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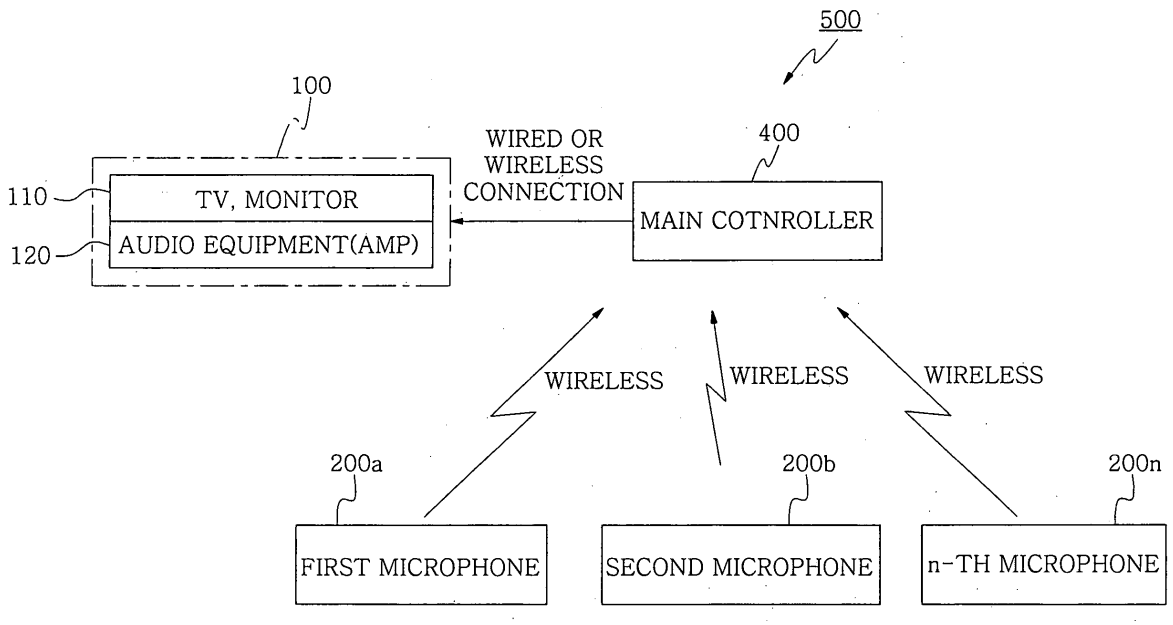
(54) Wireless music accompaniment apparatus having control function of audio signal output level

(57) There is provided a music accompaniment apparatus that includes: at least two wireless microphones for converting externally input audio signals to electrical signals and sending the electrical signals using a built-in RF transmitter module through a wireless connection; and a main controller having one RF receiver module capable of simultaneous signal reception from the at least two wireless microphones through at least two receiver channels, receiving audio signals from the at least two wireless microphones, mixing the audio signals with embedded accompaniment signals and caption signals, and sending output signals with an output level varied according to the type of external equipment used as an output target. The music accompaniment apparatus reduces the production cost, enhances transmission/reception efficiency, and reproduces audio signals of the best audio quality without distortion.

FIG. 1



EP 2 051 240 A1

Description

BACKGROUND OF THE INVENTION

1. Technical Field

[0001] The present invention relates to a music accompaniment apparatus, and more particularly, to a wireless music accompaniment apparatus having a control function of audio signal output level that controls the external output level of audio signals differently according to the type of equipment connected to the music accompaniment apparatus and simultaneously receives audio signals from a plurality of wireless microphones through one receiver module.

2. Discussion of Related Art

[0002] The music accompaniment apparatus is a device for reproducing accompaniment music stored in a memory and allowing the user to listen to the accompaniment music and sing along. The music accompaniment apparatus is used together with a video system that displays images or captions changing with the progress of the music played, in order to provide better stage presence. A score evaluation device is also used to evaluate the user's singing ability based on sound volume, rhythm and the like and to display scores evaluated, allowing the user to know his/her singing ability objectively.

[0003] There are two types of this music accompaniment apparatus: a microphone type music accompaniment apparatus having all functions embedded in a microphone, and a microphone-separated music accompaniment apparatus having a microphone separated from a main body (main controller). For the microphone-separated structure, the microphone is connected to the main body through a wired or wireless connection. Compared with the wired connection, the wireless connection provides less limitation in distance and guarantees portability. In case of the wireless connection, both the wireless microphone and the main body have transmitter/receiver modules.

[0004] Conventionally, the main body is required to have transmitter/receiver modules as many as the wireless microphones. With two wireless microphones used, for example, the main body necessarily has two transmitter/receiver modules, because the transmitter/receiver module is incapable of simultaneously receiving the audio signals through the two wireless microphones. Accordingly, the main body needs transmitter/receiver modules as many as the wireless microphones when using two or more wireless microphones. This causes a rise of the production cost. In addition, the use of one microphone allows just one transmitter/receiver module used for the main body, which makes the apparatus disadvantageous in the aspect of efficiency.

[0005] For audio and video output, the music accompaniment apparatus has its own display device or speaker, but generally uses external equipment such as television or audio equipment through a connection. Especially, home or portable music accompaniment apparatus is supposed to have a connection to that kind of external equipment. The external equipment such as television, audio equipment or the like has a different maximum input level of audio signals acceptable inside the apparatus. There is no problem when the output level of the audio signals output from the music accompaniment apparatus is lower than the maximum input level acceptable to the external devices.

[0006] However, some problems occur when the output level of the audio signals from the music accompaniment apparatus is greater than the maximum input level of the audio signals acceptable to the external devices. In this case, the external devices become disabled to receive the audio signals from the music accompaniment apparatus or, if possible, hardly reproduce the audio signals output from the music accompaniment apparatus in normal condition. This leads to poor audio quality and, in the worst, disables the external devices to reproduce the audio signals.

SUMMARY OF THE INVENTION

[0007] It is accordingly an object of the present invention to provide a wireless music accompaniment apparatus having a control function of audio signal output level that resolves the above-mentioned problems of the prior art.

[0008] It is another object of the present invention to provide a wireless music accompaniment apparatus having a control function of audio signal output level that reduces the production cost.

[0009] It is still another object of the present invention to provide a wireless music accompaniment apparatus having a control function of audio signal output level that enhances transmission/reception efficiency.

[0010] It is still another object of the present invention to provide a wireless music accompaniment apparatus having a control function of audio signal output level that controls the output level according to the type of an external device connected.

[0011] It is still further another object of the present invention to provide a wireless music accompaniment apparatus having a control function of audio signal output level that reproduces audio signals to realize the best audio quality.

[0012] To achieve the above objects of the present invention, there is provided a music accompaniment apparatus that includes: at least two wireless microphones for converting externally input audio signals to electrical signals and sending the electrical signals using a built-in RF transmitter module through a wireless connection; and a main controller having one RF receiver module capable of simultaneous signal reception from the at least two wireless microphones through at least two receiver channels, receiving audio signals from the at least two

wireless microphones, mixing the audio signals with embedded accompaniment signals and caption signals, and sending output signals with an output level varied according to the type of external equipment used as an output target.

[0013] Each of the at least two wireless microphones receives control signals for control of the main controller and data signals to be sent to the main controller through input buttons provided on the outer side of the wireless microphones and additionally sends the control signals and the data signals to the main controller through the RF transmitter module. The main controller receives the control signals and the data signals through the RF receiver module.

[0014] The main controller includes: a signal receiving section for receiving audio signals, control signals and data signals wirelessly sent from the at least two microphones and dividing and processing the received signals; a main CPU having a general-process input output controller for input/output of at least two signals externally applied and various interfaces including memory interface and optical interface, and controlling the whole operation including a transmission or output control for the audio, control and data signals; a signal output section being controlled by the main CPU, processing the data and audio signals internally stored or received through the signal receiving section and sending the processed signals to external equipment with an output level varied according to the type of the external equipment; and a memory section provided for data backup and storing an operation system and music-related data including various software for operations of the main controller, audio files, and movie files.

[0015] The signal output section includes an audio output section for output of audio signals received through the at least two microphones and accompaniment signals stored in the memory section.

[0016] The audio output section includes: an equipment selecting section for selecting the type of external equipment connected to the music accompaniment apparatus through a wired or wireless connection to externally reproduce audio signals received through the at least two microphones or audio signals including the accompaniment signals stored in the memory section; and an output level controlling section for controlling the external output level of audio output signals output to the external equipment in response to a selection signal of the equipment selecting section.

[0017] The output level controlling section includes at least one level converter for controlling the external output level of the audio output signals. The external output level of the audio output signals is controlled by control of an operational power voltage level of the level converter.

[0018] The output level controlling section controls the external output level to be lower when the external equipment selected by the equipment selecting section is a television than when the selected external equipment is audio equipment (AMP).

[0019] The output level controlling section stores predetermined average maximum levels by equipment types and controls the external output level to the average maximum level corresponding to the equipment selected by the equipment selecting section.

[0020] The output level controlling section stores predetermined optimal levels for the best audio quality by equipment types and controls the external output level to the optimal level corresponding to the equipment selected by the equipment selecting section.

[0021] The main controller further includes a memory card input section having interfaces for adding an external memory card or an external extension pack.

[0022] The main controller further includes a data communication section for data communications with an outer side including download of the music data.

[0023] The main controller further includes: a button input section for control of the main CPU and data input through a remote controller or buttons; and a display section for displaying input data and checking operation-related data.

[0024] The main controller has a structure capable of being connected to a wire microphone as well as the wireless microphones.

[0025] The control of the main controller is realized by input of a control signal through the main controller or the at least two wireless microphones.

[0026] According to the present invention, one transmitter/receiver module is built in the main controller to reduce production cost and enhance reception/transmission efficiency. The present invention controls the audio output level according to the type of external equipment connected and thereby reproduces audio signals of the best audio quality without distortion.

[0027] The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as being limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] The above and other features and advantages of the present invention will become more apparent to those of ordinary skill in the art by describing in detail preferred embodiments thereof with reference to the attached drawings in which:

FIG. 1 is a block diagram of a music accompaniment apparatus according to an embodiment of the present invention;

FIG. 2 is a block diagram of the main controller of

FIG. 1;

FIG. 3 is a block diagram of the audio output section of FIG. 2;

FIG. 4 is a block diagram of the wireless microphone of FIG. 1;

FIG. 5 shows a wireless reception/transmission relationship between the main controller and the wireless microphones in FIG. 1; and

FIG. 6 is an external view showing an outer appearance of the music accompaniment apparatus of FIG. 1.

DETAILED DESCRIPTION OF THE INVENTION

[0029] The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided as teaching examples of the invention. Like numbers refer to like element.

[0030] FIG. 1 is a block diagram of a wireless music accompaniment apparatus 500 according to an embodiment of the present invention.

[0031] As shown in FIG. 1, the wireless music accompaniment apparatus 500 according to an embodiment of the present invention includes external equipment 100, a main controller 400 and a plurality of microphones 200a, 200b and 200c.

[0032] The external equipment 100 may include well-known devices such as television 110 or audio equipment 120. The television 110 includes a television or a monitor with built-in or separated speakers for audio signal output. The external equipment 100 is connected to the main controller 400 through a wired or wireless connection. But the television or audio equipment is usually connected to the main controller 400 through a wired connection, because most of the television or audio equipment commercially available does not have a module for wireless reception. In case of wireless connection, the external equipment 100 needs to have a connection to a separate receiver device for wireless reception or include such a receiver device.

[0033] The external equipment 100 displays music data including video and audio signals sent from the main controller 400. The term "display" as used herein refers to audio display of audio signals output through a speaker as well as video display of video or caption signals.

[0034] The main controller 400 has one built-in RF receiver module (415 in FIG. 2) capable of simultaneous signal reception from the at least two wireless microphones 200a, 200b and 200c through at least two receiver channels. The main controller 400 receives audio signals from the at least two wireless microphones 200a, 200b and 200c, mixes the received audio signals with embedded accompaniment and caption signals and outputs the mixed audio signals with an output signal level varied depending on the type of the external equipment as an output target. The RF receiver module 415 receives audio signals from the at least two microphones 200a, 200b and 200c in a simultaneous way, namely, has a plurality of receiver channels. The detailed configuration and operation of the main controller 400 are described below with reference to FIG. 2.

[0035] The at least two microphones 200a, 200b and 200c (hereinafter, denoted by reference numeric 200), which are wireless microphones, perform dividing and compounding electrical signals converted from the control signals for control of the main controller 400 and the user's audio signals and send the signals to the main controller 400. For this, each microphone has a built-in RF transmitter module (240 in FIG. 4).

[0036] The control signal Con is used for the user controlling the main controller 400 using the microphones 200. Namely, the user can perform a control of the operation of the main controller 400 or other control operations through the microphones 200. Actually, each microphone 200 can be used to control the main controller 400. In another embodiment of the present invention, though, a selected one (for example, microphone 200a) of the microphones 200 is used to control the main controller 400, while the others 200b and 200c do such usual functions of a microphone as conversion of the user's input audio signals to electrical signals and wireless transmission of the signals.

[0037] The wireless microphone 200 includes a dynamic microphone using the vibration of a diaphragm produced in response to incoming sound waves to create a voltage proportional to the velocity of the motion in a coil; a condenser microphone using capacitance changes to convert sound waves moving the diaphragm to electrical signals; or an electric-condenser microphone using the electric phenomenon that high electric field applied to a specific polymer compound semi-permanently retains electrical charges induced on the surface after its removal. The wireless microphone 200 includes both directional (unidirectional or bi-directional) microphones and omnidirectional microphones.

[0038] The configuration and operation of each microphone 200 are described in detail with reference to FIG. 4.

[0039] Hereinafter, both the RF receiver module and the RF transmitter module will be referred to as "RF transmitter/receiver module". The wireless transmitter/receiver module is generally constructed for both transmission and reception. The term "transmitter/receiver module" as used herein refers to a module capable of both transmission and reception and may be replaced by the term "RF transmitter module" when provided in the wireless microphones 200 to perform data transmission only, or by the term "RF receiver module" when in the main controller 400 for data reception.

[0040] Between the main controller 400 and the wireless microphones 200 are used various wireless communications systems as well known to those skilled in the art.

[0041] FIG. 2 is a block diagram of the main controller of FIG. 1.

[0042] As shown in FIG. 2, the main controller 400 includes a signal receiving section 470, a main CPU 450, a signal output section 480, and a memory section 420; and additionally, a memory card input section 440, a data communication section 445, a button input section 498, and a display section 492.

[0043] The signal receiving section 470 includes an RF transmitter/receiver module 415 and a signal processing and dividing section 410.

[0044] The RF transmitter/receiver module 415, which involves wireless data transmission/reception, may include one RF transmitter/receiver module for both data transmission and reception, or a separate RF receiver module for data reception only.

[0045] Only one of the RF transmitter/receiver module 415 is provided and, as illustrated in FIG. 5, constructed to receive signals from the plural microphones 200 in a simultaneous way. With n microphones 200, for example, the RF transmitter/receiver module 415 simultaneously receives signals from n RF transmitter/receiver modules provided in the respective microphones 200. For this, the RF transmitter/receiver module 415 has a plurality of receiver channels.

[0046] Thanks to technology development, the RF transmitter/receiver module having two receiver channels is commercially available, and the RF transmitter/receiver module with more than two receiver channels is expected to come out in the near future.

[0047] The signal processing and dividing section 410 divides the signals received through the RF transmitter/receiver module 415 into audio signal Audio, control signal Con and data signal Data and then processes the divided signals. The audio signal Audio is the user's input audio signal sent through the wireless microphone 200, and the control signal Con is a signal sent by the user pressing buttons provided on the outer side of the microphone.

[0048] The control signal Con includes signals for volume control or sound effect control (e.g., echo) of the output audio signals, and signals for control of the operation of the main controller 400. The data signal Data includes numeric signals entered by the user to choose a specific music. The audio signal Audio, the control signal Con and the data signal Data are sent to the signal receiving section 470 as a composite signal or as individual signals.

[0049] The signal receiving section 470 receives the audio signal Audio, the control signal Con and the data signal Data wirelessly sent from the wireless microphone 200 as a composite signal or individual signals. When receiving the composite signal, the signal receiving section 470 divides the composite signal into audio signal Audio, control signal Con and data signal Data and then processes the signals. For individual signals, the signal receiving section 470 just performs a signal processing operation on them.

[0050] The main CPU 450 controls the general operations of the main controller 400 and has a general-process input output (GPIO) controller for input/output of at least two signals externally applied, and various interfaces including a memory interface and an optical interface.

[0051] The signal output section 480, which is controlled by the main CPU 450, processes the data and audio signals received through the signal receiving section 470 or stored in the built-in memory section 420 and then outputs the signals to the external equipment 100 such as a television or audio equipment.

[0052] The signal output section 480 includes an audio output section 425 and a video (caption) output section 430.

[0053] The audio output section 425 is constructed to output the audio signals sent from the main CPU 450 and thus connected to the external equipment 100 to output the audio signals. The audio signals Audio output through the audio output section 425 include audio signals and accompaniment signals input through the wireless microphones 200.

[0054] The audio output section 425 outputs the audio signals Audio Output with an output level varied according to the type of the external equipment 100.

[0055] The video (caption) output section 430 is for displaying video signals Video output from the main CPU 450. The video signals Video include movie, caption or text signals.

[0056] The video output section 430 includes a video encoder (not shown) and a graphic engine (not shown).

[0057] The video encoder encodes the video signals output from the graphic engine and then outputs the encoded video signals externally. The video signals Video may be television video signals (Composite Video Banking Sync: CVBS) or VGA signals.

[0058] The graphic engine uses various controllers for processing video signals such as music video data or background images, or video signals Video such as caption and movie signals. The graphic engine has a controller for processing NTSC/PAL, VGA or CRTC signals, a text frame for caption display, a video DAC for background image display, and an overlay controller for displaying captions or lyrics overlapped on the background image, to process the video signals Video.

[0059] The memory section 420 is used for performing data backup and storing an operation system, various software for the operation of the main controller 400, audio files, and music-related video files including flash animation and movie files.

[0060] The memory section 420 includes a main memory 422 having at least one RAM, a storage memory 424 having at least one ROM including a flash memory, and a backup memory 426 for data backup.

[0061] The memory card input section 440 has an external memory card interface for information reception of external memory cards, and an external extension pack interface including a plurality of extension slots for addition of external extension packs. The external memory

card includes an SD memory card or an MMC memory card. The external extension packs are used for supplementation, revision and replacement of music-related data.

[0062] The data communication section 445 includes an USB port or an IEEE1394 port connected to a computer for data communication with external equipment such as downloads of music data, and other data communication means as well known to those skilled in the art.

[0063] The main controller 400 further includes a button input section 498 for control of the main body or data input through a remote controller 496 or buttons; a display section 492 for a display of input data or a check of operational data; and a panel control section 490 for control of the button input section 498 and the display section 498.

[0064] FIG. 3 is a block diagram showing the detailed configuration of the audio output section 425 of FIG. 2.

[0065] As shown in FIG. 3, the audio output section 425 includes an audio signal processing section 130, an output level controlling section 140 and an equipment selecting section 150.

[0066] The audio signal processing section 130 processes signals received through the signal receiving section 470 or the main CPU 450 to be suitable for the output level, or various audio-related signals including accompaniment signals stored in the memory section 420. The signal processing in the audio signal processing section 130 involves a step of analog-to-digital conversion (and vice versa), and a step of mixing accompaniment signals stored in the memory section 420 with audio signals received through the signal receiving section 470 and sending the mixed signals externally.

[0067] The audio signal processing section 130 processes external audio signals externally applied to the wireless microphone 200 and internal audio signals including embedded accompaniment signals, and mixes the audio signals. Hereinafter, the output signal of the audio signal processing section 130 is referred to as "audio output signal".

[0068] The equipment selecting section 150 selects the type of external equipment 100 connected to the music accompaniment apparatus 500 to reproduce the audio signals output from the music accompaniment apparatus 500. Generally, external equipment connected to the music accompaniment apparatus 500 includes television 110 or audio equipment 120, and additionally, different audio reproduction equipment for audio reproduction. The external equipment 100 has a structure connectable to the music accompaniment apparatus 500 and includes any type of equipment for reproducing the audio signals output from the music accompaniment apparatus 500.

[0069] The equipment selecting section 150, when electrically connected to the external equipment 100, automatically senses the type of the external equipment connected. For this, the external equipment 100 may generate sensing signals by which its type is identified.

[0070] When automatic sensing not allowed, or without automatic sensing means, the user can choose the external equipment 100 manually through switch on or press of a select button. When television 110 is used as the external equipment 100, for example, the user presses a TV select button provided on the microphone 200 or the main controller 400 to generate a TV selection signal. For audio equipment 120 as the external equipment 100, the user switches on or presses an audio equipment select button provided on the microphone 200 or the main controller 400 to generate an audio equipment selection signal. The switching means for selection or the select buttons are provided as many as the types of the external equipment 100.

[0071] The output level controlling section 140 controls the external output level of audio output signals output from the audio signal processing section 130 in response to a selection signal of the equipment selecting section 150. The output level controlling section 140 includes at least one level converter (not shown) for amplifying the audio output signals of the audio signal processing section 130 and outputting the amplified signals externally.

[0072] The level converter may be an amplifier provided in audio signal input/output circuitry. In this case, the output level of the amplifier is controlled by control of the operational power voltage level of the amplifier.

[0073] Of course, other methods to control the output level are also available. Namely, various methods and circuitry well known to those skilled in the art may be used as a component of the output level controlling section 140.

[0074] When the external equipment 100 is television 110, for example, the output level controlling section 140 controls the output level to 1 Vrms. There are some cases where audio signal input is disabled or the signal is not reproduced if the level of the audio signal Audio for certain televisions exceeds 2 Vrms. Hence, controlling the output level of the audio signal Audio from the output level controlling section 140 to 1 Vrms may resolve the problem regarding the audio signal input disabled or not reproduced when the external equipment 100 is television 110. The gain of the audio signal output from the output level controlling section 140 in this case may be properly controlled to enhance the audio quality. The gain is raised for a reduction of the output level and lowered for a rise of the output level.

[0075] The output level of the output level controlling section 140 is controlled to 2 Vrms, for example, when the external equipment 100 is audio equipment 120.

[0076] It is assumed that the level of the audio signal Audio input through the output level controlling section 140 is equal or approximate to 2 Vrms. The output level controlling section 140 maintains the output level at 1 Vrms when the external equipment 100 connected is television 110. But, the output level controlling section 140 just outputs the input value without level control when the external equipment 100 is audio equipment 120.

[0077] For all external equipment available, the output level controlling section 140 predetermines average maximum level values by equipment for audio signal input and stores the predetermined values in a separate memory or the memory section 420. Once the equipment selecting section 150 selects the type of the external equipment, the output level controlling section 140 acquires an average maximum level value corresponding to the selected equipment and controls the external output level to an appropriate level value.

[0078] In another embodiment, the output level controlling section 140 stores optimal level values for the best audio quality rather than the average maximum level values. The optimal level values are determined as an input value realizing the best audio quality by equipment according to different experiments or data. Then the external output level can be controlled to an optimal level value corresponding to the equipment selected by the equipment selecting section 150.

[0079] In another example, when the external equipment 100 is a new one other than the predetermined external equipment, the output level controlling section 140 may have a separate input means for input of a new level value, or otherwise, be allowed to choose similar equipment instead. Alternatively, the output level controlling section 140 may select an optimal level value or a maximum level value while the level value is changing in a sequence. The separate input means includes buttons provided on the microphone 200 or the main controller 400.

[0080] As described above, the present invention varies the output level of the audio signals according to the type of the external equipment connected to the music accompaniment apparatus to reproduce the audio signals and realize the best audio quality.

[0081] FIG. 4 is a block diagram showing the configuration of the wireless microphone 200 of FIG. 1.

[0082] As shown in FIG. 4, the wireless microphone 200 provided in the music accompaniment apparatus according to an embodiment of the present invention includes an amplifier 220 for amplifying input audio signals Audio, and an A/D converter 225 for converting the amplified audio signals to digital signals, and additionally, a codec 230, a microphone CPU 250, a signal composition and conversion section 235, a button input section 295, a memory section 270, an RF transmitter/receiver module 240 and a display section 290.

[0083] The codec 230 encodes or controls the digital audio signals output from the amplifier 220 or the A/D converter 225. The audio codec 230 performs encoding or decoding of the audio signals according to SBC (Smart Bitrate Control) or ADM system. The audio codec 230 may include a function of the A/D converter 225.

[0084] The button input section 295 is to input control signals for control of the main controller 400 and selection of transmitter/receiver channels between the main controller 400 and sub terminals 300. The control signal Con is input through the buttons provided on the outer side of the microphone 200.

[0085] The signals input through the button input section 295 are input/output through a button interface in the microphone CPU 250. The display section 290 is provided to display the information of the control signals and/or the operational status of the microphone 200 for the user's recognition. The display section 290 simply displays numerals or signals of control keys entered through the button input section 295.

[0086] The microphone CPU 250 controls the general operation of the microphone 200, an encoding operation for the digital audio signals output from the codec 230, and a conversion operation for composite signals of the encoded audio signals and the control signals to be suitable for transmission.

[0087] The microphone CPU 250 controls not only the general function of the microphone but also the input/output of the control signals and other signals.

[0088] The signal composition and conversion section 235 converts a composite signal of the encoded audio signals and the control signals to be suitable for transmission, or just outputs the individual signals without composition. The composite signal includes at least one of the audio signals and the control signals.

[0089] The RF transmitter/receiver module 240 wirelessly outputs individual signals or composite signals output from the signal composition and conversion section 235. In the case of wireless output, the signals are sent through a base-band transmission system or the like, or through an antenna 285.

[0090] If not in usual cases, the memory section 270 may be provided in the microphones for data storage when necessary.

[0091] Instead of the wireless microphones 200, the music accompaniment apparatus 500 may have a wired microphone capable of the same functions of the wireless microphones 200.

[0092] FIG. 6 presents schematic perspectives showing the outer appearance of the wireless microphones 200 and the main controller 400 of FIG. 1. Though the outer appearance of the wireless microphones 200 and the main controller 400 is given as an example, different modifications or revisions are available in design to provide convenience and comfortness and to make the apparatus look favored.

[0093] As shown in FIG. 6, there are provided two microphones 200 and one main controller 400.

[0094] The music accompaniment apparatus may have at least one microphone 200 and basically two microphones 200.

[0095] The microphones 200 send composite signals made by conversion of audio signals input by the user and control signals input through buttons to electrical signals and composition of the electrical signals.

[0096] The microphones 200 include button input section 295, display section 290 and antenna (not shown) connected to the RF transmitter/receiver module in addition to the outer appearance of a general microphone.

[0097] The main controller 400 apparently has receiving grooves for storage of the microphones 200, a button input section 498 for input of control signals or other signals, and a display section 492 for check and verification of input signals. The main controller 400 additionally has a cable 475 connected to a TV or PC for signal transmission, a USB port, or an antenna (not shown).

[0098] As described above, the present invention uses one transmitter/receiver module connected to the main controller to reduce the production cost and enhance the transmission/reception efficiency, controls the audio output level according to the type of external equipment connected, and thereby reproduces audio signals of the best audio quality without distortion.

[0099] The invention has been described using preferred exemplary embodiments. However, it is to be understood that the scope of the invention is not limited to the disclosed embodiments. On the contrary, the scope of the invention is intended to include various modifications and alternative arrangements within the capabilities of persons skilled in the art using presently known or future technologies and equivalents. The scope of the claims, therefore, should be accorded the broadest interpretation so as to encompass all such modifications and similar arrangements.

[0100] There is provided a music accompaniment apparatus that includes: at least two wireless microphones for converting externally input audio signals to electrical signals and sending the electrical signals using a built-in RF transmitter module through a wireless connection; and a main controller having one RF receiver module capable of simultaneous signal reception from the at least two wireless microphones through at least two receiver channels, receiving audio signals from the at least two wireless microphones, mixing the audio signals with embedded accompaniment signals and caption signals, and sending output signals with an output level varied according to the type of external equipment used as an output target. The music accompaniment apparatus reduces the production cost, enhances transmission/reception efficiency, and reproduces audio signals of the best audio quality without distortion.

Claims

1. A music accompaniment apparatus comprising:

at least two wireless microphones for converting externally input audio signals to electrical signals and sending the electrical signals using a built-in RF transmitter module through a wireless connection; and

a main controller having one RF receiver module capable of simultaneous signal reception from the at least two wireless microphones through at least two receiver channels, receiving audio signals from the at least two wireless microphones, mixing the audio signals with embedded accompaniment signals and caption signals, and sending output signals with an output level varied according to the type of external equipment used as an output target.

2. The music accompaniment apparatus as claimed in claim 1, wherein each of the at least two wireless microphones receives control signals for control of the main controller and data signals to be sent to the main controller through input buttons provided on the outer side of the wireless microphones and additionally sends the control signals and the data signals to the main controller through the RF transmitter module,

the main controller receiving the control signals and the data signals through the RF receiver module.

3. The music accompaniment apparatus as claimed in claim 2, wherein the main controller comprises:

a signal receiving section for receiving audio signals, control signals and data signals wirelessly sent from the at least two microphones and dividing and processing the received signals;

a main CPU having a general-process input output controller for input/output of at least two signals externally applied and various interfaces including memory interface and optical interface, and controlling the whole operation including a transmission or output control for the audio, control and data signals;

a signal output section being controlled by the main CPU, processing the data and audio signals internally stored or received through the signal receiving section and sending the processed signals to external equipment with an output level varied according to the type of the external equipment; and

a memory section provided for data backup and storing an operation system and music-related data including various software for operations of the main controller, audio files, and movie files.

4. The music accompaniment apparatus as claimed in claim 3, wherein the signal output section comprises:

an audio output section for output of audio signals received through the at least two microphones and accompaniment signals stored in the memory section.

5. The music accompaniment apparatus as claimed in claim 4, wherein the audio output section comprises:

an equipment selecting section for selecting the type of external equipment connected to the mu-

sic accompaniment apparatus through a wired or wireless connection to externally reproduce audio signals received through the at least two microphones or audio signals including the accompaniment signals stored in the memory section; and

an output level controlling section for controlling the external output level of audio output signals output to the external equipment in response to a selection signal of the equipment selecting section.

6. The music accompaniment apparatus as claimed in claim 5, wherein the output level controlling section comprises at least one level converter for controlling the external output level of the audio output signals.

7. The music accompaniment apparatus as claimed in claim 6, wherein the external output level of the audio output signals is controlled by control of an operational power voltage level of the level converter.

8. The music accompaniment apparatus as claimed in claim 5, wherein the output level controlling section controls the external output level to be lower when the external equipment selected by the equipment selecting section is a television than when the selected external equipment is audio equipment (AMP).

9. The music accompaniment apparatus as claimed in claim 5, wherein the output level controlling section stores predetermined average maximum levels by equipment types and controls the external output level to the average maximum level corresponding to the equipment selected by the equipment selecting section.

10. The music accompaniment apparatus as claimed in claim 3, wherein the output level controlling section stores predetermined optimal levels for the best audio quality by equipment types and controls the external output level to the optimal level corresponding to the equipment selected by the equipment selecting section.

11. The music accompaniment apparatus as claimed in claim 3, wherein the main controller further comprises:

a memory card input section having interfaces for adding an external memory card or an external extension pack.

12. The music accompaniment apparatus as claimed in claim 11, wherein the main controller further comprises:

a data communication section for data communications with an outer side including download of the music data.

13. The music accompaniment apparatus as claimed in claim 12, wherein the main controller further comprises:

a button input section for control of the main CPU and data input through a remote controller or buttons; and

a display section for displaying input data and checking operation-related data.

14. The music accompaniment apparatus as claimed in claim 13, wherein the main controller has a structure capable of being connected to a wire microphone as well as the wireless microphones.

15. The music accompaniment apparatus as claimed in claim 2, wherein the control of the main controller is realized by input of a control signal through the main controller or the at least two wireless microphones.

FIG. 1

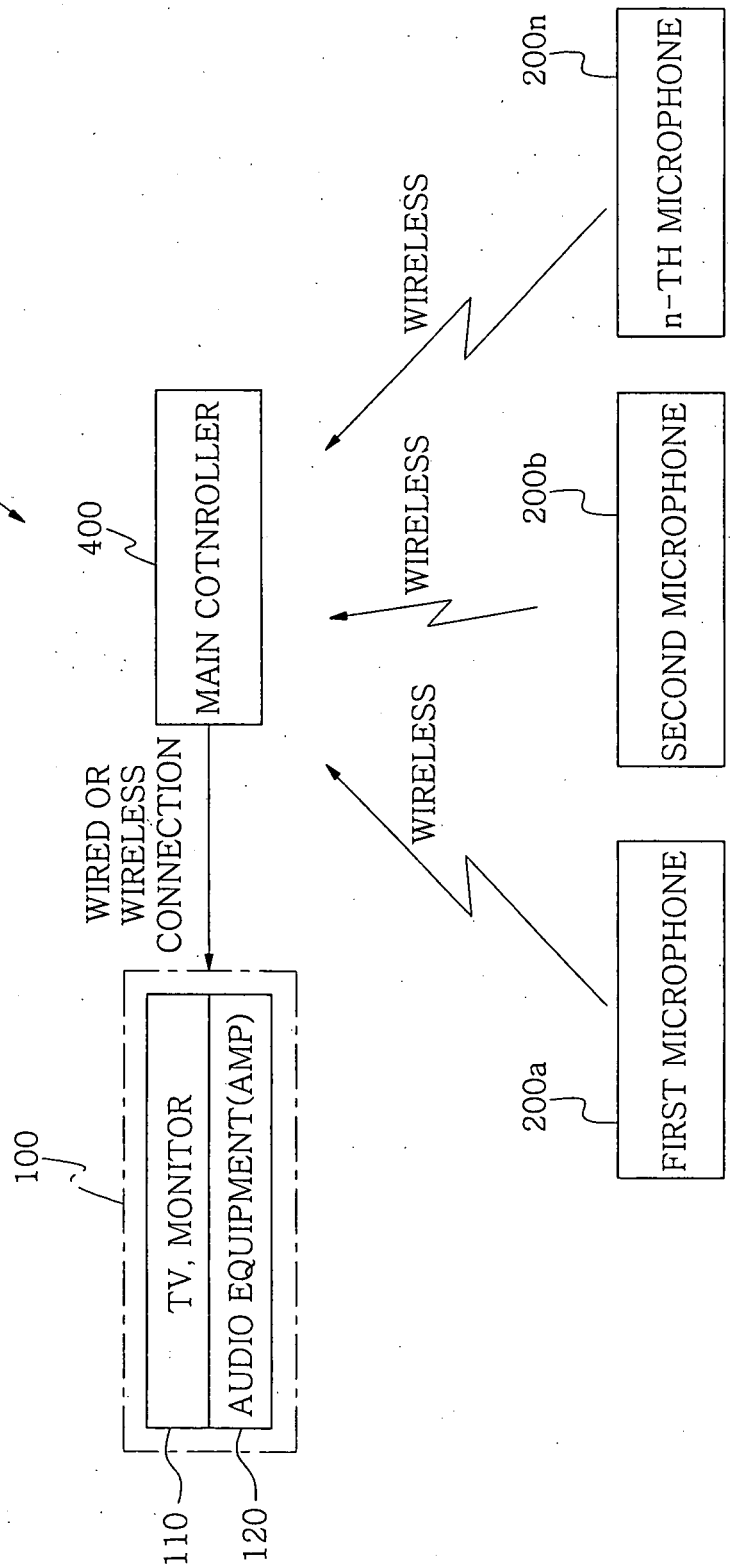

500
400
MAIN COTNROLLER
WIRELESS
WIRELESS
WIRELESS
200n
n-TH MICROPHONE
200b
SECOND MICROPHONE
200a
FIRST MICROPHONE
WIRED OR
WIRELESS
CONNECTION
100
TV, MONITOR
AUDIO EQUIPMENT(AMP)
110
120

FIG. 2

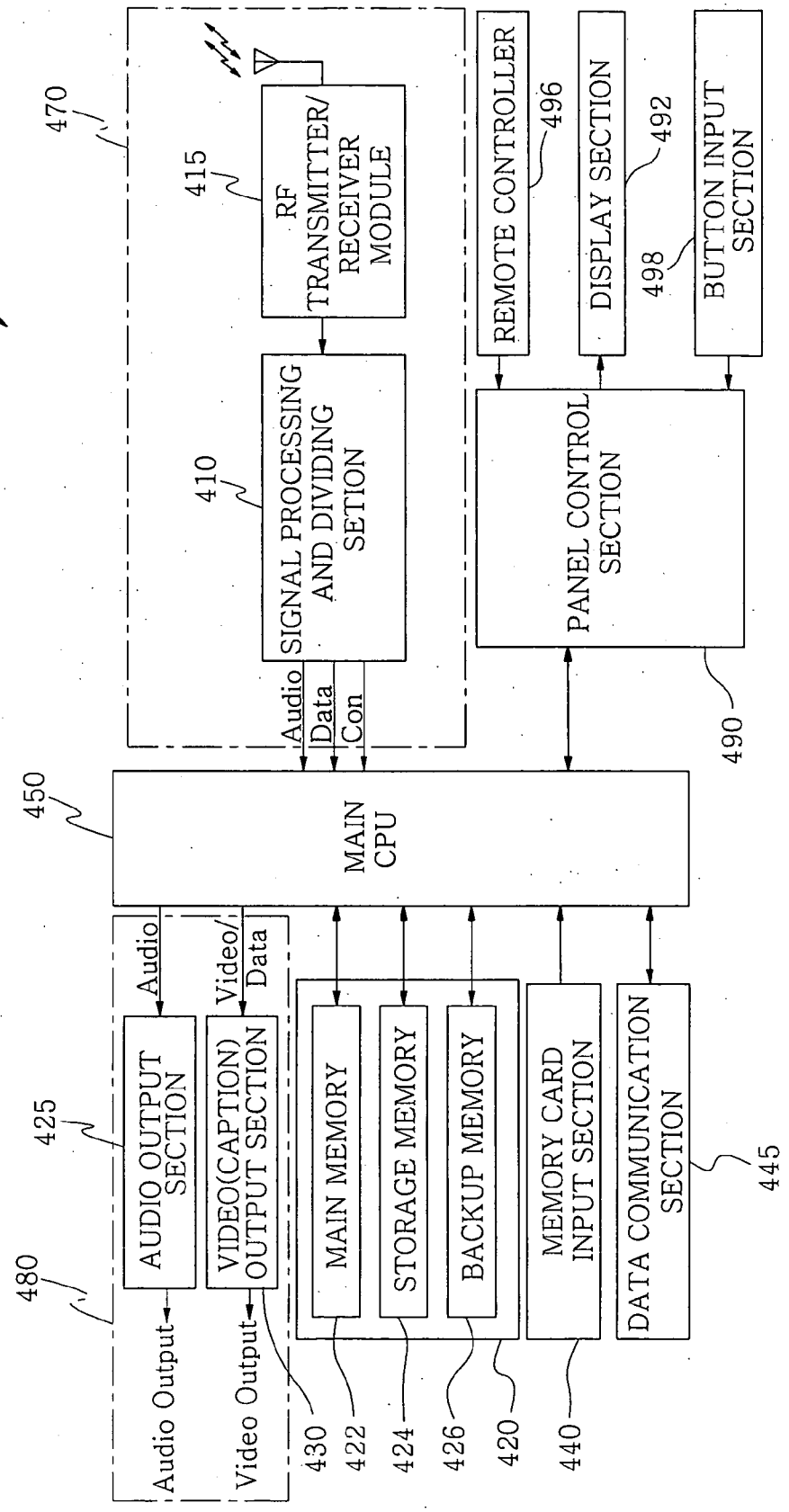

400
470
415
RF TRANSMITTER/ RECEIVER MODULE
410
SIGNAL PROCESSING AND DIVIDING SETION
Audio
Data
Con
REMOTE CONTROLLER
496
DISPLAY SECTION
492
498
BUTTON INPUT SECTION
PANEL CONTROL SECTION
490
450
MAIN CPU
480
425
AUDIO OUTPUT SECTION
Audio
VIDEO(CAPTION) OUTPUT SECTION
Video/ Data
Audio Output
Video Output
MAIN MEMORY
STORAGE MEMORY
BACKUP MEMORY
MEMORY CARD INPUT SECTION
DATA COMMUNICATION SECTION
445
430
422
424
426
420
440

FIG. 3

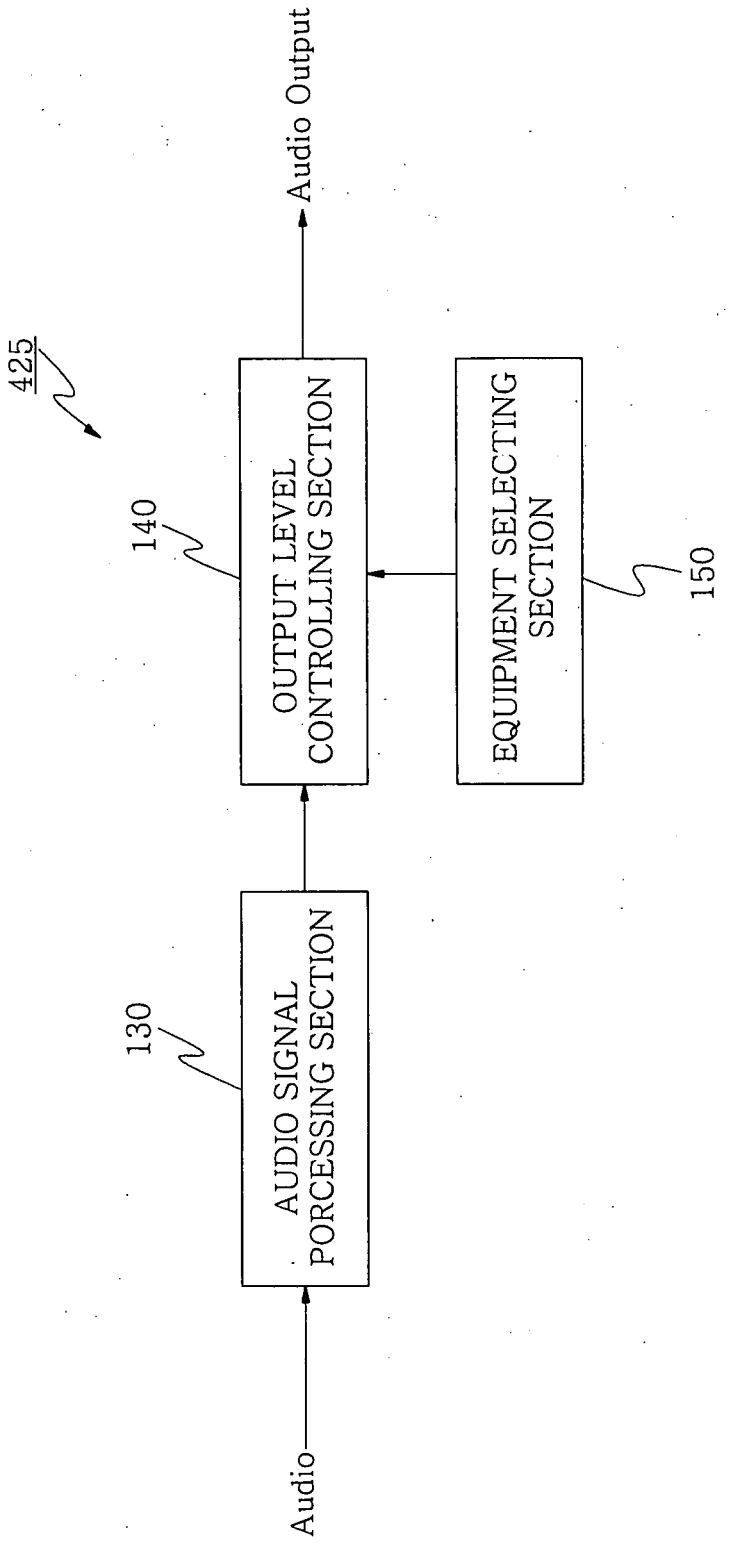

425
Audio Output
140
OUTPUT LEVEL CONTROLLING SECTION
EQUIPMENT SELECTING SECTION
150
130
AUDIO SIGNAL PORCESSING SECTION
Audio

FIG. 4

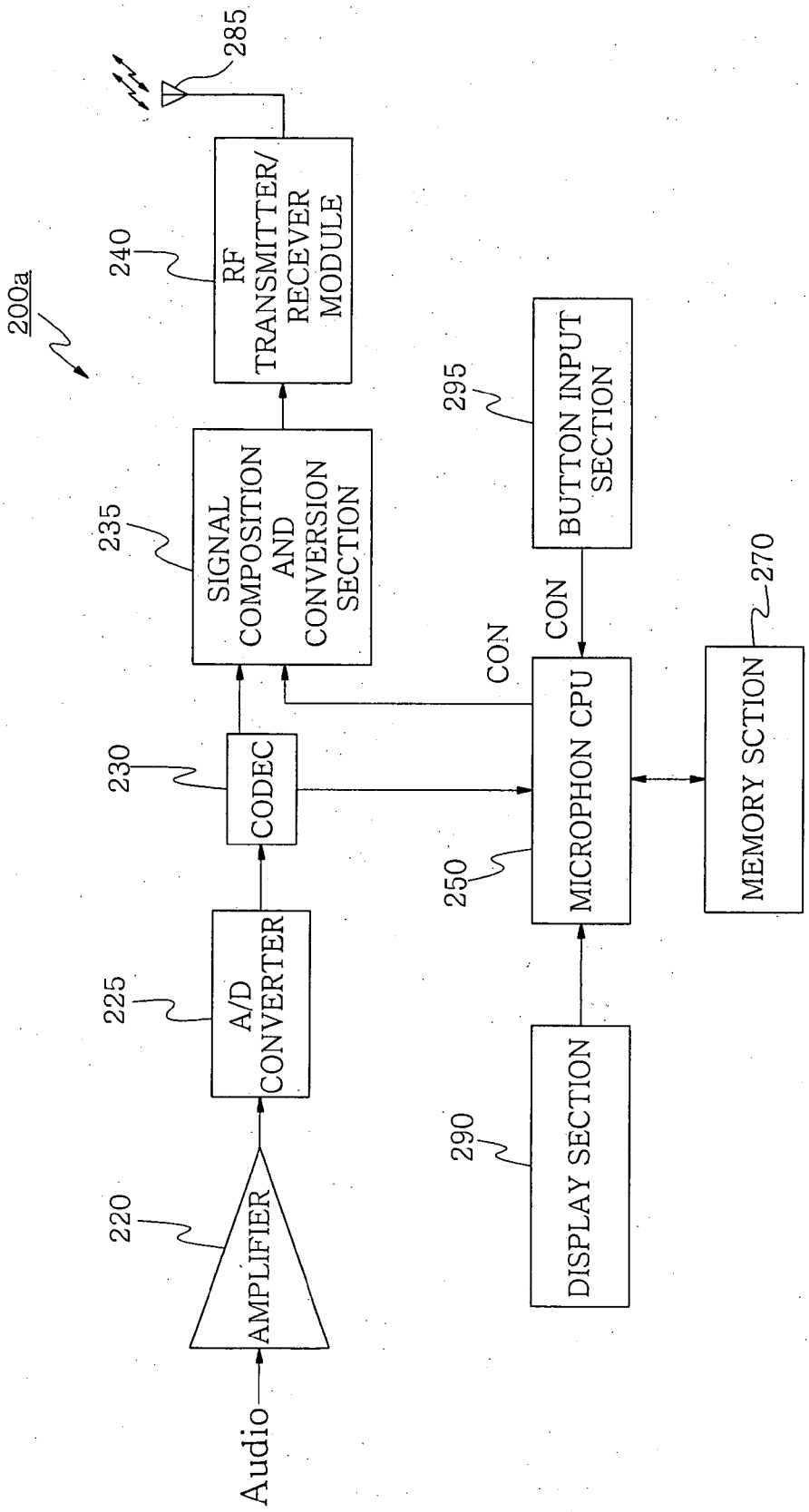

200a
285
240
RF TRANSMITTER/ RECEVER MODULE
235
SIGNAL COMPOSITION AND CONVERSION SECTION
295
BUTTON INPUT SECTION
CON
CON
230
CODEC
MICROPHON CPU
270
MEMORY SCTION
250
225
A/D CONVERTER
290
DISPLAY SECTION
220
AMPLIFIER
Audio

FIG. 5

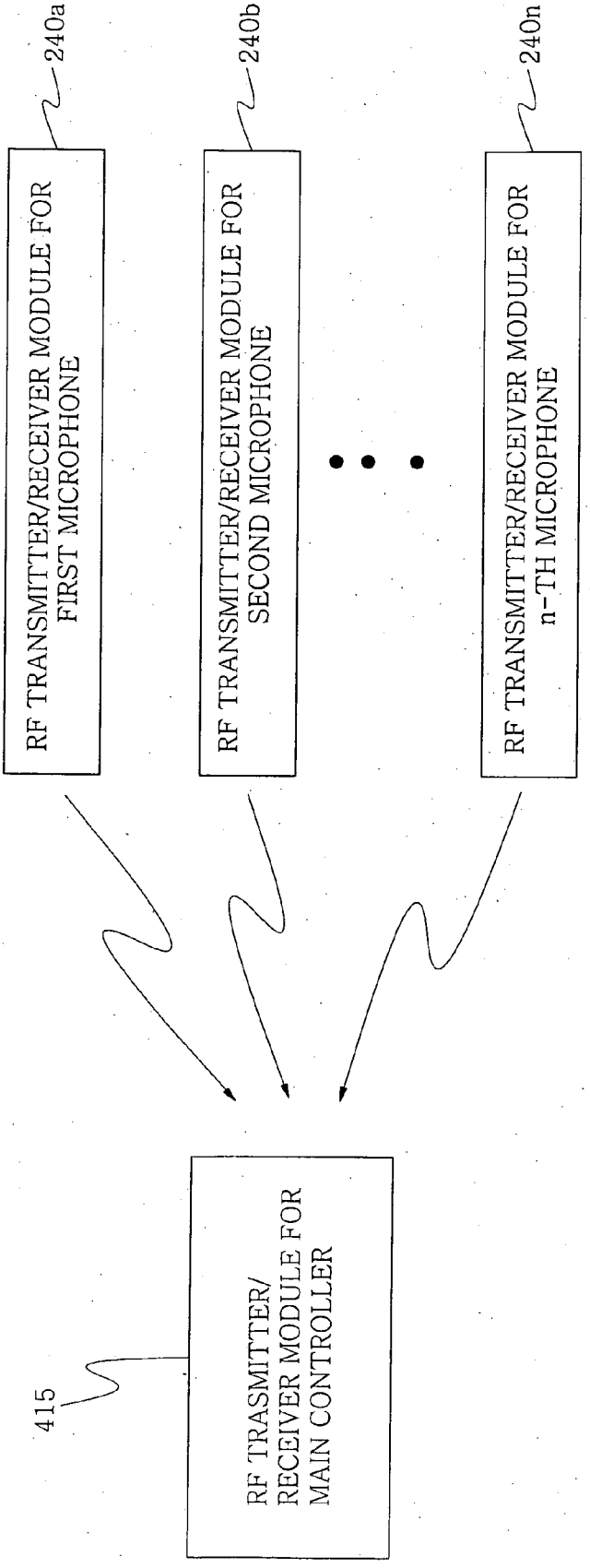
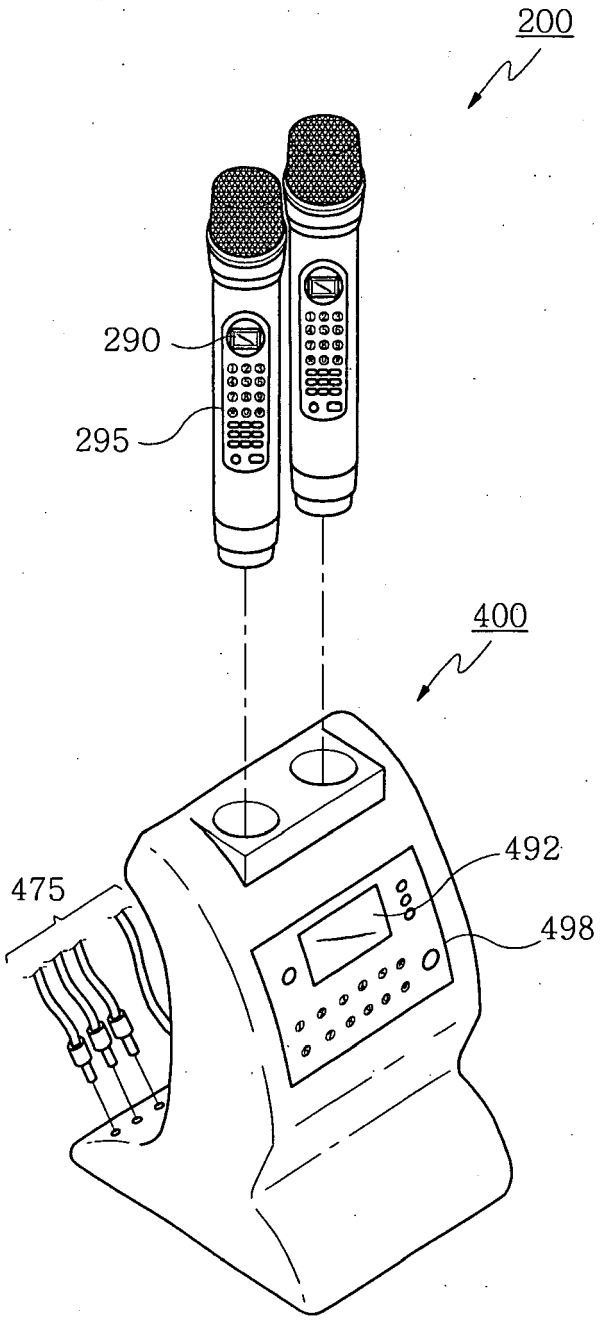

240a
RF TRANSMITTER/RECEIVER MODULE FOR FIRST MICROPHONE
240b
RF TRANSMITTER/RECEIVER MODULE FOR SECOND MICROPHONE
240n
RF TRANSMITTER/RECEIVER MODULE FOR n-TH MICROPHONE
415
RF TRASMITTER/ RECEIVER MODULE FOR MAIN CONTROLLER

FIG. 6



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EUROPEAN SEARCH REPORT

Application Number
EP 07 02 0502

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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X Y	US 2004/127285 A1 (KAVANA JORDAN STEVEN [US]) 1 July 2004 (2004-07-01) * paragraphs [0023] - [0026], [0030], [0031]; claims 1,3,6,9; figures 1,4 *	1,2,15 3-14	
Y	US 6 473 604 B1 (HINKLE JOSEPH A [US] ET AL) 29 October 2002 (2002-10-29) * abstract; claim 12; figures 1-4 *	3-10	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 April 2008	Feron, Marc

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4

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