US011956712B2

(12) **United States Patent**
Lee et al.

(10) **Patent No.: US 11,956,712 B2**
(45) **Date of Patent: *Apr. 9, 2024**

(54) **ELECTRONIC APPARATUS AND METHOD OF SETTING NETWORK OF AUDIO DEVICE**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **17/571,745**

(22) Filed: **Jan. 10, 2022**

(65) **Prior Publication Data**

US 2022/0132407 A1 Apr. 28, 2022

Related U.S. Application Data

(63) Continuation of application No. 16/657,334, filed on Oct. 18, 2019, now Pat. No. 11,228,968, which is a (Continued)

(30) **Foreign Application Priority Data**

Jan. 30, 2015 (KR) 10-2015-0015333

(51) **Int. Cl.**
H04W 48/16 (2009.01)
H04W 48/20 (2009.01)

(52) **U.S. Cl.**
CPC ***H04W 48/16*** (2013.01); *H04W 48/20* (2013.01)

(58) **Field of Classification Search**
CPC H04W 48/16; H04W 48/20
See application file for complete search history.

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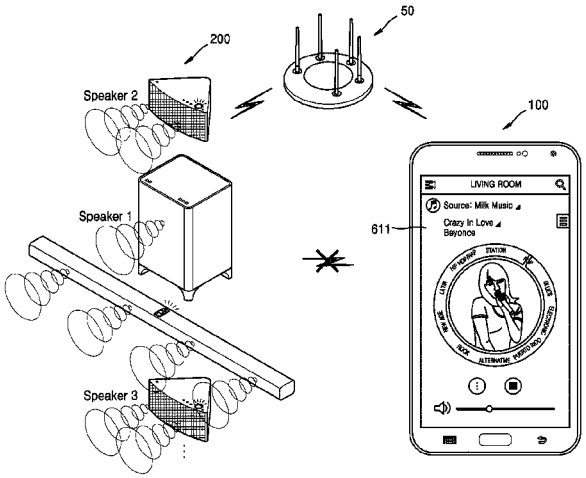
Primary Examiner — Steven S Kelley
(74) *Attorney, Agent, or Firm* — Sughrue Mion, PLLC

(57) **ABSTRACT**

Electronic device includes first wireless communication interface; second wireless communication interface; and controller. The controller is configured to, based on discovering operation of external electronic device to discover the electronic device, establish connection with the external electronic device using the second wireless communication interface, based on the connection to access point using the first wireless communication method being required, transmit, via the second wireless communication interface, to the external electronic device, information indicating that the electronic device requires the connection to the access point using the first wireless communication method, based on the
(Continued)



access point connection information received from the external electronic device via the second wireless communication interface, establish, via the first wireless communication interface, the connection with the access point using the first wireless communication method, and transmit reply to the external electronic device, indicating that the connection between the electronic device and the access point is established.

13 Claims, 14 Drawing Sheets

Related U.S. Application Data

continuation of application No. 14/989,193, filed on Jan. 6, 2016, now Pat. No. 10,477,461.

(60) Provisional application No. 62/100,160, filed on Jan. 6, 2015.

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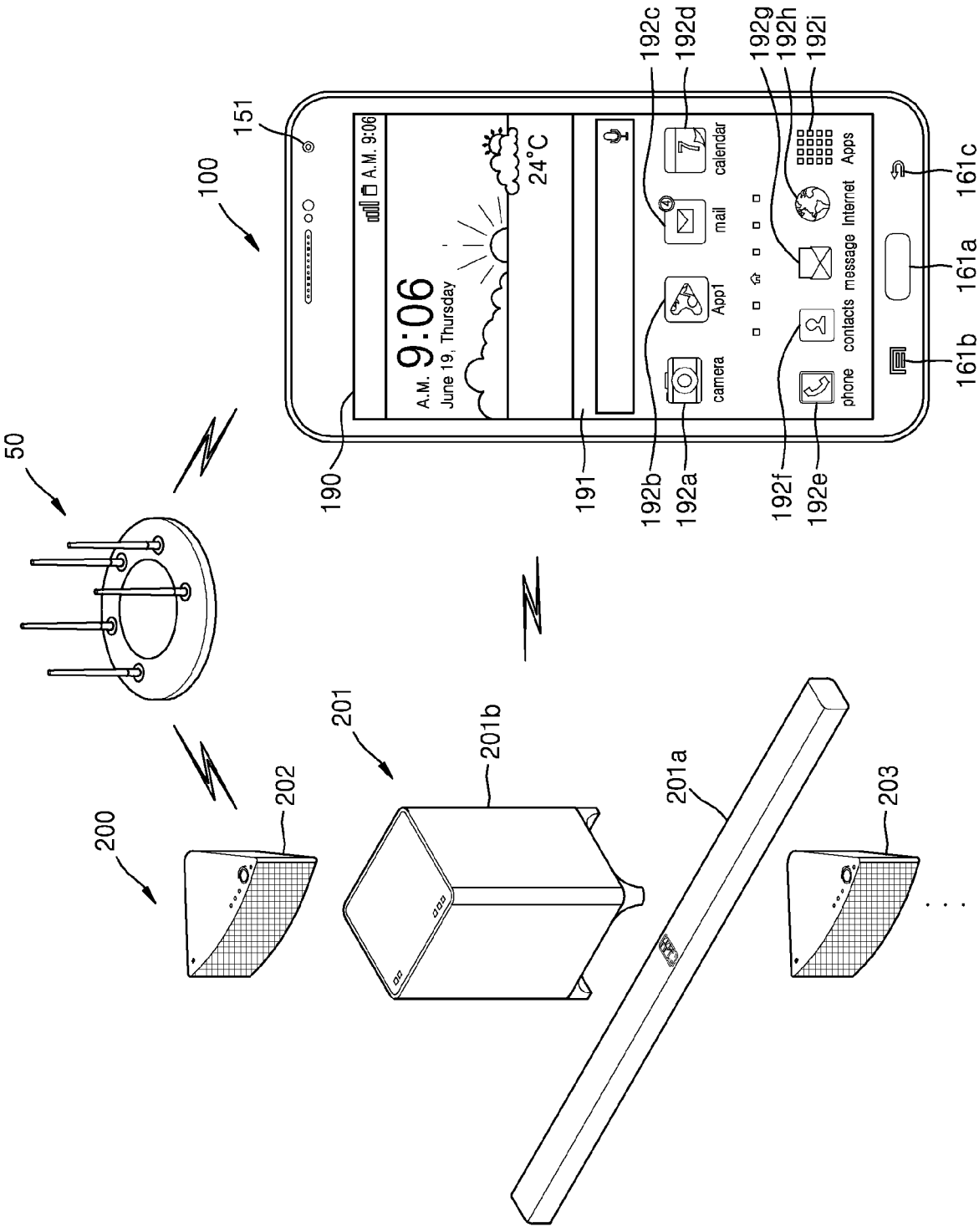

50
100
151
190
191
192a
192b
192c
192d
192e
192f
192g
192h
192i
161a
161b
161c
A.M. 9:06
A.M. 9:06
June 19, Thursday
24°C
calendar
mail
App1
camera
phone
contacts
message
Internet
Apps
200
201
201a
201b
202
203

FIG. 1

FIG. 2

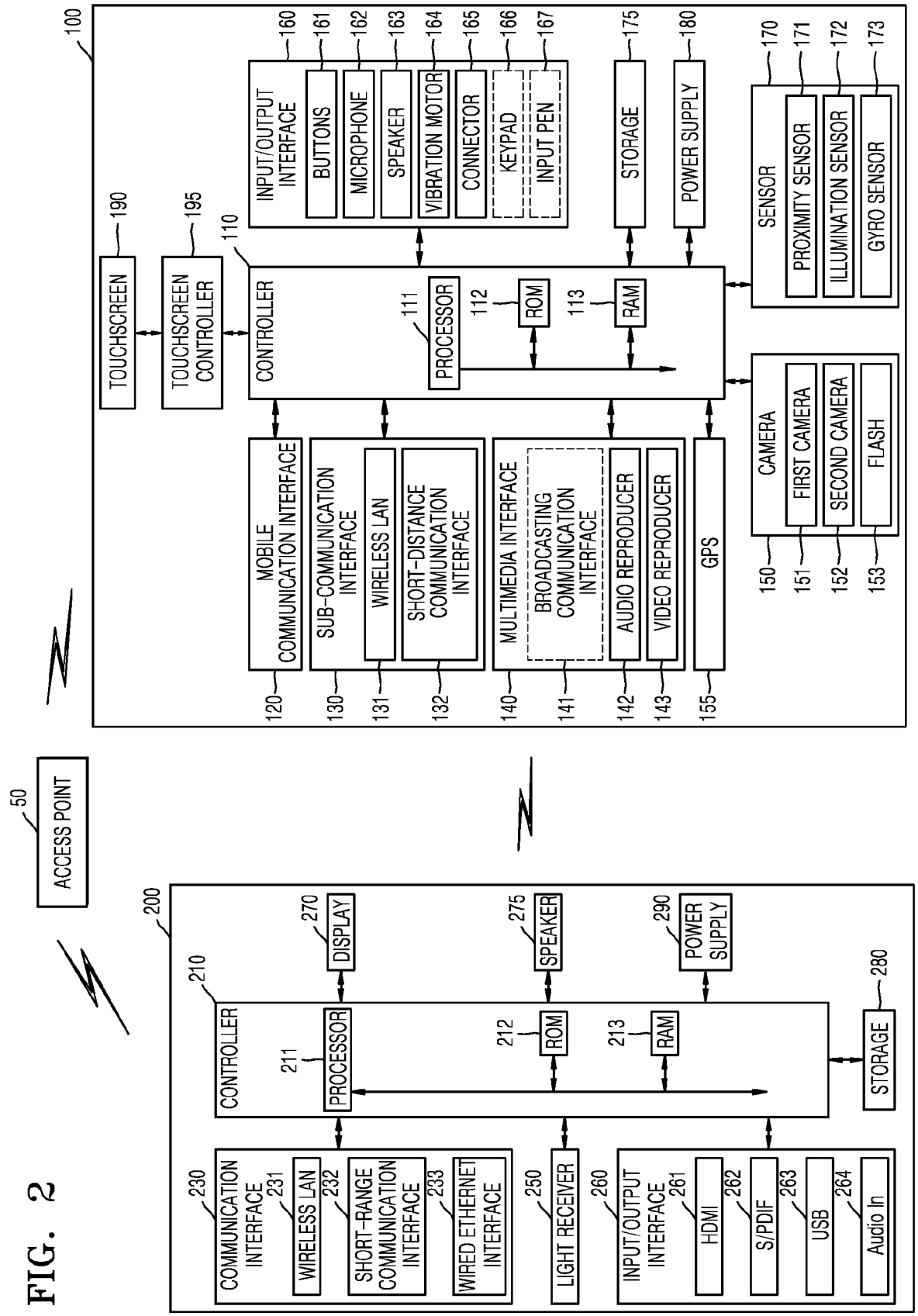

50
ACCESS POINT
100
TOUCHSCREEN
190
TOUCHSCREEN CONTROLLER
195
CONTROLLER
110
PROCESSOR
111
ROM
112
RAM
113
INPUT/OUTPUT INTERFACE
160
BUTTONS
161
MICROPHONE
162
SPEAKER
163
VIBRATION MOTOR
164
CONNECTOR
165
KEYPAD
166
INPUT PEN
167
STORAGE
175
POWER SUPPLY
180
SENSOR
170
PROXIMITY SENSOR
171
ILLUMINATION SENSOR
172
GYRO SENSOR
173
CAMERA
150
FIRST CAMERA
151
SECOND CAMERA
152
FLASH
153
MOBILE COMMUNICATION INTERFACE
120
SUB-COMMUNICATION INTERFACE
130
WIRELESS LAN
131
SHORT-DISTANCE COMMUNICATION INTERFACE
132
MULTIMEDIA INTERFACE
140
BROADCASTING COMMUNICATION INTERFACE
141
AUDIO REPRODUCER
142
VIDEO REPRODUCER
143
GPS
155
200
CONTROLLER
210
PROCESSOR
211
ROM
212
RAM
213
DISPLAY
270
SPEAKER
275
POWER SUPPLY
290
STORAGE
280
COMMUNICATION INTERFACE
230
WIRELESS LAN
231
SHORT-RANGE COMMUNICATION INTERFACE
232
WIRED ETHERNET INTERFACE
233
LIGHT RECEIVER
250
INPUT/OUTPUT INTERFACE
260
HDMI
261
S/PDIF
262
USB
263
Audio In
264

FIG. 3

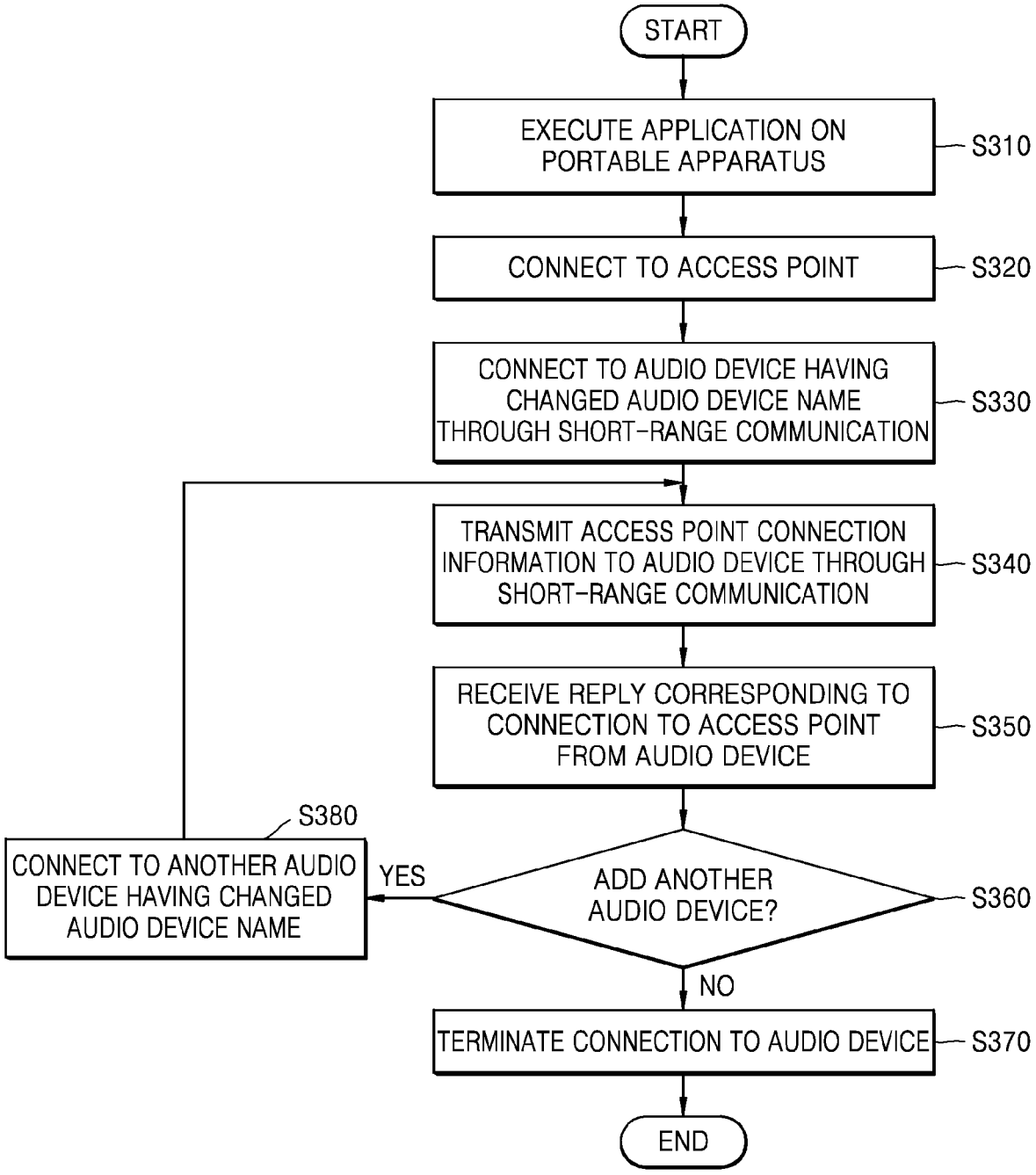
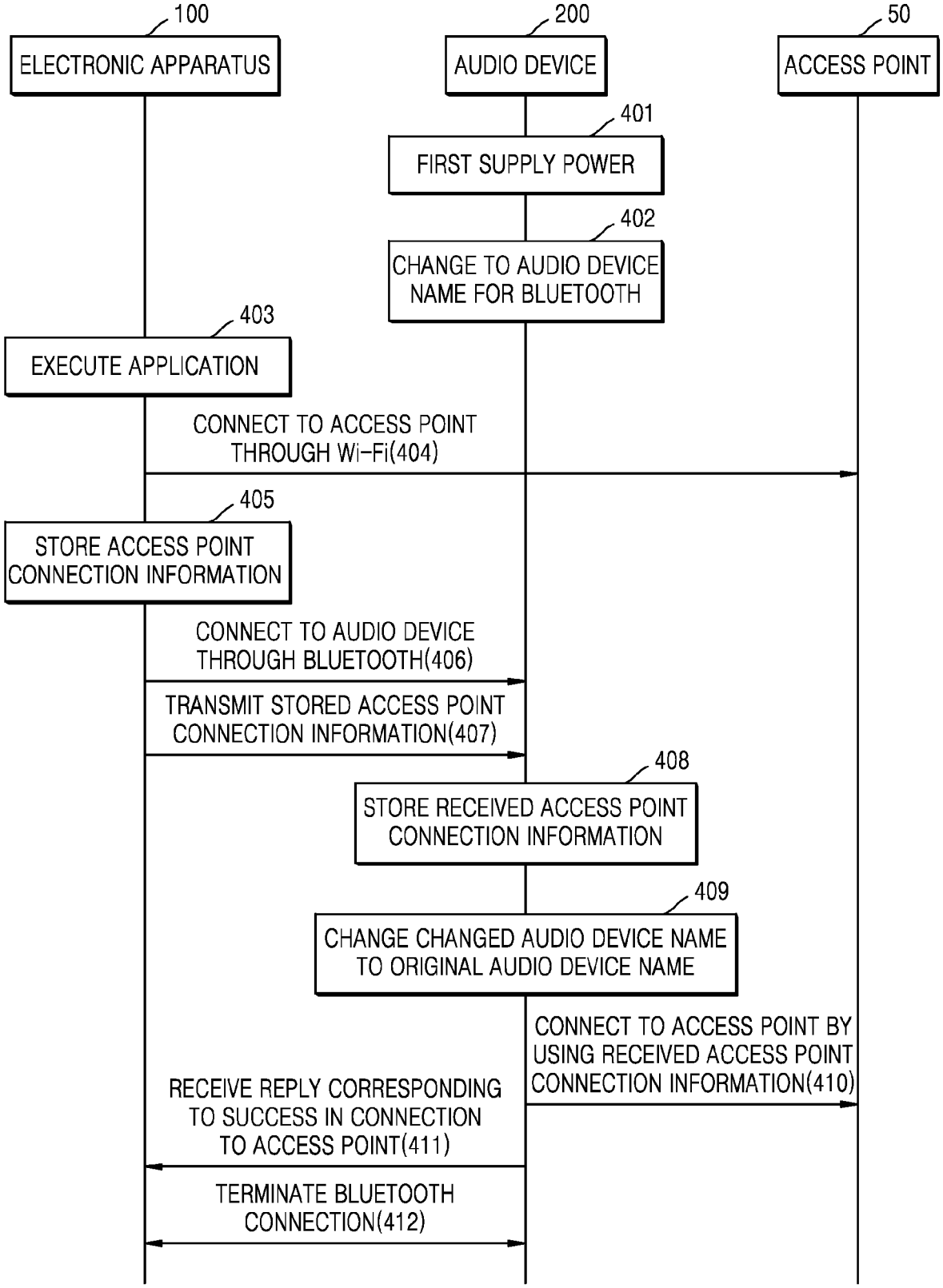

START
EXECUTE APPLICATION ON PORTABLE APPARATUS
S310
CONNECT TO ACCESS POINT
S320
CONNECT TO AUDIO DEVICE HAVING CHANGED AUDIO DEVICE NAME THROUGH SHORT-RANGE COMMUNICATION
S330
TRANSMIT ACCESS POINT CONNECTION INFORMATION TO AUDIO DEVICE THROUGH SHORT-RANGE COMMUNICATION
S340
RECEIVE REPLY CORRESPONDING TO CONNECTION TO ACCESS POINT FROM AUDIO DEVICE
S350
ADD ANOTHER AUDIO DEVICE?
S360
YES
S380
CONNECT TO ANOTHER AUDIO DEVICE HAVING CHANGED AUDIO DEVICE NAME
NO
TERMINATE CONNECTION TO AUDIO DEVICE
S370
END

FIG. 4


100
ELECTRONIC APPARATUS
200
AUDIO DEVICE
50
ACCESS POINT
401
FIRST SUPPLY POWER
402
CHANGE TO AUDIO DEVICE NAME FOR BLUETOOTH
403
EXECUTE APPLICATION
CONNECT TO ACCESS POINT THROUGH Wi-Fi(404)
405
STORE ACCESS POINT CONNECTION INFORMATION
CONNECT TO AUDIO DEVICE THROUGH BLUETOOTH(406)
TRANSMIT STORED ACCESS POINT CONNECTION INFORMATION(407)
408
STORE RECEIVED ACCESS POINT CONNECTION INFORMATION
409
CHANGE CHANGED AUDIO DEVICE NAME TO ORIGINAL AUDIO DEVICE NAME
CONNECT TO ACCESS POINT BY USING RECEIVED ACCESS POINT CONNECTION INFORMATION(410)
RECEIVE REPLY CORRESPONDING TO SUCCESS IN CONNECTION TO ACCESS POINT(411)
TERMINATE BLUETOOTH CONNECTION(412)

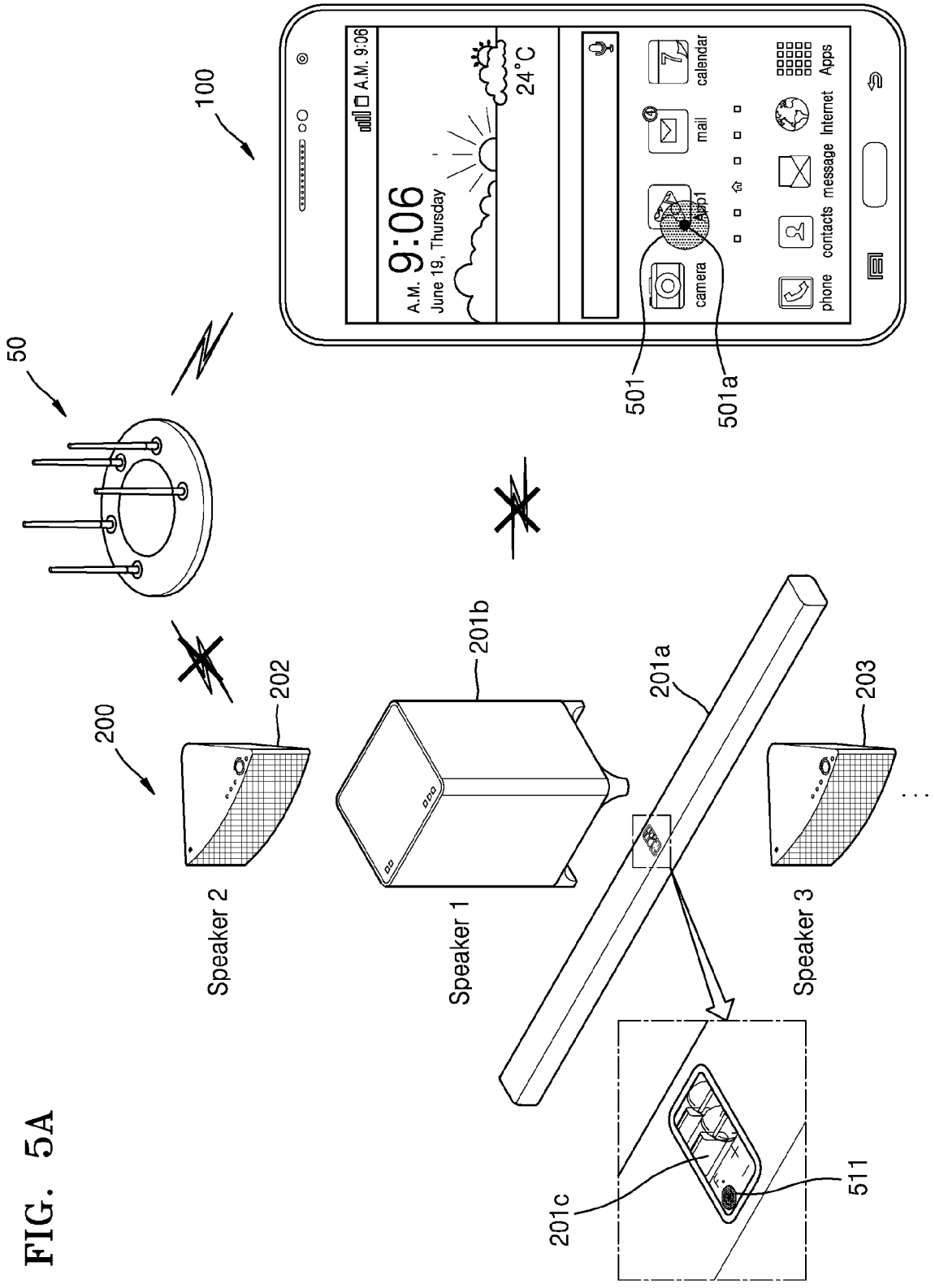

100
A.M. 9:06
A.M. 9:06
June 19, Thursday
24°C
calendar
mail
App1
camera
phone
contacts
message
Internet
Apps
501
501a
50
200
202
Speaker 2
201b
Speaker 1
201a
203
Speaker 3
201c
511

FIG. 5A

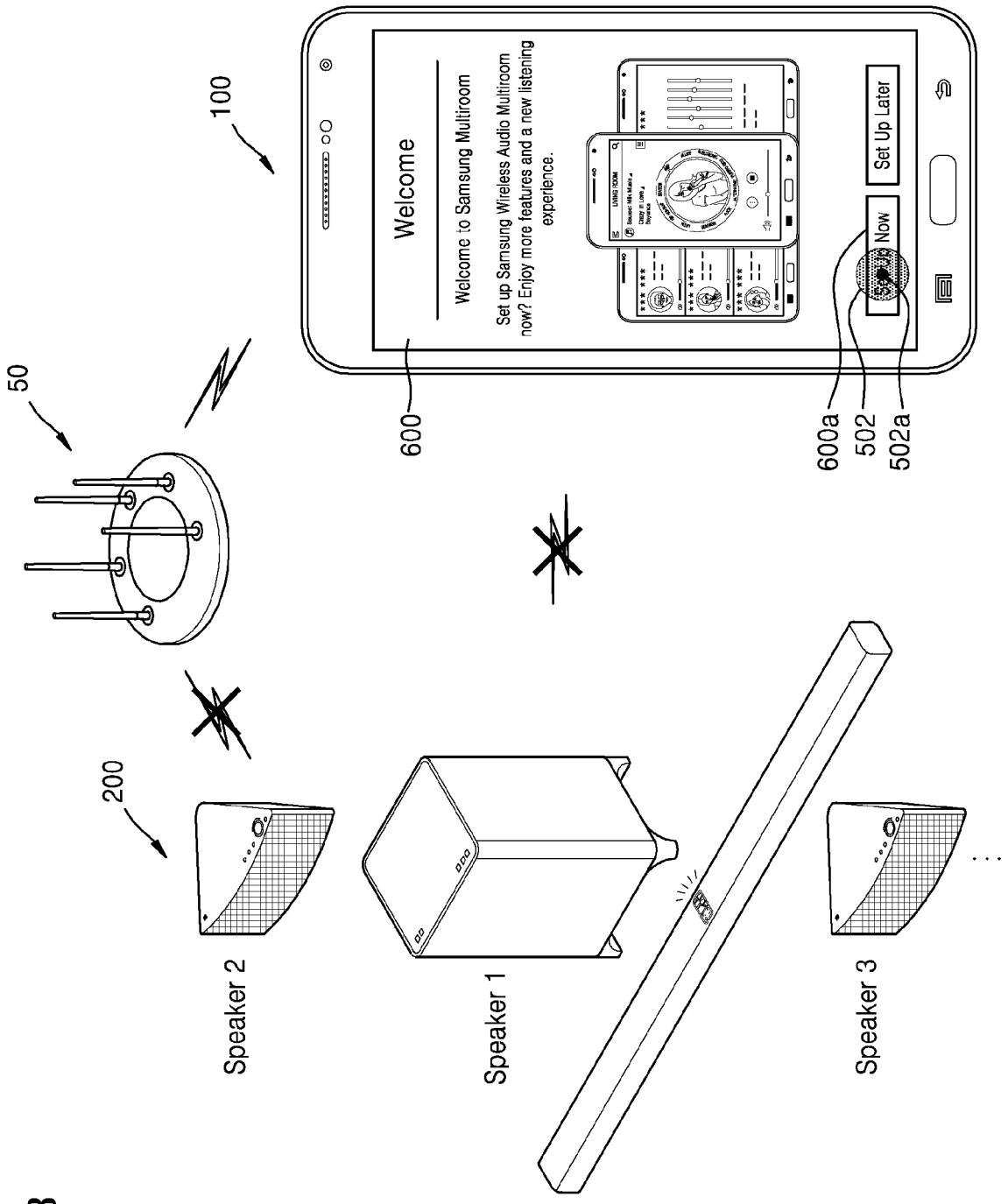

100
Welcome
Welcome to Samsung Multiroom
Set up Samsung Wireless Audio Multiroom now? Enjoy more features and a new listening experience.
Set Up Later
Now
600
600a
502
502a
50
200
Speaker 2
Speaker 1
Speaker 3

FIG. 5B

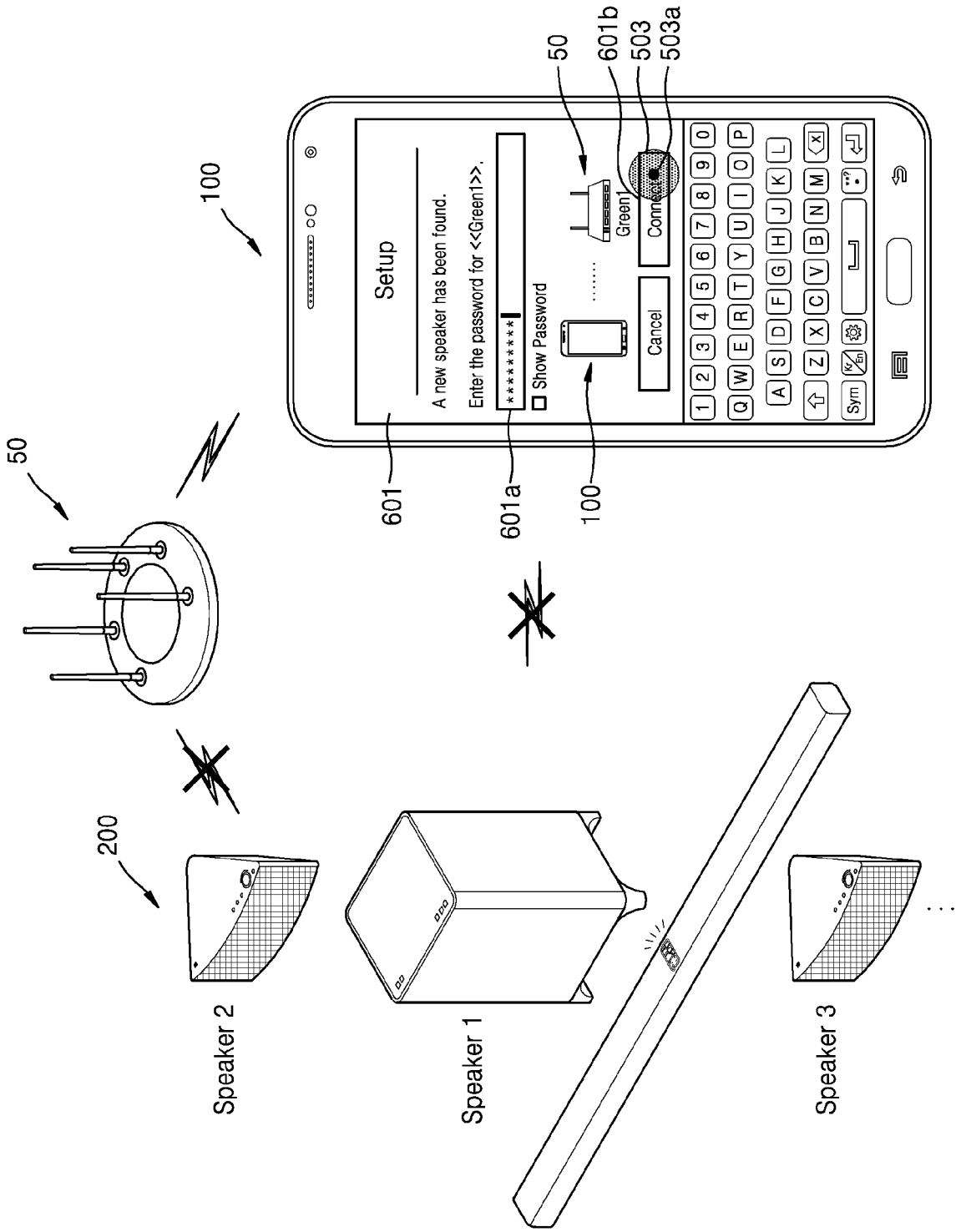

50
601b
503
503a
100
Setup
A new speaker has been found.
Enter the password for <<Green1>>.
Show Password
Green1
Connect
Cancel
601
601a
100
50
200
Speaker 2
Speaker 1
Speaker 3

FIG. 5C

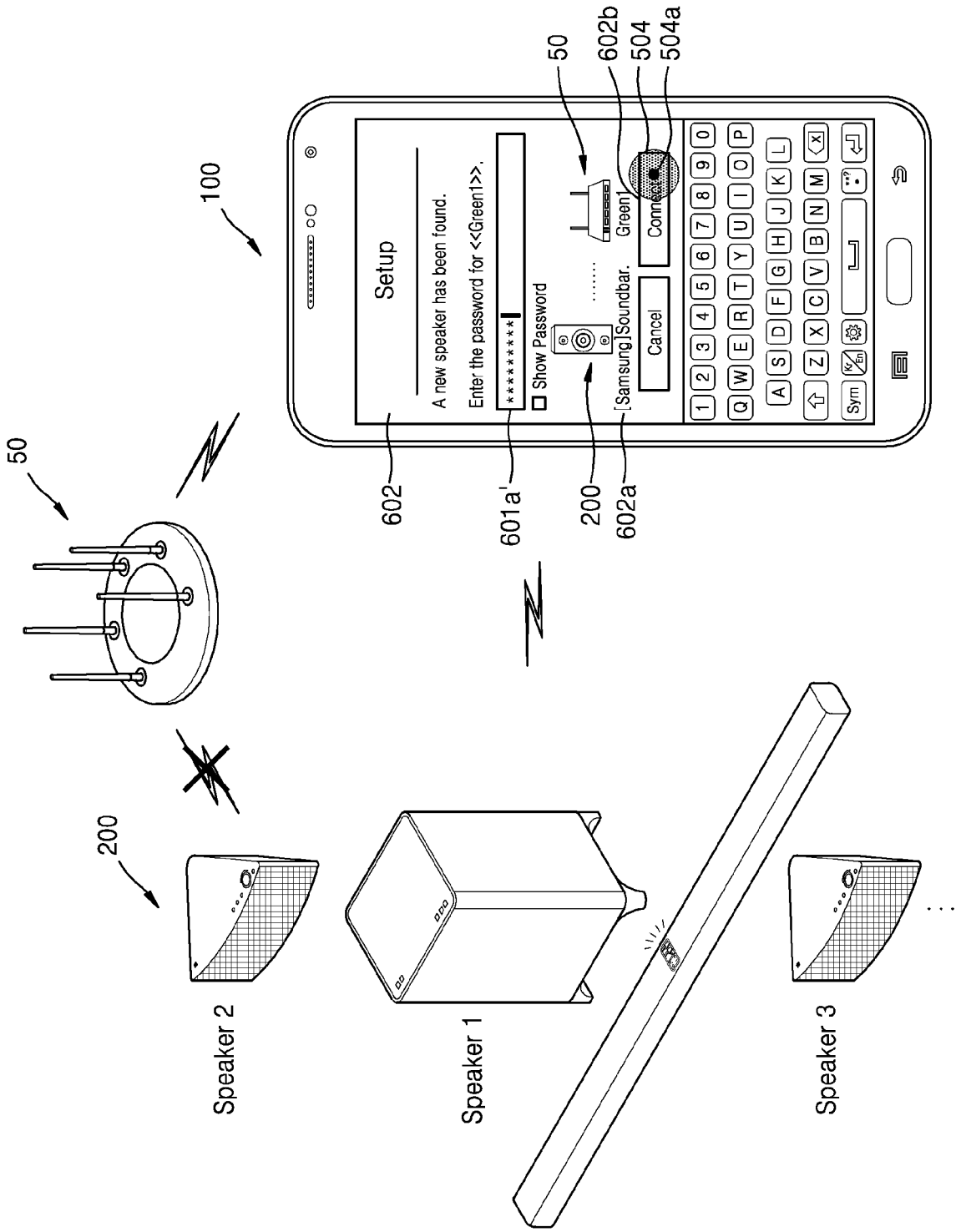

50
602b
504
504a
100
Setup
A new speaker has been found.
Enter the password for <<Green1>>.
Show Password
Green1
Connect
Cancel
Samsung Soundbar.
602
601a'
200
602a
50
200
Speaker 2
Speaker 1
Speaker 3

FIG. 5D

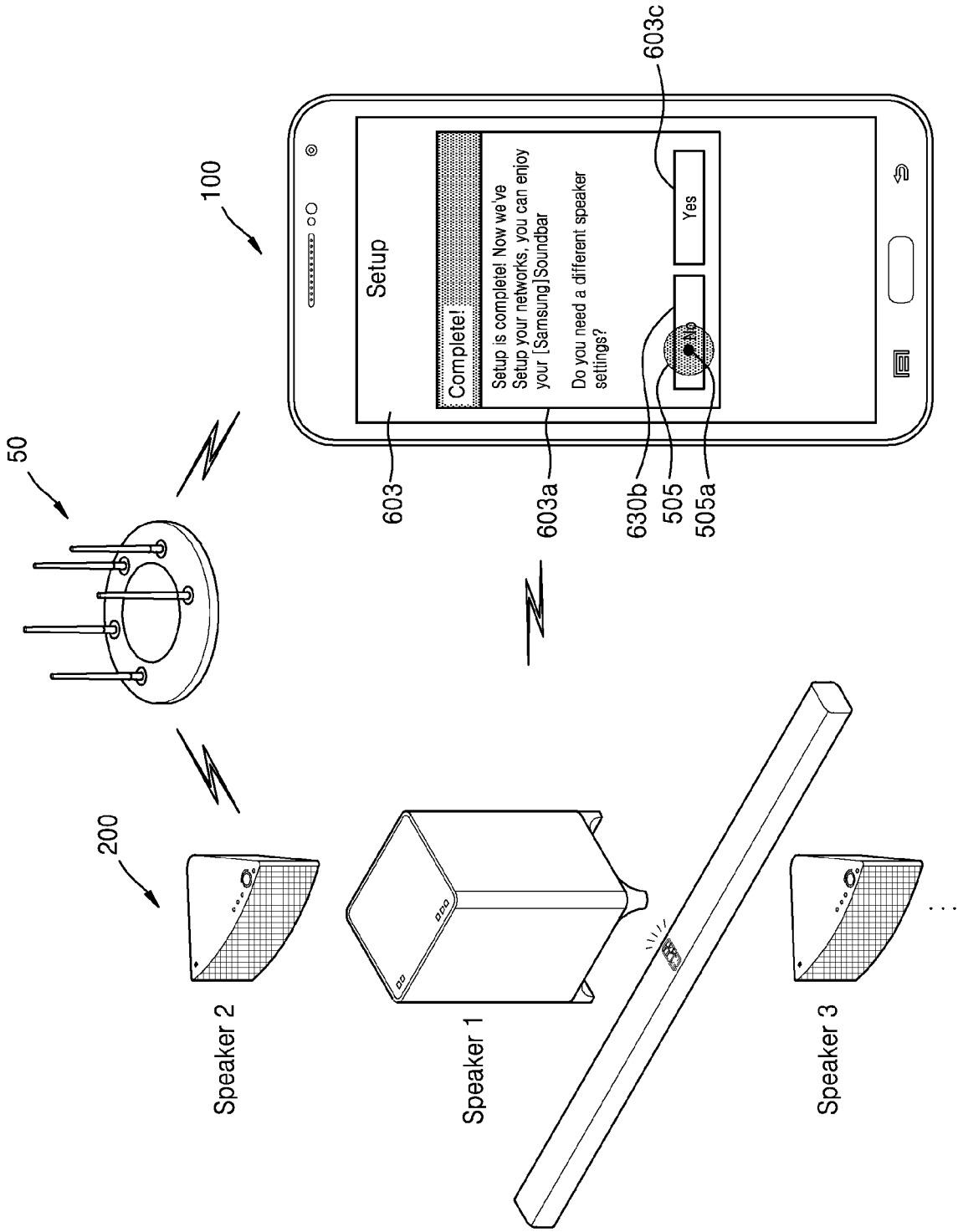

100
Setup
Complete!
Setup is complete! Now we've Setup your networks, you can enjoy your [Samsung]Soundbar
Do you need a different speaker settings?
Yes
No
603c
603
603a
630b
505
505a
50
200
Speaker 2
Speaker 1
Speaker 3

FIG. 5E

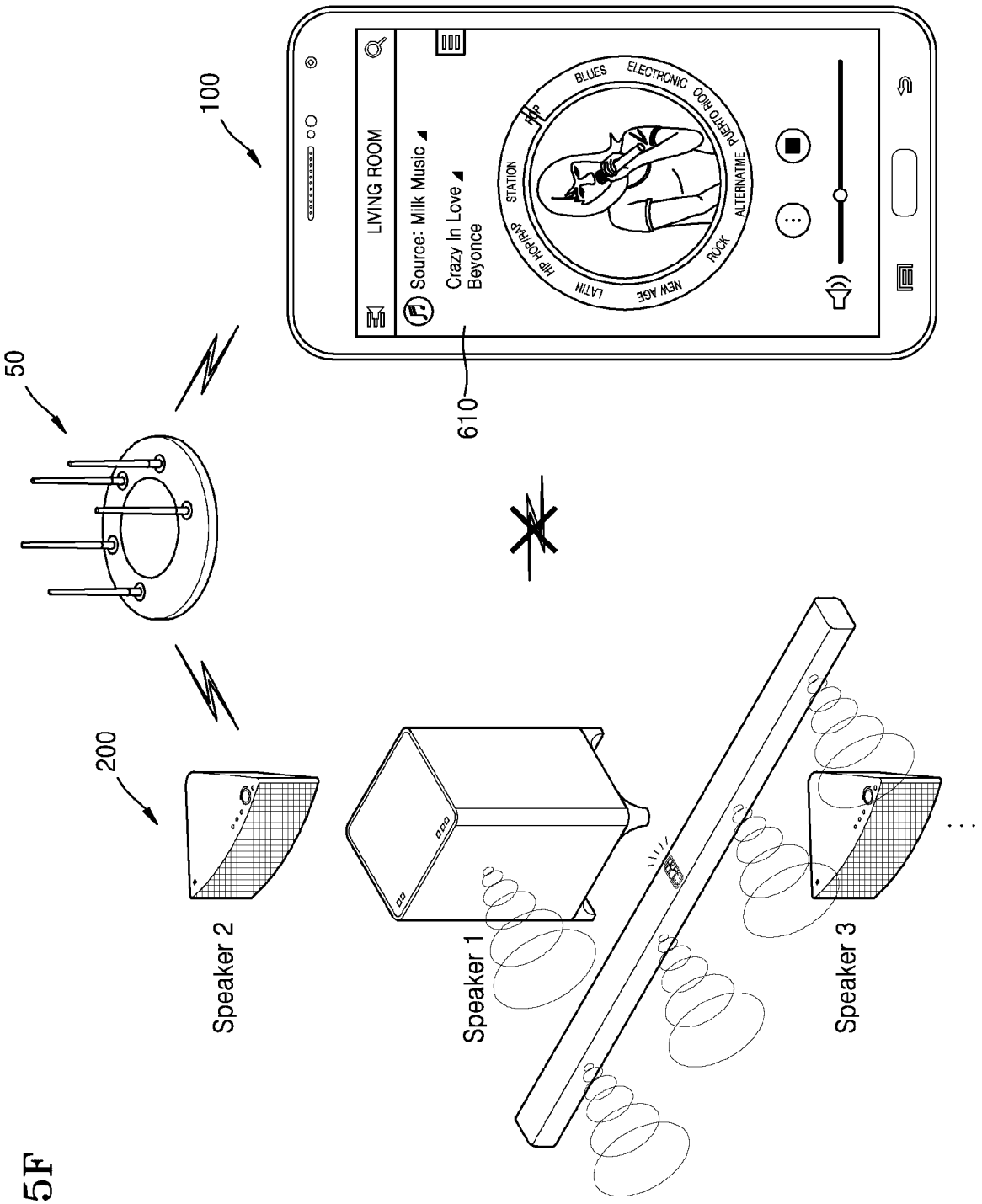

100
LIVING ROOM
Source: Milk Music
Crazy In Love
Beyonce
610
BLUES
ELECTRONIC
PUERTO RICO
ALTERNATIVE
ROCK
LATIN
NEW AGE
HIP HOP/RAP
STATION
50
200
Speaker 2
Speaker 1
Speaker 3

FIG. 5F

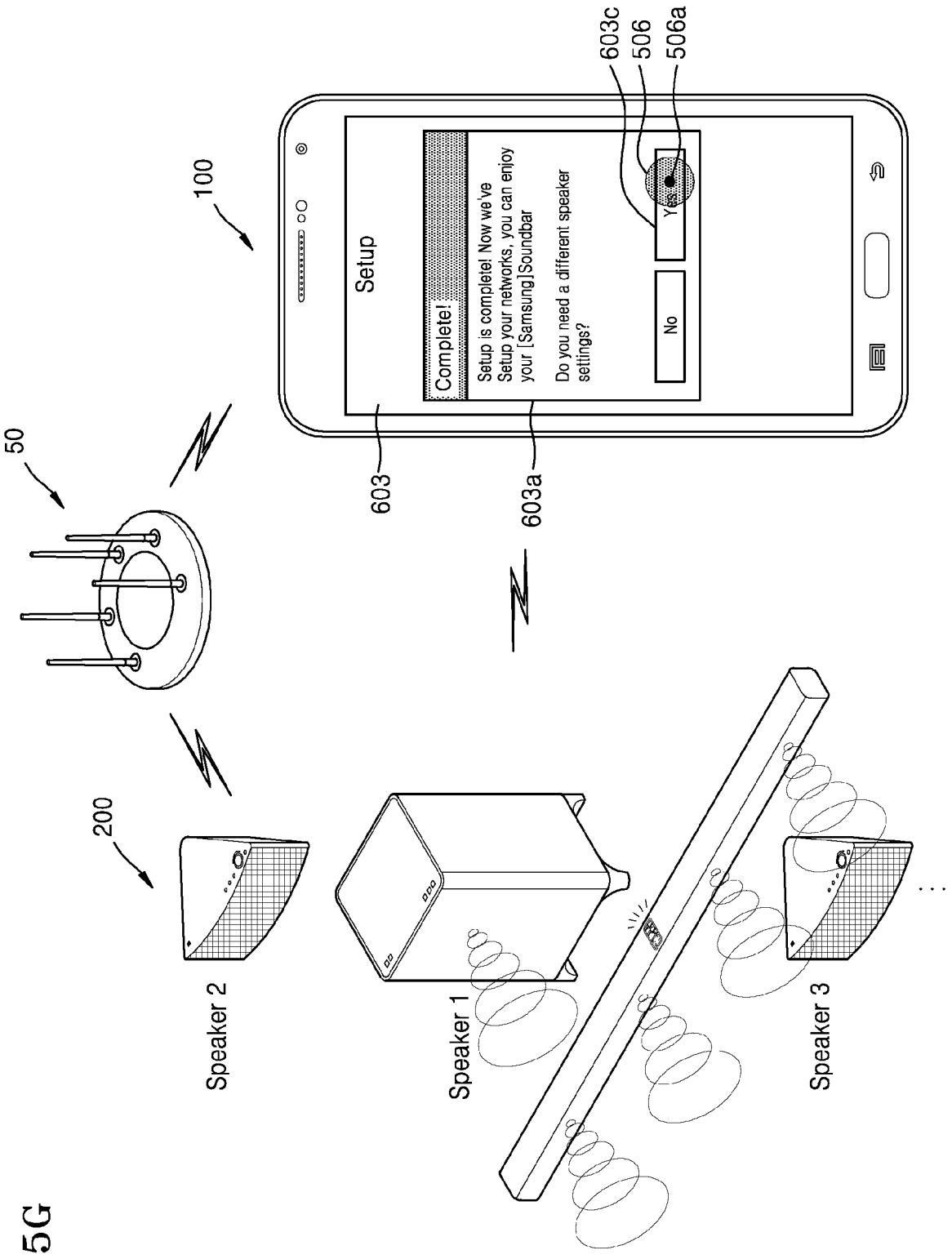

603c
506
506a
100
Setup
Complete!
Setup is complete! Now we've Setup your networks, you can enjoy your [Samsung]Soundbar
Do you need a different speaker settings?
Yes
No
603
603a
50
200
Speaker 2
Speaker 1
Speaker 3

FIG. 5G

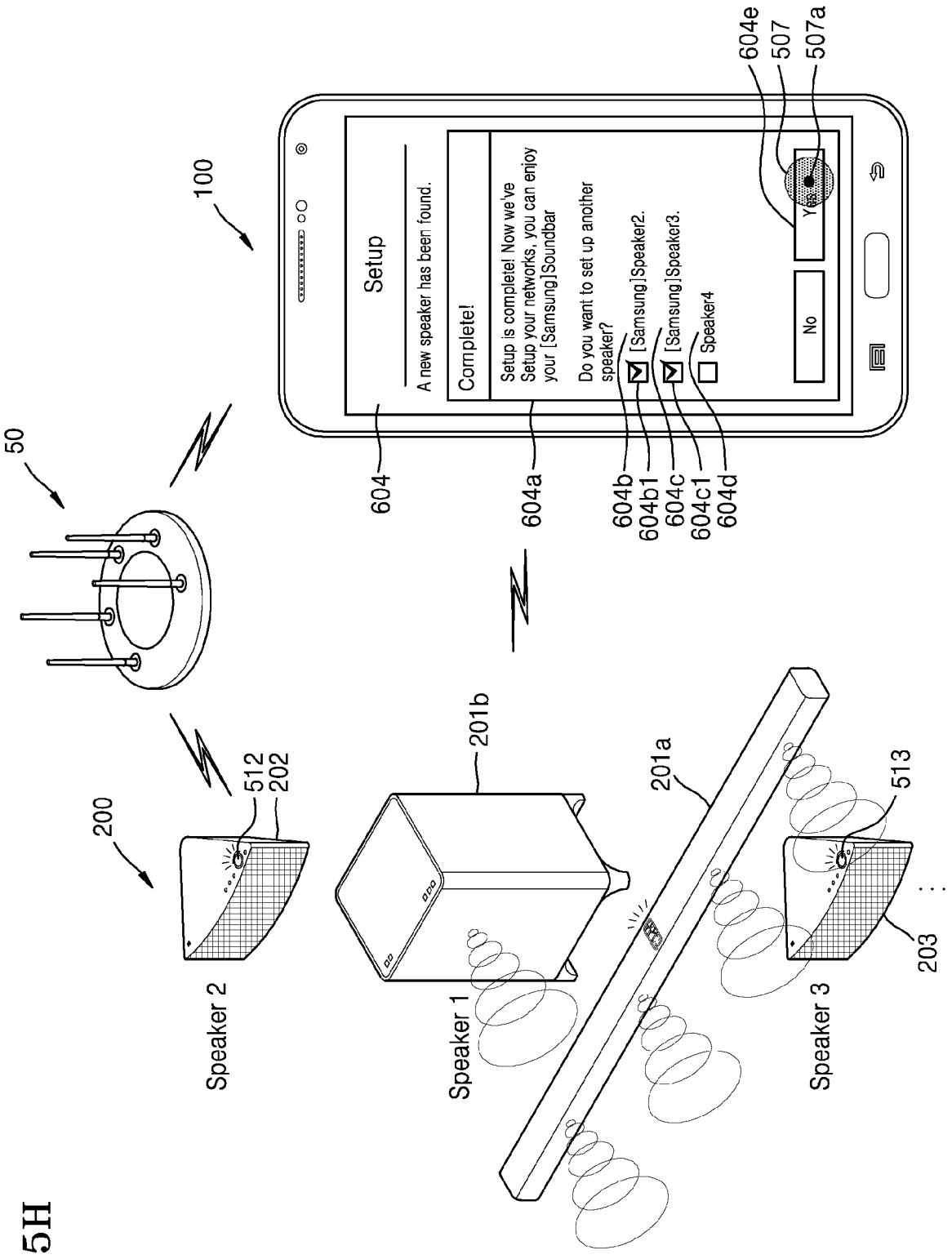

100
50
200
512
202
Speaker 2
201b
Speaker 1
201a
513
Speaker 3
203
604
Setup
A new speaker has been found.
Complete!
Setup is complete! Now we've Setup your networks, you can enjoy your [Samsung]Soundbar
Do you want to set up another speaker?
[Samsung]Speaker2.
[Samsung]Speaker3.
Speaker4
No
Yes
604a
604b
604b1
604c
604c1
604d
604e
507
507a

FIG. 5H

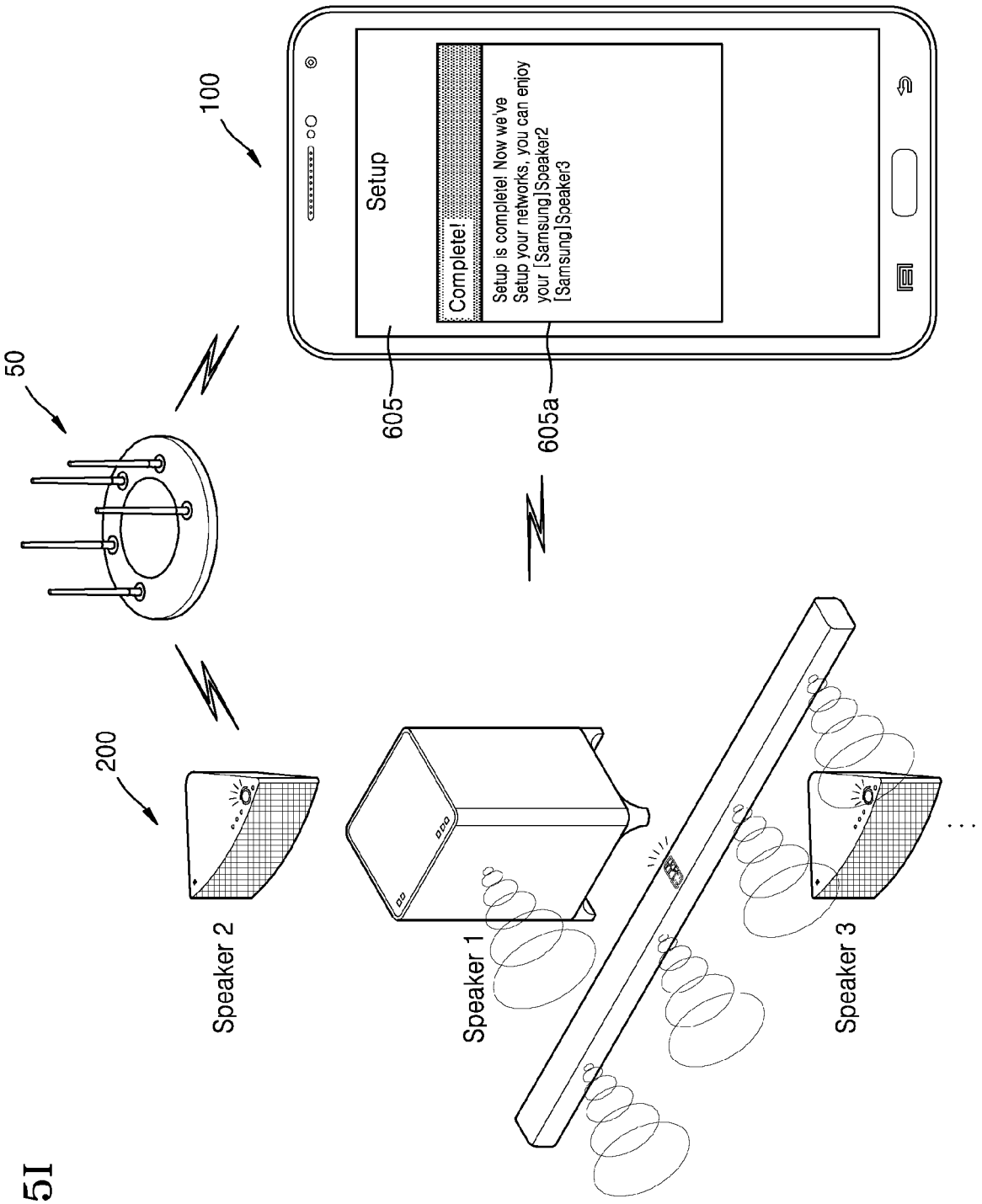

100
Setup
Complete!
Setup is complete! Now we've Setup your networks, you can enjoy your [Samsung]Speaker2 [Samsung]Speaker3
605
605a
50
200
Speaker 2
Speaker 1
Speaker 3

FIG. 5I

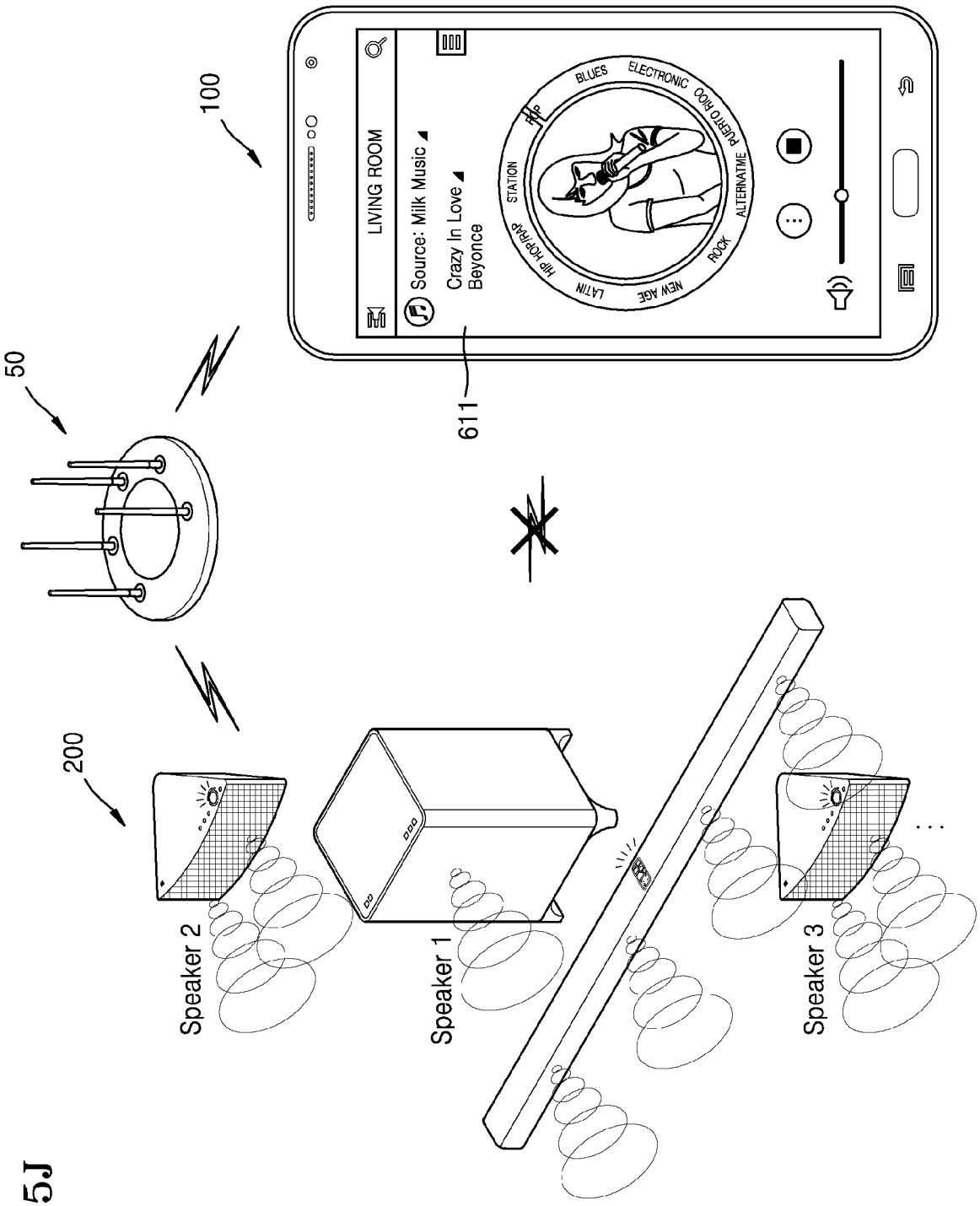

100
LIVING ROOM
Source: Milk Music
Crazy In Love
Beyonce
611
BLUES
ELECTRONIC
PUERTO RICO
ALTERNATIVE
ROCK
LATIN
NEW AGE
HIP HOP/RAP
STATION
50
200
Speaker 2
Speaker 1
Speaker 3

FIG. 5J

ELECTRONIC APPARATUS AND METHOD OF SETTING NETWORK OF AUDIO DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a Continuation Application of U.S. application Ser. No. 16/657,334 filed on Oct. 18, 2019, which is a continuation of U.S. application Ser. No. 14/989,193 filed on Jan. 6, 2016, which issued as U.S. Pat. No. 10,477,461 and claims the benefit of U.S. Provisional Application No. 62/100,160, filed on Jan. 6, 2015 in the U.S. Patent and Trademark Office, and claims priority from Korean Patent Application No. 10-2015-0015333, filed on Jan. 30, 2015 in the Korean Intellectual Property Office, the disclosures of which are incorporated by reference herein in their respective entireties.

BACKGROUND

1. Field

Exemplary embodiments relate to electronic apparatuses and methods for setting networks of audio devices, and more particularly, to an electronic apparatus configured for wirelessly setting a network of an audio device by using an application that is installed in the electronic apparatus and a method which is performable by the electronic apparatus to set the network of the audio device.

2. Description of the Related Art

Audio devices (e.g., speakers, soundbars, and home theaters) that support not only wired connection but also wireless connection have been developed. Wireless audio devices may provide various pieces of audio content to users via coder/decoders (i.e., "codecs") that provide a high-quality sound and the convenience of a wireless method. For wireless connection to an access point (or a router), a wireless network of an audio device must be set. It may be difficult for a user to set a network of an audio device based on whether there are a display and a button (including a number key) for network setup. Further, when there are a plurality of audio devices having wireless networks that must be set, a user must repeatedly perform the same process of setting a wireless network.

SUMMARY

Provided are an electronic apparatus that is configured to easily and simply set a network of an audio device and a method that is performable by the electronic apparatus to set the network of the audio device.

Additional aspects will be set forth in part in the description which follows and, in part, will be apparent from the description, or may be learned by practice of the presented exemplary embodiments.

According to an aspect of an exemplary embodiment, an electronic apparatus includes: a first communication interface which is wirelessly connected to an access point; a second communication interface which is wirelessly connected to an audio device having a changed audio device name; and a controller configured to control the first communication interface and the second communication interface, wherein the controller is further configured to store access point connection information that corresponds to the access point and to transmit, via the second communication interface, the access point connection information to the audio device.

The controller may be further configured to connect to the audio device via the second communication interface by changing an original audio device name.

According to an aspect of an exemplary embodiment, a method which is performable by an electronic apparatus for setting a network of an audio device includes: storing, in an application that is installed in the electronic device, access point connection information that relates to an access point that is connected to the electronic apparatus via a first communication interface; connecting, via a second communication interface, to an audio device; and transmitting, via the second communication interface, the access point connection information to the audio device, wherein the audio device includes an original audio device name and the changed audio device name.

The connecting to the audio device may include connecting to the audio device by changing the original audio device name.

According to an aspect of an exemplary embodiment, an audio device includes: a first communication interface which is wirelessly connected to an access point by using an original audio device name; a second communication interface which is wirelessly connected to an electronic apparatus by using a changed audio device name; and a controller configured to control the first communication interface and the second communication interface, wherein the controller is further configured to receive, from the electronic device, access point connection information that corresponds to the access point, and to connect to the access point by using the received access point connection information.

When power is supplied to the audio device, the controller may be further configured to change the original audio device name of the audio device to the changed audio device name.

According to an aspect of another exemplary embodiment, an electronic apparatus includes: a touchscreen; and a controller configured to control the touchscreen, wherein the controller is further configured to display, on the touchscreen, a first user interface for receiving a first user input that relates to establishing a wireless communication connection to an access point, and to display, on the touchscreen, a second user interface for receiving a second user input that relates to establishing a wireless communication connection to the access point and an audio device in response to the received first user input.

The controller may be further configured to store access point connection information that corresponds to the access point, and to transmit the access point connection information to the audio device in response to the received second user input.

BRIEF DESCRIPTION OF THE DRAWINGS

These and/or other aspects will become apparent and more readily appreciated from the following description of the exemplary embodiments, taken in conjunction with the accompanying drawings in which:

FIG. **1** is a view for explaining an operation between an electronic apparatus and an audio device, according to an exemplary embodiment;

FIG. **2** is a block diagram of the electronic apparatus and the audio device, according to an exemplary embodiment;

FIG. **3** is a flowchart of a method that is performable by the electronic apparatus for setting a network of the audio device, according to an exemplary embodiment;

FIG. **4** is a sequence diagram of a method that is performable by the electronic apparatus for setting a network of the audio device, according to an exemplary embodiment; and

FIGS. **5**A through **5**J are views for explaining a method that is performable by the electronic apparatus for setting a network of the audio device, according to an exemplary embodiment.

DETAILED DESCRIPTION

Exemplary embodiments will now be described more fully with reference to the accompanying drawings. In addition, methods for manufacturing and using electronic apparatuses according to exemplary embodiments will now be described more fully with reference to the accompanying drawings. In the drawings, elements having substantially the same functions are denoted by the same reference numerals or symbols.

It will be understood that, although the terms first, second, third etc. may be used herein to describe various elements, these elements should not be limited by these terms. These terms are only used to distinguish one element from another element. Thus, a first element discussed below could be termed a second element and, similarly, a second element could be termed a first element without departing from the teachings of exemplary embodiments. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

When a "key" (or a button) provided (or formed) on an electronic apparatus or an audio device is selected, it may connote that the key (or the button) may be pressed or touched.

The term "application" refers to software that is executable on an operating system (OS) for a computer or on a mobile OS and is usable by a user. Examples of an application may include any of a contacts application, a calendar application, a memo application, an alarm application, a social network system (SNS) application, a chatting application, a map application, a word processor, a spread sheet, a music player, and a video player.

The term "application" according to an exemplary embodiment may refer to software that is executable on an electronic apparatus or an external device (e.g., a server or an audio device) that is wirelessly or wiredly connected to the electronic apparatus. The term "application" according to an exemplary embodiment may refer to software that may control a function or an operation of an external device (e.g., a server or an audio device) that is wirelessly or wiredly connected to an electronic apparatus in which the application is installed. The term "application" according to an exemplary embodiment may refer to software that is executable on an electronic apparatus in response to a received user input.

Content may be executable on an application of an electronic apparatus. Examples of content may include a video file and/or an audio file that is played in a video player that is an application, a music file that is played in a music player, a photo file that is displayed on a photo gallery, and/or a web page file that is displayed on a web browser. Contents may refer to a plurality of pieces of content.

Examples of content may include any of a video file, an audio file, a text file, an image file, and a web page that are displayable on or executable on an application. The term "video" used herein may be interchangeably used with a moving image. Examples of content may include any of a video file, an audio file, a text file, an image file, and a web page that are executable in response to a received user input (e.g., a touch). Examples of content include an application screen that is executable and a user interface that constitutes the application screen. The term "widget" refers to a mini application that is a type of graphical user interface (GUI) that enables a user to more efficiently interact with an application or an OS. Examples of a widget include a weather widget, a calculator widget, and a clock widget.

A touch (including a touch gesture) may be input by using a user's body part and/or by using an input pen.

In an exemplary embodiment, an original audio device name may be a first audio device name. A changed audio device name may be a second audio device name.

When an audio device is turned on, it may mean that in a state in which a power plug of the audio device is inserted into a power source (e.g., a power outlet), power is supplied to the audio device by using a power button.

As used herein, the singular forms "a", "an", and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising", when used in this specification, specify the presence of stated features, integers, steps, operations, elements, components, and/or combinations thereof, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or combinations thereof.

As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items. Expressions such as "at least one of" when preceding a list of elements, modify the entire list of elements and do not modify the individual elements of the list.

FIG. **1** is a view for explaining an operation between an electronic apparatus **100** and an audio device **200**, according to an exemplary embodiment.

Referring to FIG. **1**, an access point **50**, the electronic apparatus **100**, and the audio device **200** may be wirelessly connected to one another by using communication interfaces thereof (not shown). For example, the electronic apparatus **100** and the audio device **200** may be connected in an ad hoc mode, or an infrastructure mode in which the electronic apparatus **100** and the audio device **200** are wirelessly connected to each other via the access point **50**. The audio device **200** may be wiredly connected to the electronic apparatus **100**. Examples of wireless communication may include, but are not limited to, wireless fidelity (Wi-Fi), Bluetooth, Bluetooth low energy, ZigBee, Wi-Fi Direct, ultra-wideband (UWB), infrared data association (IrDA), and near field communication (NFC).

The electronic apparatus **100** may control a function and/or an operation (e.g., power on/off, volume control, sound effect (e.g., movie, concert, or sports), and/or network setup) of the audio device **200** by using a wireless local area network (LAN) or short-range communication (e.g., Bluetooth or NFC).

The electronic apparatus **100** may output audio (e.g., a music file) to the audio device **200** by using a wireless LAN or short-range communication (e.g., Bluetooth or NFC). Alternatively, the electronic apparatus **100** may output audio (e.g., a music file) to the audio device **200** by using the access point **50** that connects to the electronic apparatus **100** via a wireless LAN. The audio device **200** may receive the audio from the access point **50** and may output the received audio.

The audio device **200** may include a soundbar system **201** which includes a soundbar **201***a* and a woofer **201***b*, and audio devices, such as one or more portable speakers **202** and **203**. The soundbar system **201** and the audio devices **202** and **203** may be located in a space (e.g., a living room of a house or one office) within which the audio device **200** may access one access point **50**. The soundbar system **201** and the audio devices **202** and **203** may be located in different spaces (e.g., a living room of a house, a first room, and a second room, or an office, a first conference room, and a second conference room) from which the audio device **200** may access one access point **50**. Alternatively, the soundbar system **201** and the audio devices **202** and **203** may be located in different spaces (e.g., a living room of a house, a first room on a first floor, and a second room on a second floor, or an office on a fifth floor, a first conference room on the fifth floor, and a second conference room on a sixth floor) from which the audio device **200** may access one access point **50**.

It will be understood by one of ordinary skill in the art that the audio device **200** may include, but is not limited to, any of a 2-channel system, a 2.1-channel system, a 4-channel system, a 4.1-channel system, a 5.1-channel system, a 6.1-channel system, a 7.1-channel system, a 9.1-channel system, or a 11.2-channel system.

The audio device **200** may output audio that is wirelessly received from the access point **50** that is connected to an external audio source (e.g., the electronic apparatus **100**, a server (not shown), and/or a storage (not shown)). Alternatively, the audio device **200** may output audio that is wiredly or wirelessly received from an external audio source (e.g., the electronic apparatus **100**, a server (not shown), or a storage (not shown)).

The term "user" according to an exemplary embodiment may refer to a person who controls a function or an operation of the electronic apparatus **100** and/or a function or an operation of the audio device **200**. Examples of a user may include a manager and an installer.

In order to control the audio device **200**, a remote controller (not shown) that may be manipulated by a user's input may be used. The remote controller may control a function of the audio device **200** by using at least one of a key (including a button), a touchpad, a microphone (not shown) that may receive the user's voice, and a sensor (not shown) that may recognize a motion of the remote controller.

FIG. **2** is a block diagram of the electronic apparatus **100** and the audio device **200**, according to an exemplary embodiment.

Referring to FIG. **2**, the electronic apparatus **100** may be wiredly or wirelessly connected to the audio device **200** by using a mobile communication interface **120**, a sub-communication interface **130**, and a connector **165**. Examples of the electronic apparatus **100** may include any of a mobile phone (not shown), a smartphone (not shown), an MP3 player (not shown), a video player (not shown), a tablet PC (not shown), a wearable apparatus (not shown) that may be worn on a body, an electronic board (not shown), a home appliance (e.g., a refrigerator, an air conditioner, or a cleaner), and a display apparatus (not shown).

It will be understood by one of ordinary skill in the art that examples of the display apparatus may include, but are not limited to, any of an analog television (TV), a digital TV, a three-dimensional (3D)-TV, a smart TV, a light-emitting diode (LED) TV, an organic light-emitting diode (OLED) TV, a plasma TV, a monitor, a curved TV with a screen having a fixed curvature, a flexible TV with a screen having a fixed curvature, a bended TV with a screen having a fixed curvature, and a variable TV with a screen whose curvature may vary based on a received user input.

The electronic apparatus **100** may include an input pen and a touchscreen **190** and may transmit or receive data (or content) to or from the audio device **200** via the mobile communication interface **120** or the sub-communication interface **130**. The electronic apparatus **100** may transmit or receive data (or content) to or from an external device via an interaction (e.g., a touch or a touch gesture) that is input via the touchscreen **190**. Alternatively, the electronic apparatus **100** may include a display (not shown, including only a display panel without a touch panel) and may transmit or receive data (content) to or from the audio device **200** via the mobile communication interface **120** or the sub-communication interface **130**. The electronic apparatus **100** may include one or more touchscreens **190**. In addition, the electronic apparatus **100** may include a plurality of screens that are separated to respectively correspond to the touchscreens **190**.

The electronic apparatus **100** includes a controller **110**, the mobile communication interface **120**, the sub-communication interface **130**, a multimedia interface **140**, a camera **150**, a global positioning system (GPS) unit **155**, an input/output interface **160**, a sensor **170**, a storage **175**, and a power supply **180**. The electronic apparatus **100** further includes the touchscreen **190** and a touchscreen controller **195**.

The controller **110** may include a processor **111**, a read-only memory (ROM) **112** in which a control program for controlling the electronic apparatus **100** is stored, and a random-access memory (RAM) in which a signal or data that is received from the outside of the electronic apparatus **100** is stored or data for various operations performed by the electronic apparatus **100** is stored. The processor **111**, the ROM **112**, and the RAM **113** may be provided as semiconductor chips.

The controller **110** controls an overall operation of the electronic apparatus **100** and the flow of signals between the elements **120** through **195** included in the electronic apparatus **100**. The controller **110** controls the power supply **180** to supply power to the elements **120**. Further, when the user's input or set conditions are satisfied, the controller **110** may execute an individual sensor of the sensor **170**, or an OS or an application that is stored in the storage **175**.

The processor **111** may include a graphics processing unit (GPU) for graphic processing. The processor **111** may be provided as a system-on-chip (SoC) including a core (not shown) and a GPU (not shown). The processor **111** may include a single core, a dual core, a triple core, a quad core, or a multiple core thereof. Further, the processor **111**, the ROM **112**, and the RAM **113** may be connected to one another via a bus.

The controller **110** may control the mobile communication interface **120**, the sub-communication interface **130**, the multimedia interface **140**, the camera **150**, the GPS unit **155**, the input/output interface **160**, the sensor **170**, the storage **175**, the power supply **180**, the touchscreen **190**, and the touchscreen controller **195**.

The controller **110**, according to an exemplary embodiment, controls a first communication interface that is wirelessly connected to the access point **50** and a second communication interface that is wirelessly connected to the audio device **200** which has a changed audio device name, stores access point connection information that corresponds to the access point **50** that is connected via the first com-

munication interface, and transmits the access point connection information to the audio device **200** via the second communication interface.

The controller **110** may control the audio device **200** having the changed audio device name that is obtained by changing an original audio device name to be connected via the second communication interface.

The controller **110** may control the audio device **200** that is first supplied with power and has the changed audio device name that is obtained by changing the original audio device name to be connected via the second communication interface.

The controller **110** may control the audio device **200** having the changed audio device name that is discovered via the second communication interface to be preferentially displayed on a screen of the electronic apparatus **100**.

When a reply that corresponds to a connection between the audio device **200** and the access point **50** which is established by using the access point connection information is received from the audio device **200**, the controller **110** may control the connection to the audio device **200** to be terminated in response to the reply.

The controller **110** may control user feedback to be provided in response to the reply. The user feedback may include at least one of visual feedback, auditory feedback, and tactile feedback.

The controller **110** may control a music application to be displayed in response to the reply and audio data that corresponds to a song selected by using the music application to be output to the audio device **200**.

When a plurality of the audio devices **200** for which respective network settings are needed are connected, the controller **110** may control the access point connection information to be transmitted to each of the plurality of audio devices **200**.

The controller **110** may control a first user interface which is configured for receiving a first user input that relates to establishing a wireless connection to the access point **50** to be displayed on the touchscreen **190**, and may control a second user interface which is configured for receiving a second user input that relates to establishing a wireless connection to the audio device **200** and the access point **50** in response to the received first user input to be displayed on the touchscreen **190**.

The controller **110** may control access point connection information that corresponds to the access point **50** that is wirelessly connected to be stored in response to receiving the first user input and to be transmitted to the audio device **200** in response to receiving the second user input.

The controller **110**, according to an exemplary embodiment, includes the processor **111**, the ROM **112**, and the RAM **113**.

The mobile communication interface **120** may be connected to the outside via a mobile communication network by using one or more antennas under the control of the controller **110**. The mobile communication interface **120** may transmit/receive a wireless signal for any of a voice call, a video call, a short message service (SMS), a multimedia message service (MMS), or data communication to/from any of a mobile phone (not shown) having an available phone number, a smartphone (not shown), a tablet PC, or another electronic apparatus (not shown).

The sub-communication interface **130** may be wirelessly connected to the access point **50** under the control of the controller **110**. The sub-communication interface **130** may transmit access point connection information to the audio device **200** under the control of the controller **110**.

The sub-communication interface **130** may include at least one of a wireless LAN **131** and a short-range communication interface **132**. For example, the sub-communication interface **130** may include one of the wireless LAN **131** and the short-range communication interface **132** or both the wireless LAN **131** and the short-range communication interface **132**.

The wireless LAN **131** may be wirelessly connected to the access point **50** in a place at which the access point **50** is provided under the control of the controller **110**. The wireless LAN **131** supports the IEEE 802.11x wireless LAN standard of the Institute of Electrical and Electronics Engineers (IEEE). The short-range communication interface **132** may wirelessly perform short-range communication between the electronic apparatus **100** and the audio device **200** without the access point **50** under the control of the control **110**. Examples of short-range communication may include Bluetooth, Bluetooth low energy, IrDA, UWB, and NFC.

The electronic apparatus **100** may include at least one of the mobile communication interface **120**, the wireless LAN **131**, and the short-range communication interface **132** in accordance with the performance of the electronic apparatus **100**. For example, the electronic apparatus **100** may include one of the mobile communication interface **120**, the wireless LAN **131**, and the short-range communication interface **132**, or a combination of the mobile communication interface **120**, the wireless LAN **131**, and the short-range communication interface **132**. Further, the electronic apparatus **100** may connect to an external accessory (e.g., a wireless headset or a wireless keyboard) by using one of the mobile communication interface **120** and the sub-communication interface **130**.

The term "communication interface" used herein includes the mobile communication interface **120** and the sub-communication interface **130**.

The multimedia interface **140** may include a broadcast receiving unit (also referred to herein as a "broadcasting communication interface") **141**, an audio reproducer **142**, and/or a video reproducer **143**. The broadcast receiving unit **141** may receive a broadcast signal (e.g., a TV broadcast signal, a radio broadcast signal, or a data broadcast signal) that is transmitted from an external broadcasting station and broadcast additional information (e.g., an electronic program guide (EPG) or an electronic service guide (ESG)) via an antenna (not shown) under the control of the controller **110**. Further, the controller **110** may reproduce the broadcast signal and the broadcast additional information by using the touchscreen **190**, a video coder/decoder ("codec") (not shown), and an audio codec (not shown).

The audio reproducer **142** may reproduce an audio source (e.g., an audio file having a file extension mp3, wma, ogg, or way) that has previously been stored in the storage **175** of the electronic apparatus **100** or is received from the outside by using an audio codec under the control of the controller **110**.

The audio reproducer **142**, according to an exemplary embodiment, may reproduce an auditory feedback (e.g., an output of an audio source that is stored in the storage **175**) that corresponds to a reply that corresponds to the connection to the access point **50** by using an audio codec under the control of the controller **110**.

The audio reproducer **142**, according to an exemplary embodiment, may reproduce an auditory feedback (e.g., an output of an audio source that is stored in the storage **175**) that corresponds to a touch or a continuous movement of the

touch detected by the touchscreen **190** by using an audio codec under the control of the controller **110**.

The video reproducer **143** may reproduce a digital video source (e.g., a video file having a file extension mpeg, mpg, mp4, avi, mov, or mkv) that has previously been stored in the storage **175** of the electronic apparatus **100** or is received from the outside by using a video codec under the control of the controller **110**. A multimedia application that may be installed in the electronic apparatus **100** may reproduce an audio source or a video source by using an audio codec and/or a video codec. Alternatively, a multimedia application that may be installed in the electronic apparatus **100** may reproduce a video source by using a hardware codec (not shown) and/or a software codec (not shown).

The video reproducer **143**, according to an exemplary embodiment, may reproduce a visual feedback (e.g., an output of a video source that is stored in the storage **175**) in response to a reply that corresponds to the connection to the access point **50** by using a video codec under the control of the controller **110**.

The multimedia interface **140** may include the audio reproducer **142** and the video reproducer **143** without the broadcast reception unit **141**, according to the performance or the structure of the electronic apparatus **100**. Alternatively, the controller **110** may include the audio reproducer **142** or the video reproducer **143** of the multimedia interface **140**.

The term "audio codec" as used herein may include one or more audio codecs. The term "video codec" as used herein may include one or more video codecs.

The camera **150** may include at least one of a first camera **151** that is a front camera and a second camera **152** that is a rear camera in order to capture a still image and/or a moving image under the control of the controller **110**. For example, the camera **150** may include one of the first camera **151** and the second camera **152** or both the first camera **151** and the second camera **152**. Further, the first camera **151** or the second camera **152** may include an auxiliary light source (e.g., a flash **153**) that provides an amount of light that is sufficient to capture an image.

The controller **110** may capture a 3D still image or moving image by using the first camera **151** that is a front camera and an additional camera (e.g., a third camera (not shown) that is disposed adjacent to the first camera **151** to be spaced by an interval that is, for example, greater than 30 mm and less than 80 mm, from the first camera **151**). Alternatively, the controller **110** may capture a 3D still image or a 3D moving image by using the second camera **152** that is a rear camera and an additional camera (e.g., a fourth camera (not shown) that is disposed adjacent to the second camera **152** to be spaced by an interval that is, for example, greater than 30 mm and less than 80 mm, from the second camera **152**). Further, the first and second cameras **151** and **152** may perform any of wide-angle photographing, telephotographing, and macro photographing by using an additional lens (not shown) that is attachable/detachable to/from a separate adaptor (not shown).

The GPS unit **155** periodically receives, from any of a plurality of GPS satellites, orbit signals (e.g., orbit information of the GPS satellites, time information that relates to the GPS satellites, and navigation messages).

The electronic apparatus **100** may calculate respective locations of the plurality of GPS satellites and the electronic apparatus **100** by using the signals received from the plurality of GPS satellites, and may calculate distances by using transmission/reception time differences. A location, a time, or a movement speed of the electronic apparatus **100** may be calculated by using triangulation. Input from an additional GPS satellite (not shown) may be required in order to correct an orbit or a time.

The electronic apparatus **100** may detect a location or a movement speed of the electronic apparatus **10** that is located indoors by using the access point **50**. The electronic apparatus **100** may detect a location of the electronic apparatus **100** that is located indoors by using a cell-ID method that uses an identifier (ID) of the access point **50**, an enhanced cell-ID method that uses the ID of the access point **50** and a received signal strength (RSS), or an angle of arrival (AoA) method that uses an angle at which a signal transmitted from the access point **50** is received by the electronic apparatus **100**. Alternatively, the electronic apparatus **100** may detect a location or a movement speed of the electronic apparatus **100** that is located indoors by using a wireless beacon (not shown). It will be understood by one of ordinary skill in the art that a location of the electronic apparatus **100** that is located indoors may be detected by using any of various other methods.

The input/output interface **160** may include at least one of one or more buttons **161**, a microphone **162**, a speaker **163**, a vibration motor **164**, a connector **165**, a keypad **166**, and an input pen **167**.

Referring to FIG. **1**, the buttons **161** include a home button **161***a*, a menu button **161***b*, and a back button **161***c* that are disposed on a lower portion of a front surface. The buttons **161** may include a power/lock button (not shown) and at least one volume button (not shown) that are disposed on a side surface. Alternatively, the buttons **161** of the electronic apparatus **10** may include only the home button **161***a*, a power/lock button, and a volume button. The buttons **161** of the electronic apparatus **100** may be provided as touch buttons in a bezel outside the touchscreen **190**, instead of physical buttons. Alternatively, the buttons **161** of the electronic apparatus **100** may be displayed as text, images, or icons on the touchscreen **190**.

The microphone **162** converts a voice or a sound that is received from the outside into an electrical signal under the control of the controller **110**. The electrical signal generated by the microphone **162** may be converted by an audio codec, and may be stored in the storage **175** or may be output via the speaker **163**. One or more microphones **162** may be located on a front surface, a side surface, and a rear surface of the electronic apparatus **100**. Alternatively, one or more microphones **162** may be located only on the side surface of the electronic apparatus **100**.

The speaker **163** may output a sound that corresponds to any of various signals (e.g., a wireless signal, a broadcast signal, an audio source, a video file, or a photographing signal) of the mobile communication interface **120**, the sub-communication interface **130**, the multimedia interface **140**, and the camera **150** to the outside of the electronic apparatus **100** by using an audio codec under the control of the controller **110**.

The speaker **163** may output a sound (e.g., a touch sound that corresponds to a phone number input or a photographing button pressure sound) that corresponds to a function which has been performed by the electronic apparatus **100**. One or more speakers **163** may be located on the front surface, the side surface, and the rear surface of the electronic apparatus **100**. Referring to FIGS. **1** and **2**, a plurality of the speakers **163** may be located on the front surface of the electronic apparatus **100**. Alternatively, the speakers **163** may be respectively located on the front surface and the rear surface of the electronic apparatus **100**. One speaker **163** may be located on the front surface of the electronic appa-

ratus **100** and a plurality of the speakers **163** may be located on the rear surface of the electronic apparatus **100**. Alternatively, the speakers **163** may be located on the side surface. When an additional speaker (not shown) is located on the side surface, the electronic apparatus **100** may provide, to the user, a sound effect that is different from that of another electronic apparatus (not shown) in which speakers are located on a front surface and a rear surface.

The speaker **163**, according to an exemplary embodiment, may output an auditory feedback in response to a reply that corresponds to the connection to the access point **50** under the control of the controller **110**.

The vibration motor **164** may convert an electrical signal into a mechanical vibration under the control of the controller **110**. Examples of the vibration motor **164** may include a linear vibration motor, a bar-type vibration motor, a coin-type vibration motor, and a piezoelectric vibration motor. For example, when a voice call request is received from another electronic apparatus (not shown), the vibration motor **164** of the electronic apparatus **100** may operate in a vibration mode under the control of the controller **110**. The electronic apparatus **100** may include one or more vibration motors **164**. Further, the vibration motor **164** may vibrate the whole or a part of the electronic apparatus **100**.

The vibration motor **164**, according to an exemplary embodiment, may output a tactile feedback in response to a reply that corresponds to the connection to the access point **50** under the control of the controller **110**. Further, the vibration motor **164** may provide any of various tactile feedbacks (e.g., an intensity of a vibration and a duration of the vibration) that are stored or received from the outside based on a control command of the controller **110**.

The connector **165** may be used as an interface for connecting the electronic apparatus **100** with an external device (not shown) and/or a power source (not shown). The electronic apparatus **100** may transmit data that is stored in the storage **175** to the outside or may receive data from the outside via a wired cable that is connected to the connector **165**. The electronic apparatus **100** may receive power from the power source or may charge a battery (not shown) via the wired cable that is connected to the connector **165**. Further, the electronic apparatus **100** may connect to an external accessory (e.g., a speaker (not shown) or a keyboard dock (not shown)) via the connector **165**.

The keypad **166** may receive the user's key input in order to control the electronic apparatus **100**. Examples of the keypad **166** include a physical keypad (not shown) that is formed on the front surface of the electronic apparatus **100**, a virtual keypad (not shown) that is displayed in the touchscreen **190**, and a physical keypad (not shown) that may be wirelessly or wiredly connected. It will be understood by one of ordinary skill in the art that the physical keypad that is formed on the front surface of the electronic apparatus **100** may be omitted, in accordance with the performance or the structure of the electronic apparatus **100**.

The input pen **167** may be configured to touch an object (e.g., a menu, text, an image, a video, a figure, an icon, or a shortcut icon) or content displayed (or configured) on a home screen **191** of the touchscreen **190** or a screen (e.g., a memo screen, a notepad screen, or a calendar screen) displayed on a handwriting/drawing application. The input pen **166** may perform handwriting or drawing (e.g., painting or sketching) on a screen (e.g., a memo screen) of a handwriting application or on a screen (e.g., a canvas screen) of a drawing application displayed on the touchscreen **190**.

The input pen **167** may be used for inputting letters and so on by touching the touchscreen **190** using a capacitive method, a resistive method, or an electromagnetic resonance (EMR) method or by using a displayed virtual keypad. Examples of the input pen **167** may include a stylus pen and a haptic pen (not shown) in which a vibration device (e.g., an actuator or a vibration motor) is provided and vibrates. Further, the input pen **167** may operate the vibration device in response to not only control information received from the electronic apparatus **100** but also sensing information detected by a sensor (e.g., an acceleration sensor (not shown)) that is provided in the input pen **167**.

When the input pen **167** is taken out from an insertion hole (not shown), the controller **110** may execute a set handwriting/drawing application.

Examples of the input pen **167** may include the user's finger (e.g., the thumb). For example, handwriting or drawing may be performed by using the user's finger via an application that is displayed on the touchscreen **190** by using a capacitive method (or a resistive method).

It will be understood by one of ordinary skill in the art that a shape (e.g., a circular cross-sectional shape or a polygonal cross-sectional shape) and/or a structure (e.g., the existence of a battery (not shown)) of the input pen **167** that corresponds to the insertion hole of the electronic apparatus **100** may vary, in accordance with the performance or the structure of the electronic apparatus **100**.

The sensor **170** includes at least one sensor that detects a state of the electronic apparatus **100**. For example, the sensor **170** may include a proximity sensor **171** that detects whether the user approaches the electronic apparatus **100**, an illumination sensor **172** that detects an amount of light around the electronic apparatus **100**, and a gyro sensor **173** that detects a direction of motion by using a rotational inertia of the electronic apparatus **100**. Further, the sensor **170** may include any of an acceleration sensor (not shown) that detects acceleration applied in three axes (e.g., x, y, and z-axes) to the electronic apparatus **100**, a gravity sensor that detects a direction in which gravity is applied, and/or an altimeter that detects a height by measuring an atmospheric pressure.

The sensor **170** may measure acceleration due to motion and acceleration due to gravity of the electronic apparatus **100**. In addition, the sensor **170** may further include a fingerprint sensor (not shown) that detects the user's fingerprint and/or a heart rate sensor (not shown) that detects the user's heart rate.

At least one sensor included in the sensor **170** detects a state of the electronic apparatus **100**, generates an electrical signal that corresponds to the detected state, and transmits the electrical signal to the controller **110**. It will be understood by one of one of ordinary skill in the art that at least one sensor included in the sensor **170** may be added or deleted, in accordance with the performance of the electronic apparatus **100**.

The storage **175** may store signals or data that are input/output in response to operations of the mobile communication interface **120**, the sub-communication interface **130**, the multimedia interface **140**, the camera **150**, the GPS unit **155**, the input/output interface **160**, the sensor **170**, and the touchscreen **190** under the control of the controller **110**. The storage **175** may store any of a GUI which relates to an application that is provided by a manufacturer or is uploaded from the outside and a control program for controlling the electronic apparatus **100** or the controller **110**, images for providing the GUI, user information, documents, databases, and/or related data.

The storage **175** may store at least one initial screen (e.g., a GUI) that corresponds to an initial setup. The initial screen may include a plurality of pages.

The storage **175**, according to an exemplary embodiment, may store electronic apparatus information, audio device information that corresponds to the audio device **200** that is connected via a second communication interface, or access point information that corresponds to the access point **50** that is connected via a first communication interface.

The storage **175** may store access point connection information that corresponds to the access point **50** in order to set a network of the audio device **200**.

The storage **175** may store a password that is usable for establishing a connection to the access point **50**.

The storage **175** may store first through seventh touches, first through seventh touch positions, and/or first through seventh touch position information.

The storage **175** may store a visual feedback (e.g., a video source) that is output to the touchscreen **190** and may be perceived by the user, an auditory feedback (e.g., a sound source) that is output from the speaker **163** and may be perceived by the user, and a tactile feedback (e.g., a haptic pattern) that is output from the vibration motor **164** and may be perceived by the user in response to a reply that corresponds to success in establishing a connection to the audio device **200** and a reply that corresponds to success in establishing a connection to the access point **50**.

The storage **175** may store a feedback time (e.g., 300 msec) for which a feedback is provided to the user.

The term "storage," according to an exemplary embodiment, collectively includes the storage **175**, and the ROM **112** or the RAM **113** included in the controller **110** or a memory card (not shown, e.g., a micro secure digital (SD) card or a memory stick) provided in the electronic apparatus **100**. Examples of the storage may include a nonvolatile memory, a volatile memory a hard disk drive (HDD), and a solid-state drive (SSD).

The power supply **180** may supply power to the elements **120** through **195** included in the electronic apparatus **100** under the control of the controller **110**. The power supply **180** may supply, to the electronic apparatus **100**, power that is input from an external power source (not shown) via a wired cable (not shown) that is connected to the connector **165** under the control of the controller **110**. Further, the power supply **180** may supply power and may charge one or more batteries (not shown) under the control of the controller **110**. The one or more batteries may be disposed between the rear surface and the touchscreen **90** that is disposed on the front surface.

The power supply **180** may charge the one or more batteries by using a wireless method (e.g., a magnetic resonance method, an electromagnetic radiation method, or a magnetic induction method) under the control of the controller **110**.

The touchscreen **190** includes a touch panel (not shown) that receives a touch input and a display panel (not shown) that displays an image. The touchscreen **190** may provide a GUI that corresponds to any of various services (e.g., a voice call, a video call, data transmission, broadcast reception, photographing, video watching, or execution of an application) to the user. The touchscreen **190** transmits an analog signal that corresponds to a single touch or a multi-touch that is input via the GUI or the home screen **191** to the touchscreen controller **195**. The touchscreen **190** may receive the single touch or the multi-touch via the user's body part (e.g., a finger such as the thumb) or the input pen **167**.

The display panel includes a plurality of pixels and displays an image via the pixels. Examples of the display panel include a liquid crystal display (LCD), an OLED, and an LED. The display panel may display various images and a plurality of objects in accordance with various operation states of the electronic apparatus **100** or execution of an application or service.

Examples of a touch, according to an exemplary embodiment, are not limited to contact between the touchscreen **190** and the user's body part or the input pen **167**, and also include non-contact. Examples of non-contact may include hovering with an interval of 50 mm or less between the touchscreen **190** and the user's body part or the input pen **167**. It will be understood by one of ordinary skill in the art that a non-contact interval that may be detected by the touchscreen **190** may vary based on the performance or the structure of the electronic apparatus **100**.

The touchscreen **190** may use, for example, a resistive method, a capacitive method, an infrared method, or an acoustic wave method. Alternatively, the touchscreen **190** may use an EMR method. When the touchscreen **190** uses an EMR method, the touchscreen **190** further includes a separate EMR touch panel (not shown) which is configured for receiving an input of an input pen (not shown) and which includes a resonance circuit that resonates in an EMR loop coil.

The touchscreen **190**, according to an exemplary embodiment, may display a visual feedback in response to a reply that corresponds to the connection to the access point **50** under the control of the controller **110**.

The touchscreen controller **195** converts an analog touch that corresponds to a single touch or a multi-touch received from the touchscreen **190** into a digital signal, and transmits the digital signal to the controller **110**. The controller **110** may calculate X and Y coordinates that correspond to a touch position on the touchscreen **190** by using the digital signal received from the touchscreen controller **195**.

The controller **110** may control the touchscreen **190** by using the digital signal received from the touchscreen controller **195**. For example, the controller **110** may distinctively display a shortcut icon (e.g., **192***b* of FIG. **1**) displayed on the touchscreen **190** so that the shortcut icon is distinguished from other shortcut icons (e.g., **192***a*, **192***c*, **192***d*, **192***e*, **192***f*, **192***g*, **192***h*, and **192***i*) in response to an input touch, or may execute an application that corresponds to the selected shortcut icon **192***b* (see FIG. **1**) and display an application screen on the touchscreen **190**.

One or more touchscreen controllers **195** may be provided. The touchscreen controller **195** may be included in the controller **110** in accordance with the performance or the structure of the electronic apparatus **100**.

When the touchscreen **190** uses an EMR method, the touchscreen controller **195** converts an analog signal that corresponds to a touch received from the touchscreen **190** into a digital signal, and transmits the digital signal to the controller **110**. The controller **110** may calculate X and Y coordinates that corresponds to a touch position on the touchscreen **190** by using the digital signal received from the touchscreen controller **195**. Further, when the touchscreen **190** uses an EMR method, a touchscreen controller (not shown) that uses an EMR method may be used.

The electronic apparatus **100** may include one or more touchscreens **190**. The touchscreens **190** may be respectively located in housings (not shown) and the housings may be connected to one another by using hinges (not shown). Alternatively, a plurality of the touchscreens **190** that are flexible may be located in one housing. The plurality of

flexible touchscreens **190** may include one display panel and a plurality of touch panels. The plurality of flexible touchscreens **190** may include one touch panel that corresponds to a plurality of display panels. Alternatively, the plurality of flexible touchscreens **190** may include a plurality of touch panels which respectively correspond to a plurality of display panels.

It will be understood by one of ordinary skill in the art that at least one of the elements included in the electronic apparatus **100** of FIG. **1** may be added or deleted in accordance with the performance of the electronic apparatus **100**.

Referring to FIG. **2**, the audio device **200** is wirelessly connected to the access point **50** or the electronic apparatus **100** via a communication interface **230**. The audio device **200** may output audio that is received from the access point **50** or the electronic apparatus **100**. The audio device **200** may output an audio stream that is received from the electronic apparatus **100** or the access point **50** that is wirelessly connected to the audio device **100**.

The audio device **200** may include a controller **210**, the communication interface **230**, a light receiver **250**, an input/output interface **260**, a display **270**, a speaker **275**, a storage **280**, and/or a power supply **290**.

The controller **210** includes a processor **211**. The controller **210** may include the processor **211** and a ROM **212** in which a control program for controlling the audio device **200** is stored. Alternatively, the controller **210** may include the processor **211**, the ROM **212**, and a RAM **213** in which a signal or data which is received from the outside of the audio device **200** is stored and/or data that corresponds to various operations performed by the audio device **200** is stored. The controller **210** may include an audio codec (not shown).

The controller **210** controls an overall operation of the audio device **200** and the flow of signals between the elements **230** through **290** included in the audio device **200** and processes data. The controller **210** controls the power supply **290** to supply power to the elements **230** through **280**.

The controller **210** may output a received audio via the speaker **275**. Alternatively, the controller **210** may output a received audio to an additional speaker (not shown) via the communication interface **230** or via the input/output interface **260**.

The controller **210** controls a first communication interface that is wirelessly connected to the access point **50** by using an original audio device name and a second communication interface that is wirelessly connected to the electronic apparatus **100** by using a changed audio device name, receives access point connection information that corresponds to the access point **50** from the electronic apparatus **100** that is connected via the second communication interface, and connects to the access point **50** via the first communication interface by using the received access point connection information. The audio device **200** includes the original audio device name and the changed audio device name.

When power is first supplied to the audio device **200**, the controller **210** may control the original audio device name of the audio device **200** to be changed to the changed audio device name.

When the access point connection information is received from the electronic apparatus **100**, the controller **210** may control the changed audio device name of the audio device **200** to be changed to the original audio device name.

The controller **210** may control the access point **50** to be connected by using the access point connection information and the original audio device name via the first communication interface.

It will be understood by one of ordinary skill in the art that a configuration and an operation of the controller **210** may be changed in various ways.

The communication interface **230** may wirelessly connect to the electronic apparatus **100** under the control of the controller **210**. The communication interface **230** may include at least one of a wireless LAN **231**, a short-range communication interface **232**, and a wired Ethernet interface **233**. The communication interface **230** may receive a control signal from the access point **50** or the electronic apparatus **100** under the control of the controller **210**. Further, the communication interface **230** may receive audio data that corresponds to audio from the access point **50** or the electronic apparatus **100** under the control of the controller **210**.

The light receiver **250** receives an optical signal (including a control signal) from a remote controller (not shown) via a light window (not shown). The light receiver **250** may receive an optical signal that corresponds to a user input (e.g., a touch, a pressure, a touch gesture, a voice, or a motion) from the remote controller. The received optical signal may be converted and transmitted to the controller **210**. The control signal may be extracted from the received optical signal by the controller **210**.

The input/output interface **260** may receive audio data that corresponds to audio (e.g., a sound or music) from the outside under the control of the controller **210**. The input/output interface **260** may receive video data that corresponds to a video from the outside under the control of the controller **210**. Further, the input/output interface **260** may output audio data that corresponds to audio (e.g., a sound or music) to the outside under the control of the controller **210**. The input/output interface **260** may output video data That corresponds to a video to the outside under the control of the controller **210**.

The input/output interface **260** may include any of a high-definition multimedia interface (HDMI) port **261**, a Sony/Philips digital interface format (S/PDIF) port **262**, a universal serial bus (USB) port **263**, and/or an audio-in jack **264**. It will be understood by one of ordinary skill in the art that a configuration and an operation of the input/output interface **260** may be changed in various ways.

The display **270** may display video or text information (e.g., a title of a song, a volume, or a sound output effect) under the control of the controller **210**. The display **270** may use, for example, an LCD method, an OLED method, a plasma display panel (PDP) method, or a vacuum fluorescent display (VFD) method. It will be understood by one of ordinary skill in the art that video and/or text information that may be displayed may vary based on a display method.

The display **270** may display text, an icon, or a symbol (e.g., "▶" which corresponds to a reproduction operation or "■" which corresponds to a stop operation) that corresponds to an external electronic apparatus (e.g., the electronic apparatus **100**, a memory card, or a remote controller (not shown)) that is wirelessly connected to the audio device **200** under the control of the controller **210**.

When a USB memory (not shown) that is a memory card is connected to the audio device **200** via the USB port **263**, the display **270** may display text such as, for example, "USB ready" or "title of a song" under the control of the controller **210**.

When the electronic apparatus **100** is connected to the audio device **200** via short-range communication, the display **270** may display text such as, for example, "BT connected" or "NFC connected" under the control of the controller **210**.

When an optical signal that is output from the remote controller is received by the light receiver **250** of the audio device **200**, the display **270** may display text, an icon, or a symbol that corresponds to a power-on event for turning on a power supply to the audio device **200**, a power-off event for turning off a power supply to the audio device **200**, and/or a volume control event that indicates a controlled volume.

The text, the icon, or the symbol displayed on the display **270** may be moved in one direction under the control of the controller **210**. Alternatively, the text, the icon, or the symbol displayed on the display **270** may be moved in one direction while blinking under the control of the controller **210**.

When a power supply to the audio device **200** is turned on or off, the display **270** may display a visual feedback (e.g., text, an icon, or a symbol) that corresponds to the power supply under the control of the controller **210**.

The display **270**, according to an exemplary embodiment, may output a visual feedback that corresponds to a connection to the electronic apparatus **100** or the access point **50** under the control of the controller **210** of the audio device **200**.

The speaker **275** outputs a received audio under the control of the controller **210**. The speaker **275** may output audio (e.g., a voice, music, a sound, or an audio stream) that is received via the communication interface **230** or via the input/output interface **260**. The speaker **275** may have any of a 1-channel system, a 2-channel system, or a 2.1-channel system. Alternatively, it will be understood by one of ordinary skill in the art that the speaker **275** may have, but is not limited to, any of a 4-channel system, a 4.1-channel system, a 5.1-channel system, a 6.1-channel system, a 7.1-channel system, a 9.1-channel system, or an 11.2-channel system.

The controller **210** may up-mix audio (e.g., an audio from a 2.0-channel system) and may output the up-mixed audio to speakers (and additional speakers (not shown)) of any of a 2.1-channel system, a 4-channel system, a 5-channel system, a 5.1-channel system, or a 7.1-channel system. The controller **210** may down-mix audio (e.g., an audio from a 7.1-channel system) and may output the down-mixed audio to speakers of any of a 2-channel system, a 2.1-channel system, or a 5.1-channel system. The controller **210** may output a received audio in consideration of the number of the speakers **275** and additional speakers. For example, when the number of speakers that corresponds to a received audio is equal to the number of speakers of a 5.1-channel system, the controller **210** may output the received audio to the speakers **275** (having, for example, a 5.1-channel system) of the audio device **200**. Alternatively, when the number of speakers that corresponds to a received audio is equal to the number of speakers of a 5.1-channel system, the controller **210** may add additional speakers (having, for example, a 3-channel system) to the speakers **275** (having, for example, a 2.1-channel system) of the audio device **200** and may output the received audio to the speakers collectively having a 5.1-channel system.

The controller **210** may provide any of various audio output effects (e.g., a movie, sports, a rock concert, and an orchestra) to the user, based on the number of the speakers **275**. Further, the controller **110** may provide, to the user, any of various audio output effects (e.g., a movie, sports, a rock concert, and an orchestra) based on the total number of the speakers **275** and additional speakers that are connected via the input/output interface **260**.

The speaker **275** may output audio that is stored in the storage **280** under the control of the controller **210**. The audio device **200** may output audio to an external electronic apparatus (not shown) via the input/output interface **260**. For example, the controller **210** may output audio to an additional speaker and/or to the electronic apparatus **100**.

The speaker **275**, according to an exemplary embodiment, may output an auditory feedback that corresponds to a connection to either of the electronic apparatus **100** or the access point **50** under the control of the controller **210**. The speaker **275** may output an auditory feedback that corresponds to text, an icon, or a symbol displayed on the display **270** under the control of the controller **210**.

The storage **280** may store various data and a control program for driving and controlling the audio device **200** under the control of the controller **210**. The storage **280** may store input/output signals or data that respectively correspond to operations of the communication interface **230**, the light receiver **250**, the input/output interface **260**, the display **270**, the speaker **275**, and the power supply **180**.

Examples of the storage **280** may include a nonvolatile memory, a volatile memory, an HDD, and an SSD.

The storage **280** may store reference information that corresponds to whether power is first supplied to the audio device **200**. The reference information is also referred to as out-of-box information. The reference information may be set as a flag when a product is manufactured. Once the reference information is set, it is indicated that power is first supplied to the audio device **200**. The controller **210** may clear the reference information that is stored in the storage **280** after power is first supplied.

When it is determined that the supplying of power to the audio device **200** has begun, the controller **210** may discover the electronic apparatus **100** by using the reference information and the communication interface **230**.

The storage **280** may store audio device name information.

The storage **280** may store access point connection information that is received from the electronic apparatus **100**.

The storage **280** may store any of an image, a symbol, and/or text that may be displayed on the display **270**.

The storage **280** may store a video and/or an image that corresponds to a visual feedback. In addition, the storage **280** may store a sound that corresponds to an auditory feedback.

The power supply **290** supplies power that is input from an external power source to the elements **230** through **280** included in the audio device **200** under the control of the controller **210**. Alternatively, the power supply **180** may supply power that is supplied from one or more batteries (not shown) disposed in the audio device **200** to the elements **230** through **280** under the control of the controller **210**.

At least one element of the elements (e.g., **230** through **280**) included in the audio device **200** of FIGS. **1** and **2** may be added or deleted in accordance with the performance of the audio device **200**. Further, it will be understood by one of ordinary skill in the art that locations of the elements (e.g., **230** through **280**) may vary based on the performance or the structure of the audio device **200**.

FIG. **3** is a flowchart of a method that is performable by the electronic apparatus **100** to set a network of the audio device **200**, according to an exemplary embodiment.

FIG. **4** is a sequence diagram of a method that is performable by the electronic apparatus **100** to set a network of the audio device **200**, according to an exemplary embodiment.

FIGS. **5**A through **5**J are views for explaining a method that is performable by the electronic apparatus **100** to set a network of the audio device **200**, according to an exemplary embodiment.

In operation S**310** of FIG. **3**, an application is executed by the electronic apparatus **100**.

Referring to FIGS. **4** and **5**A, in operation **403**, an application for controlling a network of the audio device **200** to be set is executed by the electronic apparatus **100**.

A user performs a first touch **501** on the shortcut icon **192***b* that corresponds to the application that is being executed on a screen of the electronic apparatus **100**. The controller **110** may detect the first touch **501** by using the touchscreen **190** and the touchscreen controller **195**. The controller **110** may calculate a first touch position **501***a* (e.g., X1 and Y1 coordinates) that correspond to the first touch **501** by using an electrical signal that is received from the touchscreen controller **195**.

The controller **110** may store first touch position information that corresponds to the first touch position **501***a* in the storage **175**. The stored first touch position information may include a touch identification (ID) for history management, a touch position, a touch detection time, and/or touch information (e.g., a touch pressure, a touch direction, or a touch duration).

The controller **110** may execute an application (e.g., App1) that corresponds to the first touch **501** in the electronic apparatus **100**. Referring to FIG. **5**B, the controller **110** may display an application screen **600** of the application that corresponds to the first touch **501** on the touchscreen **190** of the electronic apparatus **100**. The application screen **600** may display a message for asking whether to start network setting of the audio device **200**, an item "Set Up Now" **600***a* which indicates that the network setting is to start now and an item "Set Up Later" which indicates that network setting is to start at a later time. The user may start the network setting of the audio device **200** via the application screen **600**.

The user performs a second touch **502** on the item "Set Up Now" **600***a* on the application screen **600**. The controller **110** may detect the second touch **502** by using the touchscreen **190** and the touchscreen controller **195**. The controller **110** may calculate a second touch position **502***a* (e.g., X2 and Y2 coordinates) that correspond to the second touch **502** by using an electrical signal that is received from the touchscreen controller **195**.

The controller **110** may store second touch position information that corresponds to the second touch position **502***a* in the storage **175**. The stored second touch position information may include a touch ID for history management, a touch position, a touch detection time, and/or touch information (e.g., a touch pressure, a touch direction, or a touch duration).

Referring to FIG. **5**C, the controller **110** may display an application screen **601** that corresponds to the second touch **502** on the electronic apparatus **100**. The application screen **601** may include a user interface that is provided to receive a user input for establishing a connection to the electronic apparatus **100** and the access point **50**. The application screen **601** may display a message which indicates that a new audio device has been discovered, a window for inputting a password **601***a* for connecting to the access point **50** having an ID "Green1", an image that indicates a connection to the electronic apparatus **100** and the access point **50**, and an item **601***b* for ordering to connect to the electronic apparatus **100** and the access point **50**.

Referring to FIG. **4**, in operation **401**, power is first supplied to the audio device **200**. A power cord is connected by the user to a power cord terminal (not shown) that is disposed on a rear surface of the audio device **200**. Referring to FIG. **5**A, the user performs an 11^{th} touch **511** on a power button of the audio device **200**. The controller **210** may supply power to the audio device **200** in response to the 11^{th} touch **511**. Further, the user may first supply power to the audio device **200** by using any of a remote controller (not shown), a voice, or a motion.

The controller **210** of the audio device **200** may determine whether power is first supplied to the audio device **200** by using reference information that is stored in the storage **280**. Further, the controller **210** may determine whether power supplying has begun by referring to network setting information that is stored in the storage **280**. When there is no network setting information stored in the storage **2890**, the controller **210** may determine that the power supply has commenced.

In operation **402**, when power is first supplied to the audio device **200**, the controller **210** may change an original audio device name that is stored in the storage **280** in order to wirelessly connect to the electronic apparatus **100**. The controller **210** may change the original audio device name to an audio device name that corresponds to each of various communication methods that are supported by the communication interface **230**. For example, when the electronic apparatus **100** and the audio device **200** are connected to each other via Bluetooth, the controller **210** of the audio device **200** may change the original audio device name to an audio device name that relates to Bluetooth. When the electronic apparatus **100** and the audio device **200** are connected to each other via short-range communication other than Bluetooth, the controller **210** of the audio device **200** may change the original audio device name to an audio device name that relates to short-range communication. When power is supplied to the audio device **200**, power may be supplied to a light source (not shown) that is provided in the audio device **200**, and light may be emitted through a display window **201***c*.

The controller **210** may maintain an audio device name (hereinafter, referred to as "changed audio device name") that is obtained by changing the original audio device name in order to wirelessly connect to the electronic apparatus **100**, for a preset period of time. For example, the preset period of time may include a period of time for which the electronic apparatus **100** and the audio device **200** are wirelessly connected. The preset period of time may include a period of time that elapses until reception of network setting information from the electronic apparatus **100** is completed. The preset period of time may include a period of time that elapses until the access point **50** is connected by using the received network setting information. The preset period of time may include a period of time that elapses until the connection to the access point **50** by using the received network setting information is completed. When the preset period of time elapses, the controller **210** may return the changed audio device name to the original audio device name.

The controller **210** may store the changed audio device name in the storage **280**. The controller **210** may store the original audio device name and the changed audio device name as audio device name information in the storage **280**.

Table 1 shows an example of the type of audio device name information that may be stored in the storage **280**.

TABLE 1

Original audio device name	Affix	Changed audio device name
[Samsung]Soundbar	.	[Samsung]Soundbar.
[Samsung]Soundbar	,	[Samsung]Soundbar,
[Samsung]Soundbar	_	[Samsung]Soundbar_
[Samsung]Soundbar	(space)	[Samsung]Soundbar
[Samsung]Soundbar	-	[Samsung]-Soundbar
. . .	. . .	. . .

The audio device name information may include a plurality of items which indicate the original audio device name, an affix, and the changed audio device name. Examples of the affix may include a suffix and/or a prefix that may be added to the original audio device name. The affix may include text, an integer, and/or a symbol included in the ASCII code. Alternatively, the affix may include text, an integer, and/or a symbol included in the Unicode.

It will be understood by one of ordinary skill in the art that the audio device name information is not limited to the plurality of items shown in Table 1, and may include items which indicate any of various pieces of information.

When the audio device name of the audio device **200** is changed, the controller **210** activates the short-range communication interface **232** in order to set a network of the audio device **200**. When the audio device name of the audio device **200** is changed, the controller **3210** may activate a Bluetooth module (not shown).

In operation S**320** of FIG. **3**, the access point **50** is connected.

Referring to FIGS. **4** and **5**C, in operation **404**, the electronic apparatus **100** and the access point **50** are connected to each other via Wi-Fi.

On the application screen **601** of the electronic apparatus **100** of FIG. **5**C, the user inputs the password **601***a* of the access point **50** (which has a service set identifier (SSID) of green1) that is to be connected to the electronic apparatus **100**. Any of various authentication methods may be input via the electronic apparatus **100**, in accordance with a security authentication method (e.g., WPA, WPA2, TKIP, or AES) of the access point **50**.

Further, it will be understood by one of ordinary skill in the art that when the electronic apparatus **100** and the access point **50** are first connected to each other, the electronic apparatus **100** may first discover and select the access point **50**.

The user performs a third touch **503** on the item "Connect **601***b*" in order to connect the electronic apparatus **100** with the access point **50**. The controller **110** may detect the third touch **503** by using the touch screen **190** and the touchscreen controller **195**. The controller **110** may calculate a third touch position **503***a* (e.g., X3 and Y3 coordinates) that corresponds to the third touch **503** by using an electrical signal that is received from the touchscreen controller **195**.

The controller **110** may store third touch position information that corresponds to the third touch position **503***a* in the storage **175**. The stored third touch position information may include any of a touch ID for history management, a touch position, a touch detection time, and/or touch information (e.g., a touch pressure, a touch direction, or a touch duration).

The controller **110** may connect the electronic apparatus **100** to the access point **50** in response to the third touch **503**.

Referring to FIG. **4**, in operation **405**, the controller **110** may store access point connection information that corresponds to the connected access point **50** in the storage **175**.

The access point connection information may include, for example, any of an SSID (e.g., green1), a media access control (MAC) address, and/or a security method (e.g., a WPA2-based method). Further, the access point connection information may include the password **601***a* that is input by the user.

It will be understood by one of ordinary skill in the art that an item included in the access point connection information may be added, deleted, or changed in accordance with a connection method between the electronic apparatus **100** and the access point **50**.

When the access point connection information is stored, the controller **110** may maintain or terminate the connection to the access point **50**.

The controller **110** may provide, to the touchscreen **190** of the electronic apparatus **100**, a user interface that is provided to receive a user input that relates to establishing wireless connection to the audio device **200** and the access point **50** in response to the third touch **503**. Referring also to FIG. **5**D, the controller **110** of the electronic apparatus **100** may provide an application screen **603** as the user interface that is provided to receive the user input that relates to establishing the wireless connection to the audio device **200** and the access point **50**.

In operation S**330** of FIG. **3**, the audio device **200** having the changed audio device name is connected via short-range communication.

Referring to FIGS. **4** and **5**D, in operation **406**, the electronic apparatus **100** is connected to the audio device **200** having a changed audio device name **602***a* (e.g., [Samsung] Soundbar.") via short-range communication.

The controller **110** may discover the audio device **200** (e.g., the audio device **200** having the changed audio device name) by using activated short-range communication (e.g., Bluetooth). When power is first supplied to the audio device **200**, the controller **110** may inquire and page the audio device **200** having the changed audio device name.

The controller **110** may preferentially discover the audio device **200** having an audio device name that includes an affix. The controller **110** may select the audio device **200** having the audio device name that includes the affix in order to set a network. The controller **110** may preferentially select the audio device **200** having the audio device name that includes the affix (for example, under preset conditions) in order to set a network.

When the electronic apparatus **100** and the audio device **200** having the changed audio device name **602***a* are connected to each other, referring to FIG. **5**D, the controller **110** may display an image of the audio device **200** having the changed audio device name **602***a* on the application screen **602**. Further, the controller **110** may display an image of another audio device **200** (not shown) having the original audio device name on the application screen **602**. In addition, when a plurality of the audio devices **200** are discovered, the controller **110** may display an image of the audio device **200** having an audio device name that includes an affix preferentially (for example, with high priority).

The controller **110** may store audio device information that corresponds to the connected audio device **200** in the storage **175**. The audio device information may include, for example, any of an SSID, a MAC address, operation information (e.g., a busy mode or a standby mode), and/or context information.

When the electronic apparatus **100** and the audio device **200** having the changed audio device name **602***a* are not connected to each other, the controller **110** may not display an image (including text or an icon) that corresponds to the audio device **200** having the changed audio device name **602***a* on the application screen **602**. The controller **110** may continuously attempt to connect to the audio device **200** having the changed audio device name **602***a*.

In operation S**340** of FIG. **3**, access point connection information is transmitted to the audio device **200** via short-range communication.

Referring to FIGS. **4** and **5**D, in operation **407**, the controller **110** may transmit the stored access point connection information to the audio device **200** having the changed audio device name via a Bluetooth packet (not shown). The Bluetooth packet includes an access code (72 bits) for determining whether the Bluetooth packet is valid, a header having a size of 54 bits, and a payload having a size ranging from 0 to 2,745 bits. The access code is used to determine a validity of the Bluetooth packet. The header includes a MAC address and a packet type. The payload includes transmitted data, and a size of the payload varies based on a type of a transmitted packet. The transmitted access point connection information is included in a payload of a packet.

The access point connection information that is transmitted via short-range communication may include any of an SSID (e.g., green1), a MAC address, and a security method (e.g., a WPA2-based method).

Further, the controller **110** may transmit electronic apparatus information that corresponds to the electronic apparatus **100** to the audio device **200** having the changed audio device name via short-range communication. The electronic apparatus information may include, for example, any of an SSID, a MAC address, operation information (e.g., a busy mode or a standby mode), and/or context information.

The controller **210** of the audio device **200** may receive the access point connection information via short-range communication. In operation **408**, the controller **210** may store the received access point connection information in the storage **280**.

The controller **210** of the audio device **200** may store the received electronic apparatus information that is received via the short-range communication in the storage **280**. The controller **210** of the audio device **200** may transmit a reply that corresponds to a completion of the reception of the access point connection information to the electronic apparatus **100**.

In operation **409**, when the access point connection information is received from the electronic apparatus **100**, the controller **210** changes the changed audio device name back to the original audio device name.

The controller **210** changes the changed audio device name (e.g., "[Samsung]Soundbar." in the audio device name information to the original audio device name (e.g., [Samsung]Soundbar). The controller **210** may store the original audio device name together with the audio device name information.

Referring to FIGS. **4** and **5**D, the user inputs a password **601***a*' on the application screen **602** that is displayed on the electronic apparatus **100**. When the password **601***a* is included in the access point connection information that is stored in the audio device **200**, the user may not be required to input the password **601***a'*.

The user performs a fourth touch **504** on an item "Connect **602***b*" on the application screen **602**. The controller **110** may detect the fourth touch **504** by using the touchscreen **190** and the touchscreen controller **195**. The controller **110** may calculate a fourth touch position **504***a* (e.g., X4 and Y4 coordinates) that corresponds to the fourth touch **504** by using an electrical signal that is received from the touchscreen controller **195**.

The controller **110** may store fourth touch position information that corresponds to the fourth touch position **504***a* in the storage **175**. The stored fourth touch position information may include any of a touch ID for history management, a touch position, a touch detection time, and/or touch information (e.g., a touch pressure, a touch direction, or a touch duration).

In operation **410**, when the password **601***a*' and the fourth touch **504** are input, the audio device **200** is connected to the access point **50** via Wi-Fi by using the received access point connection information.

The controller **210** of the audio device **200** may be connected to the electronic apparatus **100** and the access point **50** by using different wireless communication methods. For example, the controller **210** of the audio device **200** may connect to the electronic apparatus **100** via Bluetooth. The controller **210** of the audio device **200** may connect to the access point **50** via Wi-Fi. Alternatively, the controller **210** of the audio device **200** may connect to the electronic apparatus **100** and the access point **50** by using the same wireless communication (e.g., Wi-Fi or Bluetooth).

In operation S**350** of FIG. **3**, a reply that corresponds to the establishment of the connection to the access point **50** is received from the audio device **200**.

The controller **210** of the audio device **200** may transmit a reply that corresponds to the connection to the access point **50** to the electronic apparatus **100**. The controller **110** of the electronic apparatus **100** may receive the reply that corresponds to the connection to the access point **50** from the audio device **200**. The controller **110** may store the received reply that corresponds to the connection to the access point **50** in the storage **175**.

Referring to FIGS. **4** and **5**E, in operation **411**, when a reply that corresponds to success in establishing the connection to the access point **50** is received from the audio device **200**, the controller **110** of the electronic apparatus **100** may display the reply that corresponds to the success in the establishment of the connection to the access point **50** from the audio device **200** on the application screen **603**.

The controller **110** may display the reply that corresponds to the success in the establishment of the connection between the audio device **200** and the access point **50** as a popup window **603***a* on the application screen **603**.

The controller **110** may provide a feedback in response to the reply that corresponds to the success in establishing the connection between the audio device **200** and the access point **50** to the user. The feedback provided by the electronic apparatus **100** may be provided as one of a visual feedback, an auditory feedback, and a tactile feedback to the user. The controller **110** may provide to the user, via the electronic apparatus **100**, one of the visual feedback, the auditory feedback, and the tactile feedback, or a combination of the visual feedback, the auditory feedback, and the tactile feedback.

The visual feedback may be displayed so that a visual effect (e.g., a separate image or an animation effect, such as fading, applied to the separate image) that corresponds to the reply that corresponds to the connection to the access point **50** is distinguished from another object (e.g., a popup window) displayed on the application screen **603**. The auditory feedback may be output via the speaker **163** as a sound that corresponds to the reply that corresponds to the connection to the access point **50**. The tactile feedback may

be output from the vibration motor **164** in response to the reply that corresponds to the connection to the access point **50**.

In an exemplary configuration (not shown) of the electronic apparatus **100**, the feedback (e.g., at least one of the visual feedback, the auditory feedback, and the tactile feedback) in response to the reply that corresponds to the success in establishing the connection to the audio device **200** and the access point **50** may be selected and/or changed.

The user may input and/or change a feedback time (e.g., 300 msec or the like) for which the at least one feedback is provided to the user.

Referring to FIG. **5**E, the user may select an item No **603***b* or an item Yes **603***c* in response to whether another audio device **200** is to be added. When it is determined in operation S**360** that another audio device **200** is not to be added, the user performs a fifth touch **505** on the item "No **603***b*". The controller **110** may detect the fifth touch **505** by using the touchscreen **190** and the touchscreen controller **195**. The controller **110** may calculate a fifth touch position **505***a* (e.g., X5 and Y5 coordinates) that corresponds to the fifth touch **505** by using an electrical signal that is received from the touchscreen controller **195**.

The controller **110** may store fifth touch position information that corresponds to the fifth touch position **505***a* in the storage **175**. The stored fifth touch position information may include any of a touch ID for history management, a touch position, a touch detection time, and/or touch information (e.g., a touch pressure, a touch direction, or a touch duration).

In operation S**370** of FIG. **3**, the connection to the audio device **200** is terminated.

Referring to FIGS. **4** and **5**E, in operation **412**, the electronic apparatus **100** and the audio device **200** terminate the wireless connection therebetween. When the reply that corresponds to the success in establishing the connection to the audio device **200** and the access point **50** is transmitted from the audio device **200** to the electronic apparatus **100**, the controller **210** terminates the wireless connection to the electronic apparatus **100**. When the reply that corresponds to the success in establishing the connection to the audio device **200** and the access point **50** is received from the electronic apparatus **100**, the controller **110** may terminate the wireless connection to the audio device **200**.

Referring to FIG. **5**F, the controller **110** displays a screen **610** of a music application that is executed in response to the fifth touch **505**.

The controller **110** may control a song (e.g., a song provided from a content server (not shown)) that has been reproduced in the music application to be output (e.g., to be streamed) via the audio device **200** that is connected to the access point **50**.

The controller **110** may control the song that has been reproduced in the music application to be output to the audio device **200** that was connected to the access point **50** most recently. Further, the controller **110** may select the audio device **200** that is to output the song reproduced in the music application (for example, in an audio device list when there are a plurality of the audio devices **200**).

The controller **210** of the audio device **200** may output an audio stream received from the speaker **275**. The controller **210** may output a received audio (including an audio stream) in consideration of the number of the speakers **275** and the number of additional speakers (not shown). For example, when the number of speakers that corresponds to the received audio (including the audio stream) is equal to the number of speakers of a 5.1-channel system, the controller **210** may output the received audio to the speakers **275** (having, for example, a 5.1-channel system) of the audio device **200**. Alternatively, when the number of speakers that corresponds to the received audio (including the audio stream) is equal to the number of speakers of a 5.1-channel system, the controller **210** may add additional speakers (having, for example, a 3-channel system) to the speakers **275** (having, for example, a 2.1-channel system) of the audio device **200** and may output the received audio to the speakers collectively having a 5.1-channel system.

In operation S**370** of FIG. **3**, and referring also to FIG. **5**G, when the connection to the electronic apparatus **100** and the audio device **200** is terminated, the method performed by the electronic apparatus to set the network of the audio device **200** is completed.

When it is determined in operation S**360** that another audio device **200** is added, the method proceeds to operation S**380** of FIG. **3**.

Referring to FIG. **5**G, when another audio device **200** is added, the user performs a sixth touch **506** on the item "Yes **603***c*". The controller **110** may detect the sixth touch **506** by using the touchscreen **190** and the touchscreen controller **195**. The controller **110** may calculate a sixth touch position **506***a* (e.g., X6 and Y6 coordinates) that corresponds to the sixth touch **506** by using an electrical signal that is received from the touchscreen controller **195**.

The controller **110** may store sixth touch position information that corresponds to the sixth touch position **506***a* in the storage **175**. The stored sixth touch position information may include any of a touch ID for history management, a touch position, a touch detection time, and/or touch information (e.g., a touch pressure, a touch direction, or a touch duration).

The user makes a 12^{th} touch **512** and a 13^{th} touch **513** on power buttons of audio devices **202** and **203** that are different from each other. Power is first supplied to the audio devices **202** and **203** in response to the 12^{th} touch **512** and the 13^{th} touch **513**.

The controller **210** of each of the audio devices **202** and **203** to which the power is initially supplied may change an original audio device name. A method for changing the original audio device name of each of the audio devices **202** and **203** is substantially the same as that of the audio device **200** except that the audio devices **202** and **203** are different, and thus a repeated explanation thereof will not be given.

A method for storing a changed audio device name is substantially the same as that of the audio device **200** except that the audio devices **202** and **203** are different, and thus a repeated explanation thereof will not be given.

When the audio devices **202** and **203** are added, the electronic apparatus **100** may not be required to additionally connect to the access point **50**. The electronic apparatus **100** may use the access point connection information that has previously been stored in the storage **175**.

The electronic apparatus **100** may discover the audio devices **202** and **203** (e.g., the audio devices **202** and **203** each having a changed audio device name) by using activated short-range communication (e.g., Bluetooth). When power is first supplied to the audio devices **202** and **203**, the controller **110** may inquire or page the audio devices **202** and **203**, each of which has the changed audio device name. A method for connecting the audio devices **202** and **203** and the electronic apparatus **100** via short-range communication is substantially the same as that of connecting the audio device **200** and the electronic apparatus **100** via short-range

communication except that the audio devices **202** and **203** are different, and thus a repeated explanation thereof will not be given.

Referring to FIG. **5**H, the controller **110** displays an application screen **604** in response to the sixth touch **506**. The controller **110** may display the audio devices **202** and **203**, each of which has the changed audio device name, on the application screen **604**. In addition, the controller **110** may display another audio device **604***d* having an original audio device name on the application screen **604**.

A changed audio device name **604***b* (e.g., [Samsung] Speaker2.) that corresponds to the audio device **202** is displayed on the application screen **604**. Further, a changed audio device name **604***c* (e.g., [Samsung]Speaker3.) that corresponds to the audio device **203** is displayed on the application screen **604**.

The user's selections **604***b***1** and **604***c***1** are input in order to select boxes that respectively correspond to the changed audio device names **604***b* and **604***c* displayed on the application screen **604**.

The user makes a seventh touch **507** on an item "Yes **604***e*" on the application screen **604** in order to set a network of each of the audio devices **202** and **203**. The controller **110** may detect the seventh touch **507** by using the touchscreen **190** and the touchscreen controller **195**. The controller **110** may calculate a seventh touch position **507***a* (e.g., X7 and Y7 coordinates) that corresponds to the seventh touch **507** by using an electrical signal that is received from the touchscreen controller **195**.

The controller **110** may store seventh touch position information that corresponds to the seventh touch position **507***a* in the storage **175**. The stored seventh touch position information may include any of a touch ID for history management, a touch position, a touch detection time, and/or touch information (e.g., a touch pressure, a touch direction, or a touch duration).

The electronic apparatus **100** may transmit access point connection information to each of the audio devices **202** and **203** via short-range communication in response to the seventh touch **507**. A method for transmitting the access point connection information to each of the audio devices **202** and **203** via short-range communication is substantially the same as that of transmitting the access point connection information to the audio device **200** via short-range communication except that the audio devices **202** and **203** are different, and thus a repeated explanation thereof will not be given.

When the audio devices **202** and **203** are added, the user may not be required to additionally input a password. The access point connection information that corresponds to the audio devices **202** and **203** may include a password.

The audio devices **202** and **203** may connect to the access point **50** by using the received access point connection information. A method for connecting the audio devices **202** and **203** and the access point **50** is substantially the same as that of connecting the audio device **200** and the access point **50** except that the audio devices **202** and **203** are different, and thus a repeated explanation thereof will not be given.

When the audio devices **202** and **203** and the access point **50** are connected to each other, each of the audio devices **202** and **203** may transmit a reply that corresponds to the connection to the access point **50** to the electronic apparatus **100**. The controller **110** of the electronic apparatus **100** may receive the reply that corresponds to the connection to the access point **50** from each of the audio devices **202** and **203**. The controller **110** may store the received reply that corresponds to the connection to the access point **50** in the storage **175**.

Referring to FIG. **5**I, the controller **110** of the electronic apparatus **100** may display a reply that corresponds to the connection to the access point **50** from each of the audio devices **202** and **203** as a popup window **605***a* on an application screen **605**.

The controller **110** of the electronic apparatus **100** may provide, to the user, a feedback in response to a reply that corresponds to success in establishing the connection between the audio devices **202** and **203** and the access point **50**. The feedback in response to the reply that corresponds to the success in the establishment of the connection between the audio devices **202** and **203** and the access point **50** is substantially the same as the feedback in response to the reply that corresponds to the connection between the audio device **200** and the access point **50** except that the audio devices **202** and **203** are different, and thus a repeated explanation thereof will not be given.

The connection between the electronic apparatus **100** and the audio devices **202** and **203** is terminated.

When the reply that corresponds to the connection to the access point **50** is transmitted from each of the audio devices **202** and **203** to the electronic apparatus **100**, each controller **210** terminates the wireless connection to the electronic apparatus **100**. When the reply that corresponds to the connection to the access point **50** is received by the electronic apparatus **100**, the controller **110** may terminate the wireless connection to the audio devices **202** and **203**.

Referring to FIG. **5**J, the controller **110** may control a song (e.g., a song provided by a content server (not shown)) which has been reproduced in a music application to be output via the audio devices **200**, **202**, and **203** that are connected to the access point **50**.

When the connection between the electronic apparatus **100** and the audio devices **202** and **203** is terminated, the method for setting the network of each of the audio devices **202** and **203** is completed.

There may be provided an electronic apparatus that is connected to an audio device via first wireless communication and may easily set a network of the audio device by using access point connection information that corresponds to an access point that is connected via second wireless communication and a method performed by the electronic apparatus to set a network of the audio device.

There may be provided an electronic apparatus that may discover and select an audio device having a changed audio device name via first wireless communication and may easily set a network of the audio device having the changed audio device name by using access point connection information that corresponds to an access point that is connected via second wireless communication and a method performed by the electronic apparatus to set a network of the audio device.

There may be provided an electronic apparatus that is connected to an audio device via first wireless communication and may set a network of the audio device by using access point connection information that corresponds to an access point that is connected via second wireless communication and a method performed by the electronic apparatus to set a network of the audio device.

The method according to the exemplary embodiment may be realized in a program command (or instruction) format that may be executed by using diverse computing means, so as to be recorded in a computer-readable medium. Herein, the computer-readable medium may independently include a program command (or instruction), a data file, a data structure, and so on, or may include a combination of the same. For example, the computer-readable medium may be stored

in a volatile or nonvolatile storage device, such as a read-only memory (ROM), a memory such as a random access memory (RAM), a memory chip, or an integrated circuit, or a storage medium that may be optically or magnetically recorded to and read from by a machine (e.g., a computer) such as a compact disk (CD), a digital versatile disk (DVD), a magnetic disk, or a magnetic tape, regardless of a deletion possibility or a re-recording possibility.

It will be understood by one of ordinary skill in the art that a memory that may be included in a mobile terminal is a storage medium that may be read by a machine for storing programs or a program including instructions according to exemplary embodiments. The program command recorded on the computer-readable medium may be specially designed and constructed for one or more exemplary embodiments or may be known to and usable by one of ordinary skill in a field of computer software.

While the present inventive concept has been particularly shown and described with reference to exemplary embodiments thereof, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the spirit and scope of the present inventive concept as defined by the appended claims. The exemplary embodiments should be considered in descriptive sense only and not for purposes of limitation.

Therefore, the scope of the present inventive concept is defined not by the detailed description but by the appended claims, and all differences within the scope will be construed as being included in the present inventive concept.

What is claimed is:

1. An electronic speaker device comprising:

a first wireless communication interface configured to wirelessly communicate via a first wireless communication method;

a second wireless communication interface configured to wirelessly communicate via a second wireless communication method which is different than the first wireless communication method; and

a controller configured to control the first wireless communication interface and the second wireless communication interface,

wherein the controller is further configured to:

based on a discovering operation of an external electronic device to discover the electronic speaker device, establish a connection with the external electronic device using the second wireless communication interface,

determine whether a connection to an access point using the first wireless communication method is required,

based on a determination that the connection is required, transmit, via the second wireless communication interface, to the external electronic device, information indicating that the electronic speaker device is in a state which requires the connection to the access point using the first wireless communication method,

in response to transmitting the information to the external electronic device, receive, via the second wireless communication interface, access point connection information including a password for the access point, for connecting to the access point using the first wireless communication method,

based on the access point connection information received from the external electronic device, establish, via the first wireless communication interface, the connection with the access point using the first wireless communication method,

transmit a reply to the external electronic device, indicating that the connection between the electronic speaker device and the access point has been established based on the access point connection information, wherein based on the reply, the connection between the external electronic device and the electronic speaker device through the second wireless communication interface is terminated, and

output, by the electronic speaker device, audio information received from the access point.

2. The electronic speaker device of claim **1**, wherein the controller is further configured to transmit the information during the discovering operation of the external electronic device.

3. The electronic speaker device of claim **1**, wherein the information is identification information of the electronic speaker device for the second wireless communication method.

4. The electronic speaker device of claim **1**, wherein the first wireless communication method comprises a WiFi communication protocol, and the second wireless communication method comprises a Bluetooth communication protocol.

5. A method for operating an electronic speaker device comprising a first wireless communication interface configured to wirelessly communicate via a first wireless communication method, and a second wireless communication interface configured to wirelessly communicate via a second wireless communication method which is different than the first wireless communication method, the method comprising:

based on a discovering operation of an external electronic device to discover the electronic speaker device, establishing a connection with the external electronic device using the second wireless communication interface,

determining whether a connection to an access point using the first wireless communication method is required,

based on a determination that the connection is required, transmitting, via the second wireless communication interface, to the external electronic device, information indicating that the electronic speaker device is in a state which requires the connection to the access point using the first wireless communication method,

in response to transmitting the information to the external electronic device, receiving, via the second wireless communication interface, access point connection information including a password for the access point, for connecting to the access point using the first wireless communication method,

based on the access point connection information received from the external electronic device, establishing, via the first wireless communication interface, the connection with the access point using the first wireless communication method,

transmitting a reply to the external electronic device, indicating that the connection between the electronic speaker device and the access point has been established based on the access point connection information, wherein based on the reply, the connection between the external electronic device and the electronic speaker device through the second wireless communication interface is terminated, and

outputting, by the electronic speaker device, audio information received from the access point.

6. The method of claim **5**, further comprising:

transmitting the information during the discovering operation of the external electronic device.

7. The method of claim 5, wherein the information is identification information of the electronic speaker device for the second wireless communication method.

8. The method of claim 5, wherein the first wireless communication method comprises a WiFi communication protocol, and the second wireless communication method comprises a Bluetooth communication protocol.

9. A non-transitory computer readable medium storing a program causing a computer to execute a method for operating an electronic speaker device comprising a first wireless communication interface configured to wirelessly communicate via a first wireless communication method, and a second wireless communication interface configured to wirelessly communicate via a second wireless communication method which is different than the first wireless communication method, the method comprising:

based on a discovering operation of an external electronic device to discover the electronic speaker device, establishing a connection with the external electronic device using the second wireless communication interface,

determining whether a connection to an access point using the first wireless communication method is required,

based on a determination that the connection is required, transmitting, via the second wireless communication interface, to the external electronic device, information indicating that the electronic speaker device is in a state which requires the connection to the access point using the first wireless communication method,

in response to transmitting the information to the external electronic device, receiving, via the second wireless communication interface, access point connection information including a password for the access point, for connecting to the access point using the first wireless communication method,

based on the access point connection information received from the external electronic device, establishing, via the first wireless communication interface, the connection with the access point using the first wireless communication method,

transmitting a reply to the external electronic device, indicating that the connection between the electronic speaker device and the access point has been established based on the access point connection information, wherein based on the reply, the connection between the external electronic device and the electronic speaker device through the second wireless communication interface is terminated, and

outputting, by the electronic speaker device, audio information received from the access point.

10. The non-transitory computer readable medium of claim 9, wherein the method further comprises:

transmitting the information during the discovering operation of the external electronic device.

11. The non-transitory computer readable medium of claim 9, wherein the information is identification information of the electronic speaker device for the second wireless communication method.

12. The non-transitory computer readable medium of claim 9, wherein the first wireless communication method comprises a WiFi communication protocol, and the second wireless communication method comprises a Bluetooth communication protocol.

13. The electronic speaker device of claim 1, wherein based on the reply being transmitted to the external electronic device from the electronic speaker device through the second wireless communication interface using the second wireless communication method, the connection between the external electronic device and the electronic speaker device is terminated.

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