communications having the directivity such as the infrared technology etc., it is difficult to intuitively choose a communication counterpart's device from the plurality of devices which can communicate, since devices within a predetermined area can communicate in all directions.

In addition, in order to determine a communication counterpart's device, a conventional method forces the user to perform operations such as referring to the display and choosing a desired device out of them, and there is a need for a technology in which the communication counterpart's device can be intuitively determined by an easy operation.

DISCLOSURE OF THE INVENTION

The present invention has been conceived in view of such situation and allows intuitively determining a radio communication device to be a communication counterpart with a considerably simple operation.

The radio communication apparatus of the present invention is characterized by comprising a receiving means for receiving the inquiry signal asking whether or not radio communications are possible, a first input means for receiving an operation input when the user permits communication of information to another radio communication apparatus, and a transmitting means for transmitting predetermined information to another radio communication apparatus when an operation is inputted by the first input means.

A notice means may be further provided for notifying that an inquiry signal has been received by the receiving means.

Further, the notice means may be made to notify that a data link with another communication apparatus has been established.

Still further, the notice means may be made to notify that the data link with another communication apparatus has not been established.

The notice means may be constituted by a LED.

The first input means may be constituted by a button and the LED may be constructed by integrating with the button.

The notice means may be made to notify, by blinking the LED, that the inquiry signal has been received, further notify, by lighting the LED, that the data link with another communication apparatus has been established, and further notify, by turning the LED off, that the data link with another communication apparatus has not been established.

The notice means may be made to carry out audio reproduction of a message notifying that the inquiry signal has been received.

The first input means may be operated by the user notified by the notice means that the inquiry signal has been received, and the predetermined information which is transmitted by the transmitting means to another radio communication apparatus may be an inquiry response signal to the inquiry signal.

The first input means may be operated by the user notified by the notice means that the inquiry signal has been received, and the predetermined information which is transmitted by the transmitting means to another radio communication apparatus may be a connection request signal.

When the inquiry signal is received by the receiving means after the first input means received the operation input by the user, the transmitting means may be caused to transmit the predetermined information to another radio communication apparatus.

When the inquiry signal is received by the receiving means during the period when the first input means receives the operation input by the user, the transmitting means may be caused to transmit the predetermined information to another radio communication apparatus.

Only during the period when the first input means receives the operation input by the user, the receiving means may be caused to receive the inquiry signal.

Further, a generation means for generating an inquiry signal for searching for another radio communication apparatus capable of performing radio communications, a second input means for issuing instructions to transmit the inquiry signal, and a transmitting means for transmitting an inquiry signal when the instructions to transmit the inquiry signal are issued by the second input means may be provided.

The notice means may be made to notify further that the inquiry signal has been transmitted by the transmitting means.

The notice means may be made to notify further that the data link with another communication apparatus has been established.

The notice means may be made to notify further that the data link with another communication apparatus has not been established.

The first input means and the second input means may be unified and constructed as a third input means. When the inquiry signal is received before the third input means receives the operation input by the user, the third input means may be made to operate as the first input means, and when the third input means receives an operation input by a user before the receiving means receives the inquiry signal, the third input means may be operated as the second input means.

The third input means may be constituted by the button, the notice means may be constituted by the LED which may be integrated with the button.

The radio communications method according to the present invention is characterized by comprising: a reception control step of controlling reception of an inquiry signal for asking whether or not radio communications are available, the inquiry signal being transmitted from another radio communication apparatus; an input control step of controlling an operation input when a user permits communication of information to another radio communication apparatus; and a transmitting control step of controlling transmission of predetermined information to another radio communication apparatus when an input of operation is controlled by the input control step.

The computer program recorded on a recording medium according to the present invention is characterized by comprising: a reception control step of controlling reception of an inquiry signal for asking whether or not radio communications are available, the inquiry signal being transmitted from

another radio communication apparatus; an input control step of controlling an operation input when a user permits communication of information to another radio communication apparatus; and a transmitting control step of controlling transmission of predetermined information to another radio communication apparatuses when an input of operation is controlled by an input control step.

The computer program according to the present invention is characterized by comprising: a reception control step of controlling reception of an inquiry signal for asking whether or not radio communications are available, the inquiry signal being transmitted from another radio communication apparatus; an input control step which controls an operation input when a user permits communication of information to another radio communication apparatus; and a transmitting control step of controlling transmission of predetermined information to another radio communication apparatus when an input of operation is controlled by the input control step.

The radio communication systems according to the present invention is characterized by comprising: a generation means for generating an inquiry signal for searching for a second radio communication apparatus with which a first radio communication apparatus may carry out radio communications; a first input means for receiving an operation input when a user issues instructions to transmit an inquiry signal generated by the generation means to every apparatus which allows radio communications within a predetermined area; and a first transmitting means for transmitting the inquiry signal to every apparatus which allows radio communications within the predetermined area when the instructions to transmit the inquiry signal are issued by the first input means, and further comprising: a second input means for receiving an operation input when the user permits the second radio communication apparatus to communicate information to the first radio communication apparatus; a receiving means for receiving the inquiry signal transmitted by the first transmitting means from the first radio communication apparatus; and a second transmitting means for transmitting predetermined information to the first radio communication apparatus when the second input means inputs a fact that the user permits communicating of information to the first radio communication apparatus and the inquiry signal is received by the receiving means.

The predetermined information transmitted by the second transmitting means may be an inquiry response signal to the inquiry signal.

The predetermined information transmitted by the second transmitting means may be a connection request signal to the first radio communication apparatus.

In the radio communication apparatus and the radio communications method and the computer program according to the present invention, the inquiry signal for asking whether or not the radio communications transmitted from another radio communication apparatus is received, the operation is inputted when the user permits communicating of information to another radio communication apparatus. When the operation is inputted, predetermined information is transmitted to another radio communication apparatus.

As for the radio communication system according to the present invention, the inquiry signal for searching for the second radio communication apparatus which can perform radio communications is generated in the first radio communication apparatus. When the user issues instructions to transmit the inquiry signal to every apparatus which allows radio communications within the predetermined area, and when the operation is inputted and the instructions to transmit the inquiry signal, which is then transmitted to every apparatus

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which allows radio communications within the predetermined area. When the user permits the second radio communication apparatus to communicate information to the first radio communication apparatus, the operation is inputted, the inquiry signal transmitted from the first radio communication apparatus is received and communication of information to the first radio communication apparatus is permitted, and when the inquiry signal is received, predetermined information is transmitted to the first radio communication apparatus.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view for explaining a radio communication system to which the present invention is applied;

FIG. 2 is a block diagram showing a structure of a wireless storage server to which the present invention is applied;

FIG. 3 is a block diagram showing a structure of wireless headphones to which the present invention is applied;

FIG. 4 is a view for explaining an example of structure of a connection response button and an LED;

FIG. 5 is a view for explaining an example of structure of the connection response button and the LED;

FIG. 6 is a view for explaining an example of structure of the connection response button and the LED;

FIG. 7 is a flow chart for explaining a connection establishment process 1;

FIG. 8 is a flow chart for explaining a connection establishment process 2;

FIG. 9 is a view for explaining an inquiry packet and an inquiry response packet;

FIG. 10 is a flow chart for explaining a connection establishment process 3;

FIG. 11 is a flow chart for explaining a connection establishment process 4;

FIG. 12 is a block diagram showing a structure of an audio reproduction apparatus applying the present invention;

FIG. 13 is a flow chart for explaining a process in the audio reproduction apparatus;

FIG. 14 is a flow chart for explaining a process of the audio reproduction apparatus; and

FIG. 15 is a table for explaining modes of transmission and reception for an inquiry in the Bluetooth communication.

BEST MODES FOR IMPLEMENTING THE INVENTION

With reference to the drawings, embodiments according to the present invention will be described as follows:

A radio communication system to which the present invention is applied will be described by using FIG. 1.

A wireless storage server 1 stores therein audio data and transmits the audio data to one that is desired by a user among wireless headphones 2-1 through 2-n which exist within a predetermined area where communications are available by radio communications by means of communication systems, such as the Bluetooth communication, for example. The wireless storage server 1 becomes a master of radio communications.

The wireless storage server 1 has a connection button 11. When the connection button 11 is depressed, the wireless storage server 1 transmits an inquiry signal (Inquiry) by broadcasting (that is, to all devices within a wireless network), searches for devices which can communicate, collects responses from wireless headphones 2 which are slaves, detects the wireless headphone 2 which can communicate, and establishes communication (a data link is established), where the inquiry signal includes a search signal for searching for a radio communication apparatus which can commu-

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nicate and a notice signal for notifying that the radio communication apparatus (itself) exists.

The wireless headphones 2-1 through 2-n may communicate with the wireless storage server 1 by radios, receive and reproduce audio data transmitted by the wireless storage server 1. The wireless headphones 2 serve as a slave in radio communications.

Below, when the wireless headphones 2-1 through 2-n do not need to be distinguished separately, they are referred to only as wireless headphones 2 generically.

FIG. 2 is a block diagram showing a structure of the wireless storage server 1.

A CPU 31 controls operation of the wireless storage server 1. For example, when the connection button 11 is operated, the CPU 31 controls a radio module 34, transmits an inquiry signal via an antenna 35 by broadcasting, reads information stored in an HDD 37 according to an operation inputted into an operation section 32, and controls the radio module 34 so as to transmit the information to a device to be communicated via an antenna 35.

The operation section 32 comprises a button, a keyboard, a jog dial, a touch panel, etc., receives the user's operation input and supplies contents of the operation to the CPU 31.

The connection button 11 is operated when the user issues instructions to start communication with the wireless headphones 2, as described by using FIG. 1.

The radio module 34 converts the data, a control signal, etc., which are supplied by the CPU 31 into a predetermined format by which radio communications are available, amplifies them, and transmits them via the antenna 35, or it receives and amplifies inputs such as data, a response signal, etc., which are received by the antenna 35, converts them into the format which can be processed by the CPU 31, and supplies them to the CPU 31.

The HDD (Hard Disk Drive) 37, a RAM (Random Access Memory) 38, and a ROM (Read Only Memory) 39 are connected to the CPU 31 via a bus 36.

The HDD 37 drives hard disks to be caused to record therein or reproduce the computer program and information which are executed by a CPU 11, records music contents to be transmitted to the wireless headphones 2 so as to be reproduced, and outputs them via the bus 36 according to control of the CPU 31.

The RAM 38 stores the computer program used in the execution by the CPU 31 and a parameter which changes suitably in the execution. The ROM 39 stores basically fixed data out of the parameters for operation and the computer program which are used by the CPU 31.

A drive 40 is connected to the CPU 31 via the bus 36, as needed. The drive 40 is provided with a magnetic disk 41, an optical disc 42, a magneto-optical disc 43, and semiconductor memory 44 so as to communicate data.

FIG. 3 is a block diagram showing a structure of the wireless headphones 2.

The CPU 51 controls operation of the wireless headphones 2. For example, when the inquiry signal is received which is transmitted by the wireless storage server 1 via the antenna 55 and the radio module 54, or when an LED 56 is blinked or a connection response button 53 is operated, the radio module 54 is controlled so as to transmit a response to an inquiry signal through the antenna 55 to the wireless storage server 1, to establish communication, to light a blinking LED, and to output music contents transmitted by the wireless storage server 1 to an audio reproduction section 57 via the antenna 55 and the radio module 54, so that audio reproduction is carried out at a loud speaker 58.

An operation section **52** comprises a button, a keyboard, a jog dial, a touch panel, etc., receives the user's operation input with respect to a process which is not related to radio communications, such as a change in volume of audio reproduction and supplies the contents of operation to the CPU **31**.

The connection response button **53** is operated when the user issues instructions to perform communications with the wireless storage server **1**. In other words, the wireless headphones **2** establish connection with the wireless storage server **1**, only if the connection response button **53** is operated by the user when the inquiry signal is received from the wireless storage server **1** (that is, even in case the wireless storage server **2** exists within an area where radio communications with the wireless storage server **1** are available).

The radio module **54** converts the data, a control signal, etc., which are supplied by the CPU **51**, into the predetermined format by which radio communications are available, amplifies them, and transmits them via the antenna **55**, or it receives and amplifies inputs of the data, a response signal, etc., which are received by the antenna **55**, converts them into the format which can be processed by the CPU **51**, and supplies them to the CPU **51**.

According to control of the CPU **51**, the LED **56** is lit, turned off, or blinked. As for the LED **56**, one capable of being lit in different colors according to the control of the CPU **51** may be employed, for example.

The connection response button **53** and the LED **56** of the wireless headphones **2** are constructed as one input/output means by providing the LED **56** within the connection response button **53**, as shown in FIG. **4**. In other words, since the user does not have to look at a plurality of parts of the wireless headphones **2** and does not have to check an operation or a state, thus improving operativity.

The connection response button **53** and the LED **56** of the wireless headphones **2** may, of course, be provided in different positions as shown in FIG. **5**. Further, the wireless headphones **2** may be provided with a plurality of LED's. For example, as shown in FIG. **6**, in addition to connection response button **53**, by providing an LED **56-1** and an LED **56-2**, the user may be notified of many information items about states of the wireless headphones **2** such as whether or not the inquiry signal has been received and whether or not connection has been established by means of combinations of lighting, turning off, and blinking of two LED's.

The audio reproduction section **57** receives an input of music contents transmitted by the wireless storage server **1** from the CPU **51** via the antenna **55** and the radio module **54**, implements predetermined reproduction processes such as D/A (Digital to Analog) conversion, format conversion, decoding, etc., and outputs them to the loud speaker **58**, to thereby reproduce the contents.

A RAM **60** and a the ROM **61** are connected to the CPU **51** via the bus **59**.

The RAM **60** stores the computer program used in the execution of the CPU **51** and parameters which change suitably in the execution. The ROM **61** stores the basically fixed data among the parameters for operation and the computer programs which are used by the CPU **51**.

The drive **62** is connected to the CPU **51** via the bus **59**, as needed. The drive **62** is provided with a magnetic disk **71**, an optical disc **72**, a magneto-optical disc **73**, and a semiconductor memory **74**, so as to communicate data.

Next, with reference to a flow chart of FIG. **7**, a connection establishment process **1** for connecting the storage server **1** and the wireless headphones **2** will be described.

In step **S1**, the CPU **31** of the wireless storage server **1** determines whether or not the connection button **11** has been

depressed based on a signal supplied from the connection button **11**. In step **S1**, when it is determined that the connection button **11** has not been depressed, the process of step **S1** is repeated until it is determined that the connection button **11** is depressed.

In step **S1**, when it is determined that the connection button **11** has been depressed, the CPU **31**, in step **S2**, generates an inquiry demand command so as to be outputted to the radio module **34**.

In step **S3**, the radio module **34** generates an inquiry packet according to the inquiry demand command inputted from the CPU **31**, and transmits the inquiry packet by broadcasting via the antenna **35**.

In step **S4**, the radio module **54** of the wireless headphones **2** determines whether or not the inquiry packet transmitted by the wireless storage server **1** has been received via the antenna **55**. In step **S4**, when it is determined that the inquiry packet has not been received, the process of step **S4** is repeated until it is determined that the inquiry packet is received.

In step **S4**, when it is determined that the inquiry packet has been received, the radio module **54**, in step **S5**, outputs an inquiry reception event to the CPU **51**.

In step **S6**, for example, by controlling the LED **56** to blink, or controlling the audio reproduction section **57** to output a message such as "Are you going to listen to music?" from the loud speaker **58**, the CPU **51** of the wireless headphones **2** provides an audio assist to the user so as to notify the user that they may be connected with the wireless storage server **1**.

For example, when the user is not carrying the wireless headphones **2**, by checking to see if the LED **56** is blinking, the user can confirm that the inquiry signal has been received from the wireless storage server **1**. In order to carry out communications with the wireless storage server **1**, the connection response button **53** is depressed. On the other hand, when the user is carrying the wireless headphones **2**, the user could not check to see if the LED **56** is blinking, and therefore may listen to the audio assist and confirm that the inquiry signal has been received from the wireless storage server **1**. In order to perform communications with the wireless storage server **1**, the connection response button **53** is depressed.

In step **S7**, the CPU **51** determines whether or not the connection response button **53** has been depressed, based on the signal supplied from the connection response button **53**.

In step **S7**, when it is determined that the connection response button **53** has not been depressed, in step **S8**, the CPU **51** controls the LED **56** so as to turn the LED **56** off, the process returns to step **S4** and the process thereafter is repeated.

In step **S7**, when it is determined that the connection response button **53** has been depressed, in step **S9**, the CPU **51** generates an inquiry response command and outputs the inquiry response command to the radio module **54**.

In step **S10**, the radio module **54** generates an inquiry response packet according to the inquiry response command supplied from the CPU **51**, and transmits the inquiry response packet to the wireless storage server **1** via the antenna **55**.

In step **S11**, the radio module **34** of the wireless storage server **1**, determines whether or not the inquiry response packet transmitted from the wireless headphones **2** has been received via the antenna **35**. In step **S11**, when it is determined that the inquiry response packet has not been received, the process returns to step **S1** and the process thereafter is repeated.

In step **S11**, when it is determined that the inquiry response packet has been received in step **S12**, the radio module **34** outputs the received inquiry response packet to the CPU **31**. With reference to the inquiry response packet, the CPU **31**

extracts an apparatus ID etc. of an inquiry response packet transmitter, generates the connection request signal for the inquiry response packet transmitter, and transmits it to the wireless headphones 2 of the inquiry response packet transmitter via the radio module 34 and the antenna 35.

In step S13, the radio module 54 of the wireless headphones 2 determines whether or not the connection request transmitted by the wireless storage server 1 has been received via the antenna 55. In step S13, when it is determined that the connection request has not been received, the process of step S13 is repeated until it is determined that the connection request is received.

In step S13, when it is determined that the connection request has been received, in step S14, the radio module 54 notifies the CPU 51 that the connection request has been received. The CPU 51 generates a connection response to the connection request so as to be transmitted to the wireless storage server 1 via the radio module 54 and the antenna 55.

In step S15, the CPU 51 establishes the connection with the wireless storage server 1, and controls the LED 56 to be lit.

In step S16, the CPU 31 of the wireless storage server 1 establishes connection with the wireless headphones 2 which transmitted the connection response (a data link is established), and the process is ended.

According to the process as described by using FIG. 7, since the response to the inquiry signal is sent only when the user of the wireless headphones 2 wishes the connection with the wireless storage server 1, the response to the inquiry signal transmitted by the wireless storage server 1 by broadcasting is not transmitted from every apparatus within an area where the inquiry signal reaches, but transmitted only from a required apparatus. Therefore, in the wireless storage server 1, avoiding complicated operations such that the apparatus ID etc. of every apparatus within the area where the inquiry signal reaches are displayed so as to cause the user to choose, it becomes possible to establish connection with desired wireless headphones 2.

Further, since it is determined by the operation performed by the user with respect to the wireless headphones 2 whether or not wireless connection between the wireless storage server 1 and the wireless headphones 2 is carried out, it becomes unnecessary for the wireless storage server 1 to have a display section for displaying the apparatus ID etc. of every the apparatus in the area where the inquiry signal reaches, and an operation input section for choosing a desired apparatus therefrom, so that the structure of the wireless storage server 1 may be simplified and its cost may be reduced.

In the connection establishment process 1 as described by using FIG. 7, the inquiry packet is transmitted from the wireless storage server 1, the user of the wireless headphones 2 who received the inquiry packet is notified of reception of the inquiry packet, and when the user wishes to start communications with the wireless storage server 1, the response packet to the inquiry packet is sent back, so that communications are started. On the other hand, in the wireless headphones 2, before receiving the inquiry packet, based on whether or not the connection response button 53 is operated in advance, the inquiry response packet sent back by the wireless headphones 2 may include the information indicating whether or not communications with the wireless storage server 1 are available.

With reference to a flow chart of FIG. 8, a connection establishment process 2 for connecting the storage server 1 and the wireless headphones 2 will be described.

In step S31 through step S33, the similar process as in step S1 through step S3 as described by using FIG. 7 is carried out.

In other words, when the connection button 11 is depressed, the inquiry packet is transmitted by broadcasting from the wireless storage server 1.

In step S34, the CPU 51 of the wireless headphones 2 determines whether or not the connection response button 53 has been depressed based on the signal supplied from the connection response button 53.

In step S34, when it is determined that the connection response button S3 has been depressed, in step S35, the CPU 51 considers a state of the wireless headphones 2 as a connection permission state.

In step S34, when it is determined that the connection response button 53 has not been depressed, or after the end of process of step S35, the radio module 54, in step S36, determines whether or not the inquiry packet transmitted by the wireless storage server 1 has been received via the antenna 55. In step S36, when it is determined that the inquiry packet has not been received, the process returns to step S34 and the process thereafter is repeated.

In step S36, when it is determined that the inquiry packet has been received, in step S37, the radio module 54 outputs the inquiry reception event to the CPU 51.

In step S38, the CPU 51 determines whether or not the state of the wireless headphones 2 is in the connection permission state.

In step S38, when it is determined that the state of the wireless headphones 2 is in the connection permission state, in step S39, the CPU 51 generates the control signal for rendering the connection acceptance flag in an ON state, the flag being contained in the inquiry response packet which answers the wireless storage server 1.

Examples of the inquiry packet and the inquiry response packet are shown in FIG. 9. An inquiry packet 71 comprises a header 81 and a transmitter address 82. On the other hand, an inquiry response packet 72 comprises a header 83, a transmission destination address 84, a transmitter address 85, and a connection acceptance flag 86. When it is determined that the state of the wireless headphones 2 is in the connection permission state, the connection acceptance flag contained in the inquiry response packet 72 which answers the wireless storage server 1 is set to the ON state.

In step S38, when it is determined that the state of the wireless headphones 2 is not in the connection permission state, in step S40, the CPU 51 generates the control signal for rendering the connection acceptance flag in an OFF state, the flag being contained in the inquiry response packet which answers the wireless storage server 1. In other words, as described by using FIG. 9, the connection acceptance flag 86 contained in the inquiry response packet 72 which answers the wireless storage server 1 is set to the OFF state.

After the end of process of step S39 or step S40, the CPU 51, in step S41, generates the inquiry response command including the control signal indicating whether the connection acceptance flag contained in the inquiry response packet which answers the wireless storage server 1 is ON or OFF, outputs the inquiry response command to the radio module 54, for example, controls the LED 56 to blink, and notifies the user that it is during processing of connection with the wireless storage server 1.

In step S42, according to the inquiry response command supplied from the CPU 51, the radio module 54 generates the inquiry response packet to be transmits to the wireless storage server 1 via the antenna 55.

In step S43, the radio module 34 of the wireless storage server 1 determines whether or not the response inquiry packet transmitted from the wireless headphones 2 has been received via the antenna 35. In step S43, when it is determined

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that the inquiry response packet has not been received, the process returns to step S31 and the process thereafter is repeated.

In step S43, when it is determined that the inquiry response packet has been received, in step S44, the radio module 34 outputs the inquiry response packet to the CPU 31. With reference to the inquiry response packet, the CPU 31 determines whether or not the connection acceptance flag 86 is ON. In step S44, when it is determined that the connection acceptance flag 86 is not ON, the process returns to step S31 and the process thereafter is repeated.

In step S44, when it is determined that the connection acceptance flag 86 is ON, in step S45 through step S49, the similar process as in step S12 through step S16 of FIG. 7 is carried out, and connection between the wireless storage server 1 and the wireless headphones 2 is established, then the process is ended.

According to the process as described by using FIG. 8, the CPU 51 of the wireless headphones 2 controls the ON and OFF states of the connection acceptance flag 86 of the inquiry response packet 72, based on whether or not the connection response button 53 was operated beforehand. In the connection establishment process 2 as described by using FIG. 8, unlike the connection establishment process 1 as described by using FIG. 7, the wireless headphones 2 which received the inquiry packet 71 transmitted by the wireless storage server 1 always send back the inquiry response packet 72.

With reference to the ON and OFF states of the connection acceptance flag 86, the wireless storage server 1 which has received the inquiry response packet 72 establishes connection only with the wireless headphones 2 transmitted the inquiry response packet 72 whose connection acceptance flag 86 is ON.

Therefore, in the wireless storage server 1, avoiding complicated operations such that the apparatus ID etc. of every apparatus within the area where the inquiry signal reaches are displayed so as to cause the user to choose, it becomes possible to establish connection with the desired wireless storage server 2. Further, since it becomes unnecessary for the wireless storage server 1 to have a display section for displaying the apparatus ID etc. of every apparatus within the area where the inquiry signal reaches, and the operation input section for choosing the desired apparatus among them, the structure of the wireless storage server 1 may be simplified and its cost may be reduced.

In the connection establishment process 1 as described by using FIG. 7, and the connection establishment process 2 as described by using FIG. 8, based on whether or not the wireless headphones 2 send back the inquiry response packet to the inquiry packet transmitted by the wireless storage server 1 by broadcasting, or whether or not the connection acceptance flag 86 in the replied inquiry response packet 72 is in the ON state, the wireless storage server 1 is adapted to transmit the connection request to the wireless headphones 2. On the other hand, when the user of the wireless headphones 2 wishes to perform communication with the wireless storage server 1, the connection request may be transmitted from the wireless headphones 2 to the wireless storage server 1, with respect to the inquiry packet transmitted by the wireless storage server 1 by broadcasting.

With reference to FIG. 10, the connection establishment process 3 in which the connection request is transmitted from the wireless headphones 2 to the wireless storage server 1 will be described.

In step S61 through step S69, the similar process as in step S1 through step S9 as described by using FIG. 7 is carried out. In other words, when the connection button 11 is depressed,

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the inquiry packet is transmitted from the wireless storage server 1 by means of broadband. The wireless headphones 2 notify the user that the inquiry packet is received when the inquiry packet is received. The CPU 51 supplies the inquiry response command to the radio module 54, when an operation of the connection response button 53 is received from the user.

In step S70, the radio module 54 of the wireless headphones 2 generates the connection request signal based on the inquiry response command supplied from the CPU 51, and transmits it to the wireless storage server 1 via the antenna 55.

In step S71, the radio module 34 of the wireless storage server 1 determines whether or not the connection request transmitted from the wireless headphones 2 has been received via the antenna 35. In step S71, when it is determined that the connection request has not been received, the process returns to step S61 and the process thereafter is repeated.

In step S71, when it is determined that the connection request has been received, in step S72, the radio module 34 outputs the received connection request to the CPU 31. The CPU 31 generates the connection response to the connection request, and transmits it to the wireless headphones 2 via the radio module 34 and the antenna 35.

In step S73, the CPU 31 establishes the connection with the wireless headphones 2.

In step S74, the CPU 51 of the wireless headphones 2 establishes the connection with the wireless storage server 1, and controls the LED 56 to be turned on, so that the process is ended.

According to the process as described by using FIG. 10, only when the user of the wireless headphones 2 wishes the connection with the wireless storage server 1, the connection request is transmitted from the wireless headphones 2 to the wireless storage server 1. As with this case, in the wireless storage server 1, avoiding complicated operations such that the apparatus ID etc. of every apparatus within the area where the inquiry signal reaches are displayed so as to cause the user to choose, it becomes possible to establish connection with the desired wireless storage server 2. Further, since it becomes unnecessary for the wireless storage server 1 to have the display section for displaying the apparatus ID etc. of every apparatus within the area where the inquiry signal reaches, and the operation input section for choosing the desired apparatus from them, the structure of the wireless storage server 1 may be simplified and its cost may be reduced.

As for the connection establishment process 3 of FIG. 10, like the connection establishment process 1 as described by using FIG. 7, when the inquiry packet is transmitted from the wireless storage server 1, the user of the wireless headphones 2 who received the inquiry packet is notified of the reception of the inquiry packet, and the user wishes to start communications with the wireless storage server 1 and operates the connection response button 53, the description is carried out assuming that the connection request is transmitted from the wireless headphones 2. However, like the connection establishment process 2 as described by using FIG. 8, when the user of the wireless headphones 2 wishes to start communications with the wireless storage server 1 and operates the connection response button 53 in advance, the connection request may be transmitted from the wireless headphones 2 which received the inquiry packet.

Further, in the connection establishment process 1 as described by using FIG. 7, and the connection establishment process 2 as described by using FIG. 8, although the wireless headphones 2 have been described as receiving the inquiry packet at any time, the wireless headphones 2 may receive the

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inquiry packet only during the period when the connection response button **53** is depressed.

With reference to a flow chart of FIG. **11**, a connection establishment process **4** for connecting the storage server **1** and the wireless headphones **2** will be described.

In step **S91** through step **S93**, the similar process as in step **S1** through step **S3** as described by using FIG. **7** is carried out. In other words, when the connection button **11** is depressed, the inquiry packet is transmitted from the wireless storage server **1** by means of broadband.

In step **S94**, the CPU **51** of the wireless headphones **2** determines whether or not the connection response button **53** has been depressed, based on the signal supplied from the connection response button **53**.

In step **S94**, when it is determined that the connection response button **53** has not been depressed, the process of step **S94** is repeated until the connection response button is depressed.

In step **S94**, when it is determined that the connection response button **53** has been depressed, in step **S95**, the CPU **51** changes the state of the wireless headphones **2** into a waiting state for the inquiry packet. When it is in the state where the connection response button **53** is not depressed (i.e., when it is not in the waiting state for the inquiry packet), and when the inquiry packet is transmitted by the wireless storage server **1**, even if the wireless headphones **2** exist within a transmission service area, they do not receive the inquiry packet.

In step **S96**, the radio module **54** determines whether or not the inquiry packet transmitted by the wireless storage server **1** has been received via the antenna **55**. In step **S96**, when it is determined that the inquiry packet has not been received, the process returns to step **S94** and the process thereafter is repeated.

In step **S96**, when it is determined that the inquiry packet has been received, in step **S97**, the radio module **54** outputs the inquiry reception event to the CPU **51**.

In step **S98**, the CPU **51** generates the inquiry response command and outputs the inquiry response command to the radio module **54**, for example, controls the LED **56** to be blinked, and notifies the user that it is during processing of connection with the wireless storage server **1**.

In step **S99**, according to the inquiry response command supplied from the CPU **51**, the radio module **54** generates the inquiry response packet so as to be transmitted to the wireless storage server **1** via the antenna **55**.

In step **S100**, the radio module **34** of the wireless storage server **1** determines whether or not the inquiry response packet transmitted from the wireless headphones **2** has been received via the antenna **35**. In step **S100**, when it is determined that the inquiry response packet has not been received, the process returns to step **S91** and the process thereafter is repeated.

In step **S100**, when it is determined that the inquiry response packet has been received, in step **S101** through step **S105**, the similar process as in step **S45** of FIG. **7** through step **S49** is performed, the connection between the wireless storage server **1** and the wireless headphones **2** is established, and the process is ended.

According to the process as described by using FIG. **11**, since the wireless headphones **2** may receive the inquiry packet transmitted by the wireless storage server **1** only during the period when the connection response button **53** is depressed, the wireless storage server **1** does not receive the inquiry response from the wireless headphones **2** which does not wish to be connected.

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Therefore, as with this case, in the wireless storage server **1**, avoiding complicated operations such that the apparatus ID etc. of every apparatus within the area where the inquiry signal reaches are displayed so as to cause the user to choose, it becomes possible to establish connection with the desired wireless storage server **2**. Further, since it becomes unnecessary for the wireless storage server **1** to have the display section for displaying the apparatus ID etc. of every apparatus within the area where the inquiry signal reaches, and the operation input section for choosing a desired apparatus from them, the structure of the wireless storage server **1** may be simplified and its cost may be reduced.

Further, in the connection establishment process **4** as described by using FIG. **11**, as to the inquiry packet transmitted by the wireless storage server **1** by broadcasting, the inquiry response packet is sent back from the wireless headphones **2** in the state where the connection response button **53** is depressed. On the other hand, as with the connection establishment process **3** as described by using FIG. **10**, the wireless headphones **2** in the state where the connection response button **53** is depressed may send back the connection request with respect to the inquiry packet transmitted by the wireless storage server **1** by broadcasting.

The above processes have been described in case the storage and the server in radio communications are devices different from each other. Next, operations in devices which may operate as a server and as storage in radio communications will be described.

FIG. **12** is a block diagram showing a structure of an audio reproduction apparatus **91** which may be operated as a server and as storage in radio communications. It should be noted that in FIG. **12**, the same reference numbers are given to elements corresponding to those in the wireless headphones **2** as described by using FIG. **3**, and their description is omitted accordingly.

In other words, the audio reproduction apparatus **91** of FIG. **12** has basically the same structure as the wireless headphones **2** of FIG. **3**, except that a CPU **101** is provided instead of the CPU **51**, a connection button **102** is provided instead of the connection response button **53** and further an HDD **103** is added.

The CPU **101** controls operation of the audio reproduction apparatus **91**. For example, when the connection button **102** is operated, it determines whether it is operated before or after the reception of the inquiry signal. If it is operated before reception of an inquiry signal, the radio module **54** is controlled, and the inquiry signal is transmitted by broadcasting via the antenna **55**, and if it is operated after reception of the inquiry signal, the LED **56** is controlled to blink, so as to notify the user of the reception of the inquiry packet. Further, according to the user's operation input which is inputted from the operation section **52**, the CPU **101** outputs the music contents stored in the HDD **103** to the audio reproduction section **57**, so as the audio reproduction is carried out at the loud speaker **58**, or transmits them to other devices via the radio module **54** and the antenna **55**.

The connection button **102** is adapted to be the master in radio communications, until it receives the inquiry signal. It is operated by the user when instructions to transmit the inquiry signal are issued by broadcasting. After receiving the inquiry signal, it serves as the slave in radio communications, and it is operated by the user when instructions to send back the response to the inquiry signal of the master are issued.

Further, the connection button **102** and the LED **56** may be constituted, for example, as one input/output means similar to the connection response button **53** and the LED **56** as described by using FIG. **4**. In other words, since the user does

not have to look at a plurality of parts of the audio reproduction apparatus 91 and does not have to check an operation or a state, thus improving operativity.

In addition, the connection button 102 and the LED 56 of the audio reproduction apparatus 91 may be, of course, provided in different positions similar to the connection response button 53 and the LED 56 as described by using FIG. 5.

The HDD 103 drives hard disks to be caused to record therein or reproduce the computer program and information which are executed by the CPU 101, records music contents to be transmitted to another information processing apparatus (another audio reproduction apparatus 91, for example) so as to be reproduced, and outputs them via the bus 59 according to control of the CPU 101.

Next, operation of audio reproduction apparatus 91 will be described.

When the connection button 102 is depressed by the user in the state where the radio module 54 does not receive the inquiry signal from another information processing apparatus (for example, another audio reproduction apparatus 91), the CPU 101 recognizes the audio reproduction apparatus 91 as the master, controls the radio module 54, and transmits the inquiry packet from the antenna 55 by broadcasting.

When the inquiry response packet is received via the antenna 55 and the radio module 54, the CPU 101 establishes radio connection by transmitting the connection request to the inquiry response packet transmitter, for example, according to the user's operation input, it transmits the music contents stored in the HDD 103 to the inquiry response packet transmitter via the radio module 54 and the antenna 55.

When the radio module 54 receives the inquiry signal from another information processing apparatus (for example, another audio reproduction apparatus 91) before the connection button 102 is depressed by the user, the CPU 101 recognizes the audio reproduction apparatus 91 as the slave, controls the LED 56 to be blinked, and notifies the user that the inquiry packet has been received.

When the connection button 102 is operated by the user: within a predetermined period of time, the CPU 101 generates the response packet with respect to the inquiry, and transmits it through the radio module 54 and the antenna 55 to the inquiry packet transmitter.

In addition, when the connection button 102 is not operated by the user within the predetermined period of time, the CPU 101 controls the LED 56 to be turned off, and notifies the user that it is not during processing.

Moreover, if the time when the connection button 102 is depressed by the user and the time when the radio module 54 receives the inquiry signal from another information processing apparatus (for example, another audio reproduction apparatus 91) are simultaneous, one device is adapted to be the master and the other device is adapted to be the slave, so that a determination process of radio communications can be performed.

With reference to flow charts of FIG. 13 and FIG. 14, a process of the audio reproduction apparatus 91 will be described.

In step S121, the radio module 54 determines whether or not the inquiry packet has been received. In step S121, when it is determined that the inquiry packet has not been received, the process goes to step S131.

In step S121, when it is determined that the inquiry packet has been received, the audio reproduction apparatus 91 functions as the slave. In step S122, the radio module 54 outputs the inquiry reception event to the CPU 101. The CPU 101 receives the inquiry reception event and recognizes itself as having become the slave.

In step S123, the CPU 101 notifies the user that the inquiry signal has been received from another information processing apparatus by controlling the LED 56 to blink, or controlling the audio reproduction section 57 to output a message of "Are you going to listen to music?" from the loud speaker 58, for example, so as to perform the audio assist with the user.

In step S124, the CPU 101 determines whether or not the connection button 102 has been depressed, based on the signal supplied from the connection button 102.

In step S124, when it is determined that the connection button 102 has not been depressed, in step S125, the CPU 101 controls the LED 56 to be turned off, the process returns to step S121 and the process thereafter is repeated.

In step S124, when it is determined that the connection button 102 has been depressed, in step S126, the CPU 101 outputs the inquiry response command to the radio module 54.

In step S127, the radio module 54 transmits the inquiry response packet to the inquiry signal transmitter via the antenna 55.

In step S128, the radio module 54 determines whether or not the connection request was received via the antenna 55. In step S128, when it is determined that the connection request has not been received, the process of step S128 is repeated until it is determined that the connection request is received.

In step S128, when it is determined that the connection request has been received, in step S129, the radio module 54 notifies the CPU 101 that having the connection request has been received. The CPU 101 transmits the connection response to the connection request transmitter via the radio module 54 and the antenna 55.

In step S130, the CPU 101 establishes connection with the inquiry signal transmitter, and turns the LED 56 on, and the process is ended.

In step S121, when it is determined that the inquiry packet has not been received, in step S131, the CPU 101 determines whether or not the connection button 102 has been depressed, based on the signal supplied from the connection button 102. In step S131, when it is determined that the connection button 102 has not been depressed, the process returns to step S121 and the process thereafter is repeated.

In step S131, when it is determined that the connection button 102 has been depressed, the audio reproduction apparatus 91 functions as the master. In step S132, the CPU 101 recognizes itself as having become the master and outputs the inquiry demand command to the radio module 54.

In step S133, the radio module 54 generates the inquiry packet, transmits the inquiry packet by broadcasting via the antenna 55, and controls the LED 56 to blink.

In step S134, the radio module 54 determines whether or not the inquiry response packet has been received via the antenna 55.

In step S134, when it is determined that the inquiry response packet has not been received, in step S135, the radio module 54 notifies the CPU 101 that the inquiry response packet has not been received. The CPU 101 controls the LED 56 to be turned off, the process returns to step S121, and the process thereafter is repeated.

In step S134, when it is determined that the inquiry response packet has been received, in step S136, the radio module 54 notifies the CPU 101 that the inquiry response packet has been received. The CPU 101 transmits the connection request to the inquiry response packet transmitter via the radio module 54 and the antenna 55.

In step S137, the radio module 54 determines whether or not the connection response has been received via the antenna 55. In step S137, when it is determined that the connection

response has not been received, the process of step S137 is repeated until it is determined that the connection response is received.

In step S137, when it is determined that the connection response has been received, in step S138, the radio module 54 notifies the CPU 101 that the connection response has been received. The CPU 101 establishes connection with the connection response transmitter, controls the LED 56 to be turned on, and the process is ended.

In the processes as described by using FIG. 13 and FIG. 14, when the connection button 102 is operated before the inquiry packet is received, the audio reproduction apparatus 91 operates as the master. When the inquiry packet is received before the connection button 102 is operated, it operates as the slave.

In other words, depending on the operation timing, the connection button 102 may issue instructions to transmit the inquiry packet or issue to transmit the response packet to the inquiry. By this construction, the audio reproduction apparatus 91 does not have to comprise the display section for displaying the apparatus ID etc. of every apparatus within the area where the inquiry signal reaches, or the operation input section for choosing the desired apparatus from them. Further, for example, the same connection button 102 may issue instructions concerning transmission of the inquiry packet and transmission of the response packet to the inquiry may be ordered, so that the structure may be simplified and its cost may be reduced.

In step S127 of FIG. 13, although the audio reproduction apparatus 91 has been described as transmitting the inquiry response packet, the audio reproduction apparatus 91 may transmit the connection request instead of the inquiry response packet.

Further, although the audio reproduction apparatus 91 has been described as determining whether or not the inquiry response packet has been received in step S134 and as transmitting the connection request in step S136 when it is determined that the inquiry response packet has been received, instead of these processes, it may transmit the connection response in step S136, when it determines whether or not the connection request has been received in step S134 and if the connection request is received.

Although the audio reproduction apparatus 91 has been described as having the audio reproduction section 57 and the loud speaker 58, and as being capable of notice with voice in order to notify that the inquiry packet has been received, even in the case where the notice with voice may not be available, for example, if the user is able to check the LED 56, it is possible to notify the user only by means of the LED 56.

In addition, two audio reproduction apparatuses 91 which are not in the slave state, when connection buttons are depressed at the same time, one of the audio reproduction apparatus 91 becomes the master and the other audio reproduction apparatus 91 becomes the slave, so that connection between two audio reproduction apparatuses 91 may be established. It should be noted that the audio reproduction apparatuses 91 are, of course, able to establish connection with a device capable of radio communications other than the audio reproduction apparatuses 91.

As shown in FIG. 15, in the Bluetooth communications, the master has a mode in which two inquiry signals, General Inquiry and Limited Inquiry, are transmitted. On the other hand, the slave has the two modes of General Discoverable Mode and Limited Discoverable Mode. The wireless storage server 1 and the audio reproduction apparatus 91 (master) which have been described above each perform Limited Inquiry as the button is depressed. The wireless headphones 2

and the audio reproduction apparatus 91 (slave) which have been described above serve as Limited Discoverable Mode as the button is depressed.

For example, when there is a slave in General Discoverable Mode within an area of reach of an inquiry signal of the wireless storage server 1 as described above or of the audio reproduction apparatus 91 which has become the master, the slave in General Discoverable Mode does not respond to Limited Inquiry. In other words, by applying the present invention, when there is a slave in General Discoverable Mode which does not desire radio connection, the master does not receive the response. Therefore, by applying the present invention, the user may establish the connection between the master and the slave which actually desires the connection by means of an easy operation.

In FIG. 1 through FIG. 11, the wireless storage server 1 which transmits music contents data by radio communications and the wireless headphones 2 which receive and reproduce the music contents data by radio communications have been described. In FIG. 12 through FIG. 14, the audio reproduction apparatus 91 has been described which communicates the music contents data by radio communications and can reproduce the music contents. However, the present invention may be naturally applied to the case where any information other than the music contents (for example, audio data other than music, text data, computer program data, still image data, and video data, data including plural data among these data, etc.) is communicated.

The series of processes as described above may also be realized by software. The software is installed via a recording medium into a computer in which a computer program constituting the software is built in dedicated hardware, a general-purpose personal computer capable of executing various kinds of functions by installing therein various kinds of computer programs, etc.

As shown in FIG. 2, FIG. 3, or FIG. 12, the recording media may be constituted by package media such as the magnetic disk 41 or the magnetic disk 71 (including a flexible disk), the optical disc 42 or the optical disc 72 (including a CD-ROM (Compact Disk-Read Only Memory) and a DVD (Digital Versatile Disk)), the magneto-optical disc 43 or the magneto-optical disc 73 (including MD (Mini-Disk) (trademark)), the semiconductor memory 44 or the semiconductor memory 74, which are distributed apart from the computer in order to provide the user with the computer program and in which the computer program is recorded.

In addition, in this specification, the step of describing the computer program recorded on the recording medium includes not only a process chronologically implemented in accordance with a described order but also a process implemented in parallel or individually which is not necessarily processed chronologically.

Moreover, in this specification, "system" shall be understood as indicating a whole apparatus constituted by a plurality of apparatuses.

INDUSTRIAL APPLICABILITY

In this way, according to the present invention, it is possible to realize radio communications with another radio communication apparatus.

In particular, according to the present invention, only when the user permits radio communications with another radio communication apparatus, the radio communications can be performed, therefore, when the radio communication apparatus itself is the slave, avoiding complicated operations such that the apparatus ID etc. of every apparatus within the area

where the inquiry signal reaches are displayed on the radio communication apparatus to be the master, so that the user using a radio communication apparatus to be the master is caused to choose a device for performing radio communications, it becomes possible to establish connection with the desired slave. In addition, in this case, the operation of the slave is also considerably simple.

According to the first present invention, it becomes unnecessary for the radio communication apparatus serving as the master to have the display section for displaying the apparatus ID etc. of all apparatuses within the area where the inquiry signal reaches, and an operation input section for selecting a desired apparatus, so that its cost may be reduced.

According to other present inventions, it is possible to realize radio communications between two radio communication apparatuses, in particular only when the user of the radio communication apparatus on the slave side permits radio communications with the radio communication apparatus as being the master, radio communications can be performed, therefore avoiding complicated operations such that the apparatus ID etc. of every apparatus within the area where the inquiry signal reaches are displayed on the radio communication apparatus to be the master, so that the user using the radio communication apparatus to be the master is caused to choose the device for performing radio communications, it becomes possible to establish connection with the desired slave. In addition, the operation of the slave is also considerably simple.

Furthermore, since it becomes unnecessary for the radio communication apparatus as the master to have the display section for displaying the apparatus ID etc. of all apparatuses within the area where the inquiry signal reaches and the operation input section for choosing the desired apparatus among them, the cost may be reduced.

The invention claimed is:

[1. A first radio communication apparatus configured for short range wireless radio communication with a second radio communication apparatus, the first radio communication apparatus comprising:

first input means for receiving a user input that configures the first radio communication apparatus to broadcast an inquiry signal, wherein a unique identification for the second radio communication apparatus is not specified in the inquiry signal from the first radio communication apparatus;

receiving means for receiving predetermined information from the second radio communication apparatus, wherein the predetermined information is sent in response to user input to the second radio communication apparatus; and

communicating means for communicating, using short range wireless radio, with the second radio communication apparatus based on the predetermined information.]

[2. A short range wireless communications method for a first radio communication apparatus configured for communicating with a second radio communication apparatus, the method comprising:

receiving a user input that configures the first radio communication apparatus to broadcast an inquiry signal, wherein a unique identification for the second radio communication apparatus is not specified in the inquiry signal from the first radio communication apparatus;

receiving predetermined information from the second radio communication apparatus, wherein the predetermined information is sent in response to user input to the second radio communication apparatus; and

communicating, using short range wireless radio, with the second radio communication apparatus based on the predetermined information.]

3. *A transmission apparatus used in a wireless communication system, comprising:*

an inquiry signal sending unit configured to send an inquiry signal to search for at least a receiver apparatus to communicate with the transmission apparatus, the inquiry signal being receivable at a plurality of receiver apparatuses;

a receiving unit configured to receive a predetermined signal from one of the plurality of the plurality of receiver apparatuses, the predetermined signal including information indicating whether a user input has been detected on the receiver apparatus; and

an establishing unit configured to establish a connection with the receiver apparatus based on said predetermined signal.

4. *The transmission apparatus of claim 3, wherein the predetermined signal is transmitted from the receiver apparatus when a user input has been detected on the receiver apparatus within a predetermined period from a detection of a user input on the transmission apparatus.*

5. *The transmission apparatus of claim 3, wherein the predetermined signal includes a destination address and a source address subsequent to the destination address.*

6. *The transmission apparatus of claim 3, wherein one of a plurality of roles is selected according to timing of receiving the predetermined signal.*

7. *The transmission apparatus of claim 6, wherein one of the plurality of roles has an initiative of a communication.*

8. *The transmission apparatus of claim 6, wherein: one of the plurality of roles is a master, and another one of the plurality of roles is a slave.*

9. *An information processing apparatus used in a wireless communication system, comprising:*

a processor for executing program instructions; and a non-transitory computer-readable medium storing the program instructions, the program instructions, when executed by the processor, performing a process to:

send an inquiry signal to search for at least a receiver apparatus to communicate with the transmission apparatus, the inquiry signal being receivable at a plurality of receiver apparatuses;

receive a predetermined signal from one of the plurality of receiver apparatuses, the predetermined signal including information indicating whether a user input has been detected on the receiver apparatus; and establish a connection with the receiver apparatus based on said predetermined signal.

10. *The information processing apparatus of claim 9, wherein the program instructions, when executed by the processor, perform a process to send video data after establishing the connection with the receiver apparatus.*

11. *The information processing apparatus of claim 9, wherein the predetermined signal is transmitted from the receiver apparatus when a user input has been detected on the receiver apparatus within a predetermined period from a detection of a user input on the transmission apparatus.*

12. *The transmission apparatus of claim 11, wherein the predetermined signal includes a destination address and a source address subsequent to the destination address.*

13. *The transmission apparatus of claim 12, wherein one of a plurality of roles is selected according to timing of receiving the predetermined signal.*

14. *The transmission apparatus of claim 13, wherein one of the plurality of roles has an initiative of a communication.*

15. The transmission apparatus of claim 14, wherein;
one of the plurality of roles is a master, and
another one of the plurality of roles is a slave.

16. A transmission apparatus configured to wirelessly
transmit data to a plurality of receiver apparatuses, compris- 5
ing:

a processor for executing program instructions; and
a non-transitory computer-readable medium storing the
program instructions, the program instructions, when
executed by the processor, performing a process to:

send an inquiry signal to search for at least a receiver
apparatus to communicate with the transmission
apparatus, wherein the inquiry signal is receivable at
a plurality of receiver apparatuses;

receive a predetermined signal from one of the plurality 15
of receiver apparatuses, the predetermined signal
including information indicating whether a user input
has been detected on the receiver apparatus; and

establish a connection with the receiver apparatus
based on the predetermined signal; and

at least an antenna configured to wirelessly transmit the
inquiry signal to the receiver apparatus and receive the
predetermined signal.

17. The transmission apparatus of claim 16, wherein the
program instructions, when executed by the processor, per- 25
form a process to send video data after establishing the con-
nection with the receiver apparatus.

18. The transmission apparatus of claim 16, wherein the
predetermined signal is transmitted from the receiver appa- 30
ratus when a user input has been detected on the receiver
apparatus within a predetermined period from a detection of
a user input on the transmission apparatus.

19. The transmission apparatus of claim 18, wherein the
predetermined signal includes a destination address and a
source address subsequent to the destination address.

20. The transmission apparatus of claim 19, wherein one of
a plurality of roles is selected according to timing of receiving
the predetermined signal.

21. The transmission apparatus of claim 20, wherein one of
the plurality of roles has an initiative of a communication. 40

22. The transmission apparatus of claim 21, wherein
one of the plurality of roles is a master, and
another one of the plurality of roles is a slave.

23. A receiver apparatus configured to wirelessly receive
data from a transmission apparatus, comprising:

at least an antenna configured to wirelessly receive data;

a push button configured to input a user input;

a processor for executing program instructions; and
a non-transitory computer-readable medium storing the
program instructions, the program instructions, when 50
executed by the processor, performing a process to:

receive an inquiry signal to search for at least a receiver
apparatus to communicate with the transmission
apparatus, wherein the inquiry signal is receivable at
a plurality of receiver apparatuses;

detect a user input from the push button;

send a predetermined signal including information indi-
cating whether a user input has been detected on the
receiver apparatus; and

establish a connection with the transmission apparatus 60
based on the predetermined signal.

24. The receiver apparatus of claim 23, wherein the pro-
gram instructions, when executed by the processor, perform a
process to receive video data after establishing the connec-
tion with the transmission apparatus.

25. The receiver apparatus of claim 23, wherein the pre-
determined signal is transmitted from the receiver apparatus

when a user input has been detected on the receiver apparatus
within a predetermined period from a detection of a user input
on the transmission apparatus.

26. The receiver apparatus of claim 25, wherein the pre-
determined signal includes a destination address and a
source address subsequent to the destination address.

27. The receiver apparatus of claim 26, wherein one of a
plurality of roles is selected according to timing of sending
the predetermined signal.

28. The receiver apparatus of claim 27, wherein one of the
plurality of roles has an initiative of a communication.

29. The receiver apparatus of claim 28, wherein:

one of the plurality of roles is a master, and
another one of the plurality of roles is a slave.

30. The receiver apparatus of claim 29, further comprising
an LED configured to notify a status for establishing the
connection.

31. A radio communication apparatus comprising:

a user interface configured to receive a user input;

a circuitry configured to generate an inquiry signal to a
plurality of communication apparatuses, and to receive
predetermined information from at least one of the plu-
rality of communication apparatuses,

wherein the predetermined information is sent in response
to a user input to one of the plurality of communication
apparatuses.

32. The radio communication apparatus according to
claim 31, wherein the inquiry signal does not identify each of
the plurality of communication apparatuses.

33. The radio communication apparatus according to
claim 31, wherein the inquiry signal is a broadcast signal.

34. The radio communication apparatus according to
claim 31, wherein the predetermined information includes
information indicating that one of the plurality of communi-
cation apparatus has been selected. 35

35. The radio communication apparatus according to
claim 31, wherein the predetermined information includes a
transmitter address.

36. The radio communication apparatus according to
claim 35, wherein the predetermined information further
includes a destination address that precedes the transmitter
address.

37. The radio communication apparatus according to
claim 31, wherein the circuitry is configured to receive infor-
mation based on a Bluetooth communication. 45

38. The radio communication apparatus according to
claim 31, wherein a notification unit is configured to notify
that a data link has been established.

39. The radio communication apparatus according to
claim 31, wherein a notification unit is configured to notify
that a data link has not been established.

40. The radio communication apparatus according to
claim 31, wherein the user interface is a button that is physi-
cally depressed.

41. The radio communication apparatus according to
claim 31, wherein a speaker outputs an audio signal.

42. The radio communication apparatus according to
claim 31, further comprising an additional input unit that is
different from the user interface.

43. The radio communication apparatus according to
claim 31, wherein the user interface is a touch panel.

44. A radio communication method comprising:

receiving a user input via a user interface;

generating an inquiry signal to a plurality of communi-
cation apparatuses; and

receiving predetermined information from at least one of
the plurality of communication apparatuses, 65

wherein the predetermined information is sent in response to a user input to one of the plurality of communication apparatuses.

45. The radio communication method according to claim 44, wherein the inquiry signal does not identify each of the plurality of communication apparatuses.

46. The radio communication method according to claim 44, wherein the inquiry signal is a broadcast signal.

47. The radio communication method according to claim 44, wherein the predetermined information includes information indicating that one of the plurality of communication apparatuses has been selected.

48. The radio communication method according to claim 44, wherein the predetermined information includes a transmitter address.

49. The radio communication method according to claim 48, wherein the predetermined information further includes a destination address that precedes the transmitter address.

50. The radio communication method according to claim 44, further comprising receiving information based on a Bluetooth communication.

51. The radio communication method according to claim 44, further comprising notifying that a data link has been established.

52. The radio communication method according to claim 44, further comprising notifying that a data link has not been established.

53. The radio communication method according to claim 44, wherein the user interface is a button that is physically depressed and the user input is received via the button.

54. The radio communication method according to claim 44, further comprising outputting an audio signal using a speaker.

55. The radio communication method according to claim 44, further comprising receiving an additional user input via an additional input unit that is different from the user interface.

56. The radio communication method according to claim 44, wherein the user interface is a touch panel and the user input is received via the touch panel.

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