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Audio reproduction apparatus

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(56) Related Art
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ABSTRACT

AUDIO REPRODUCTION APPARATUS

An audio reproduction apparatus (6) includes auxiliary audio amplifiers coupled electrically in series to a primary audio amplifier (61), each having an input side (625) for receiving audio and control signals from the primary audio amplifier (61), a current inducing device (623) disposed adjacent to a signal current generating device (624), which is coupled electrically across the input side (625), for generating induced audio and control signals when the audio and control signals pass through the signal current generating device (624), and a switch unit (620) coupled electrically between the current inducing device (623) and an auxiliary amplifier (622) and operating, in response to a corresponding induced control signal, at a desired one of an ON-state, where the induced audio signals are amplified for subsequent reproduction by a loudspeaker (633), and an OFF-state, where the induced audio signals are not amplified and outputted by the auxiliary amplifier (622).

Figure 2

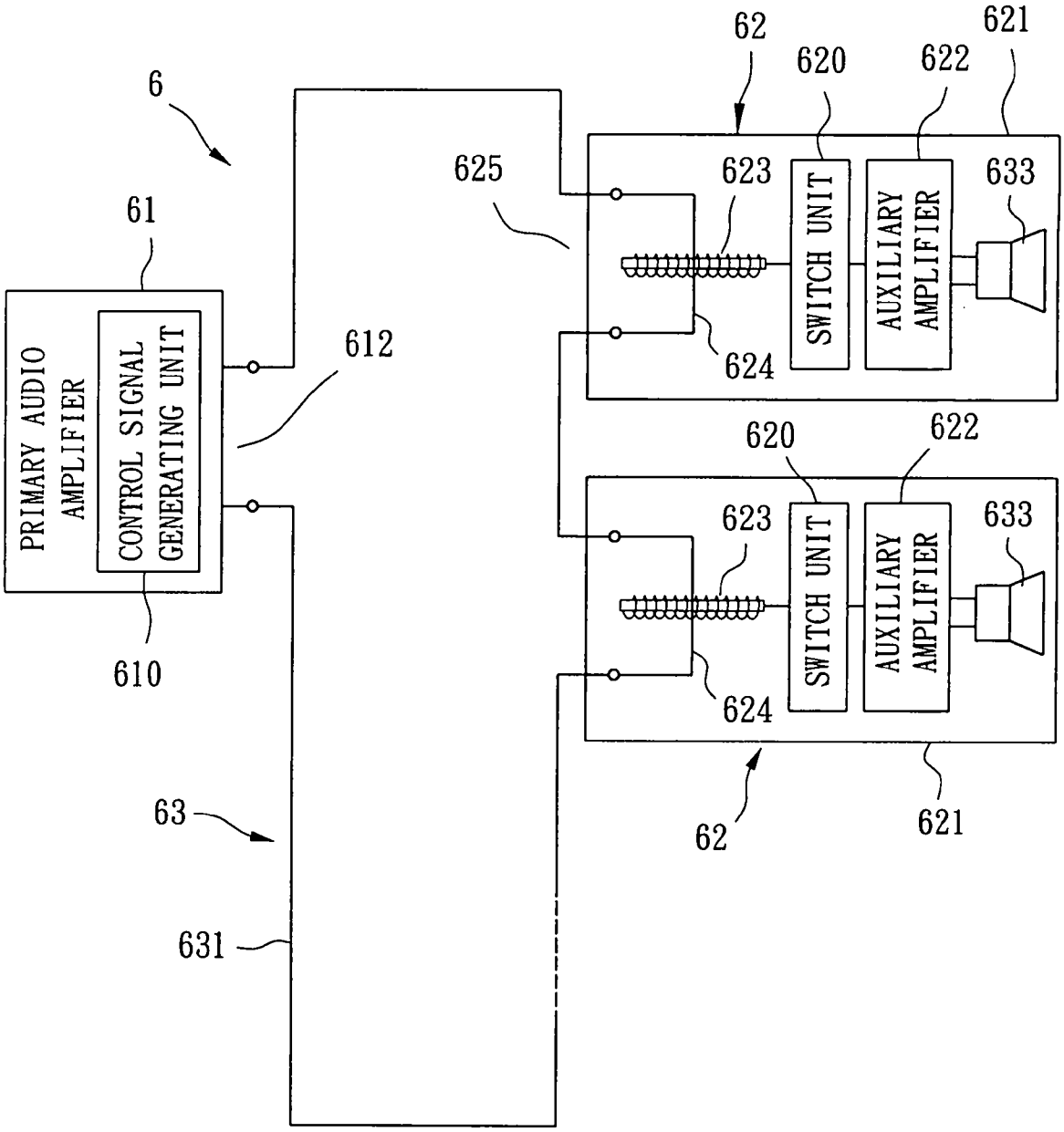
6
61
PRIMARY AUDIO AMPLIFIER
CONTROL SIGNAL GENERATING UNIT
610
612
63
631
62
620
622
621
625
623
SWITCH UNIT
AUXILIARY AMPLIFIER
633
624
62
620
622
623
633
624
621

FIG. 2

P/00/011
Regulation 3.2

AUSTRALIA

Patents Act 1990

COMPLETE SPECIFICATION
STANDARD PATENT

Invention Title: **Audio reproduction apparatus**

The following statement is a full description of this invention, including the best method of performing it known to me:

AUDIO REPRODUCTION APPARATUS

The invention relates to an audio reproduction apparatus, more particularly to an audio reproduction apparatus that can ensure a stable audio signal transmission, that can provide a wide audio reproduction area, and that has a relatively low cost.

Figure 1 illustrates a conventional audio reproduction apparatus that includes an audio amplifier 11 having an output side 110 for outputting audio signals and an output voltage, and an impedance matching network 13 coupled electrically across the output side 110. The audio amplifier 11 includes an amplifier 111, and a transformer 112 coupled electrically to the amplifier 111 for increasing the output voltage from the audio amplifier 11. The impedance matching network 13 includes a plurality of loudspeakers 131 that are coupled electrically in series or parallel to each other.

The following are some of the drawbacks of the conventional audio reproduction apparatus:

1. For optimum power transmission, an output impedance across the output side 110 should be equal to a total impedance of the impedance matching network 13, thereby resulting in a complex impedance design for the impedance matching network 13. Furthermore, since the impedance matching network 13 has so many impedance components, attenuation of frequency response of audio frequency occurs, thereby resulting in poor audio

reproduction quality.

2. When the number of the loudspeakers 131 in the impedance matching network 13 is increased, the output impedance across the output side 110 may not match the total impedance of the impedance matching network 13, thereby resulting in a limited number of the loudspeakers 131 that can be incorporated in the impedance matching network 13.

3. When it is necessary to increase the number of the loudspeakers 131 in the impedance matching network 13, another audio amplifier, which can provide higher output power, must be installed to replace the audio amplifier 11, thereby resulting in higher costs.

4. Since the impedance matching network 13 has so many impedance components, any defective one of the impedance components results in distortion of the audio signals such that a stable audio signal transmission cannot be ensured.

Therefore, the object of the present invention is to provide an audio reproduction apparatus that can overcome the drawbacks associated with the aforesaid prior art.

According to the present invention, an audio reproduction apparatus comprises:

a primary audio amplifier having an output side for outputting audio signals; and

a plurality of auxiliary audio amplifiers coupled

electrically in series to the primary audio amplifier, each of the auxiliary audio amplifiers having an input side for receiving the audio signals from the primary audio amplifier, a signal current generating device coupled electrically across the input side such that the audio signals pass through the signal current generating device, a current inducing device disposed adjacent to the signal current generating device for generating induced audio signals when the audio signals pass through the signal current generating device, an auxiliary amplifier coupled electrically to the current inducing device for amplifying and outputting the induced audio signals generated thereby, and a loudspeaker coupled electrically to the auxiliary amplifier for reproducing the induced audio signals amplified by the auxiliary amplifier.

Other features and advantages of the present invention will become apparent in the following detailed description of the preferred embodiments with reference to the accompanying drawings, of which:

Figure 1 is a schematic electrical circuit diagram of a conventional audio reproduction apparatus;

Figure 2 is a fragmentary schematic electrical circuit diagram of the first preferred embodiment of an audio reproduction apparatus according to this invention;

Figure 3 is a schematic electrical circuit diagram

of an auxiliary audio amplifier of the first preferred embodiment; and

Figure 4 is a fragmentary schematic electrical circuit diagram of the second preferred embodiment of an audio reproduction apparatus according to this invention.

Referring to Figures 2 and 3, according to the first preferred embodiment of this invention, an audio reproduction apparatus 6 is shown to include a primary audio amplifier 61, and a plurality of auxiliary audio amplifiers 62.

The primary audio amplifier 61 has an output side 612 for outputting audio signals.

The auxiliary audio amplifiers 62 are coupled electrically in series to the primary audio amplifier 61. Each of the auxiliary audio amplifiers 62 has an input side 625, a signal current generating device 624, a current inducing device, an auxiliary amplifier 622, a loudspeaker 633 and a housing 621. For each auxiliary audio amplifier 62, the input side 625 receives the audio signals from the primary audio amplifier 61. The signal current generating device 624, such as a conductive wire, is coupled electrically across the input side 625 such that the audio signals pass through the signal current generating device 624. The current inducing device is disposed adjacent to the signal current generating device 624 for generating induced audio signals when

the audio signals pass through the signal current generating device 624. In this embodiment, the current inducing device includes a coiled core 623 that is annular and that defines a plane with a center. The signal current generating device 624 extends through the center and is perpendicular to the plane, as shown in Figure 3. The auxiliary amplifier 622 is coupled electrically to the current inducing device for amplifying and outputting the induced audio signals generated thereby. The loudspeaker 633 is coupled electrically to the auxiliary amplifier 622 for reproducing the induced audio signals amplified by the auxiliary amplifier 622. The housing 621 receives the signal current generating device 624, the current inducing device, the auxiliary amplifier 622 and the loudspeaker 633 therein.

In this embodiment, the primary audio amplifier 61 further has a control signal generating unit 610 operable so as to generate a series of coded control signals corresponding to the auxiliary audio amplifiers 62, outputted at the output side 612, and received by the auxiliary audio amplifiers 62 at the input sides 625 thereof such that the current inducing device of each auxiliary audio amplifier 62 further generates induced control signals when the control signals pass through the signal current generating device 624.

In this embodiment, each auxiliary audio amplifier

62 further has a switch unit 620 received in the housing 621 and coupled electrically between the current inducing device and the auxiliary amplifier 622 and operating, in response to a corresponding one of the induced control signals, at a desired one of an ON-state, where the switch unit 620 makes connection between the current inducing device and the auxiliary amplifier 622, and an OFF-state, where the switch unit 620 interrupts connection between the current inducing device and the auxiliary amplifier 622 such that the induced audio signals are not amplified and outputted by the auxiliary amplifier 622. In other words, through the coded control signals, the switch units 620 of selected auxiliary audio amplifiers 62 can be operated in the OFF-state such that the selected auxiliary audio amplifiers 62 do not reproduce the induced audio signals.

Referring to Figure 4, according to the second preferred embodiment of this invention, an audio reproduction apparatus 5 is shown to include a primary audio amplifier 51, a plurality of auxiliary audio amplifiers 52, an auxiliary signal loop 55, and a plurality of normally-open test switches (S1, S2).

The primary audio amplifier 51 has an output side 510 for outputting audio signals.

The auxiliary audio amplifiers 52 are coupled electrically in series to the primary audio amplifier 51. Each auxiliary audio amplifier 52 includes an input

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side 520 for receiving the audio signals from the primary audio amplifier 51, a signal current generating device 524 coupled electrically across the input side 520 such that the audio signals pass through the signal current generating device 524, a current inducing device in the form of a coiled core 523 and disposed adjacent to the signal current generating device 524 for generating induced audio signals when the audio signals pass through the signal current generating device 524, an auxiliary amplifier 522 coupled electrically to the current inducing device for amplifying and outputting the induced audio signals generated thereby, a loudspeaker 525 coupled electrically to the auxiliary amplifier 522 for reproducing the induced audio signals amplified by the auxiliary amplifier 522, and a housing 521 for receiving the signal current generating device 524, the current inducing device, the auxiliary amplifier 522 and the loudspeaker 525 therein. In this embodiment, the coiled core 523 is elongated and is disposed parallel to the signal current generating device 524.

The auxiliary signal loop 55 is coupled electrically across the output side 510 of the primary audio amplifier 52, permits the audio signals from the primary audio amplifier 51 to pass therethrough, and has a plurality of test nodes (A, B).

Each of the normally-open test switches (S1, S2) is connected electrically between a respective one of the

test nodes (A, B) and a junction (J1, J2) of a corresponding adjacent pair of the auxiliary audio amplifiers 52, and is operable via remote control so as to switch from an OFF-state to an ON-state, where the respective one of the test nodes (A, B) is connected electrically to the junction (J1, J2) of the corresponding adjacent pair of the auxiliary audio amplifiers 52 therethrough, thereby permitting transmission of the audio signals from the primary audio amplifier 51 to bypass a defective one of the auxiliary audio amplifiers 52 via the auxiliary signal loop 55.

The following are some of the advantages of the present invention:

1. Since the audio signals outputted by the primary audio amplifier 61, 51 only pass through the signal current generating device 624, 524 of each of the auxiliary audio amplifiers 61, 51, distortion of the audio signals can be minimized, thereby resulting in a stable audio signal transmission.

2. Since the audio reproduction apparatus 6, 5 of this invention utilizes the current inducing device of each of the auxiliary audio amplifiers 62, 52 to generate the induced audio signals associated with the audio signals from the primary audio amplifier 61, 51, the number of auxiliary audio amplifiers 62, 52 can be varied according to a user's requirement such that the audio reproduction apparatus 6, 5 of this invention can provide

a wide audio reproduction area.

3. Regardless of how many auxiliary audio amplifiers 62, 52 are used in the audio reproduction apparatus 6, 5 of this invention, impedance matching problem between the output side 610, 510 of the primary audio amplifier 61, 51 and the input side 625, 520 of each of the auxiliary audio amplifiers 62, 52 is eliminated such that replacement of the primary audio amplifier 61, 51 is not required when the number of auxiliary audio amplifiers 62, 52 that are in use is increased, thereby resulting in lower costs.

4. Due to the presence of the control signal generating unit 610 of the primary audio amplifier 61 and the switch unit 620 of each auxiliary audio amplifier 62, the audio reproduction apparatus 6 of this invention can flexibly control reproduction of the audio signals by the desired auxiliary audio amplifiers 62.

5. Due to the presence of the auxiliary signal loop 55 and the normally-open test switches (S1, S2), any defective one of the auxiliary audio amplifiers 52 can be detected by operating the test switches (S1, S2), and regardless of the defective auxiliary audio amplifier 52, the audio reproduction apparatus 5 of this invention can still ensure a stable signal transmission.

For the purpose of this specification, it will be clearly understood that the word "comprising" means "including but not limited to," and that the word

"comprises" has a corresponding meaning.

It is to be understood that, if any prior art publication is referred to herein, such reference does not constitute an admission that the publication forms a part of the common general knowledge in the art, in Australia or any other country.

The claims defining the invention are as follows:

1. An audio reproduction apparatus comprising:

a primary audio amplifier having an output side for outputting audio signals; and

a plurality of auxiliary audio amplifiers coupled electrically in series to said primary audio amplifier, each of said auxiliary audio amplifiers having an input side for receiving the audio signals from said primary audio amplifier, a signal current generating device coupled electrically across said input side such that the audio signals pass through said signal current generating device, a current inducing device disposed adjacent to said signal current generating device for generating induced audio signals when the audio signals pass through said signal current generating device, an auxiliary amplifier coupled electrically to said current inducing device for amplifying and outputting the induced audio signals generated thereby, and a loudspeaker coupled electrically to said auxiliary amplifier for reproducing the induced audio signals amplified by said auxiliary amplifier;

wherein said primary audio amplifier further has a control signal generating unit operable so as to generate a series of control signals corresponding to said auxiliary audio amplifiers, outputted at said output side, and received by said auxiliary audio amplifiers at said input sides thereof such that said current

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inducing device of each of said auxiliary audio amplifiers further generates induced control signals when the control signals pass through said signal current generating device; and

wherein each of said auxiliary audio amplifiers further has a switch unit coupled electrically between said current inducing device and said auxiliary amplifier and operating, in response to a corresponding one of the induced control signals, at a desired one of an ON-state, where said switch unit makes connection between said current inducing device and said auxiliary amplifier, and an OFF-state, where said switch unit interrupts connection between said current inducing device and said auxiliary amplifier such that the induced audio signals are not amplified and outputted by said auxiliary amplifier.

2. The audio reproduction apparatus of Claim 1, wherein each of said auxiliary audio amplifiers further has a housing for receiving said signal current generating device, said current inducing device, said switch unit, said auxiliary amplifier and said loudspeaker therein.

3. The audio reproduction apparatus of Claim 1, wherein said current inducing device includes a coiled core.

4. The audio reproduction apparatus of Claim 3, wherein said coiled core is annular and defines a plane with a center, said signal current generating device extending through the center and being perpendicular

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to the plane.

5. The audio reproduction apparatus substantially as hereinbefore described with reference to and as illustrated in Figures 2 and 3 of the accompanying drawings.

6. An audio reproduction apparatus comprising:

a primary audio amplifier having an output side for outputting audio signals;

a plurality of auxiliary audio amplifiers coupled electrically in series to said primary audio amplifier, each of said auxiliary audio amplifiers having an input side for receiving the audio signals from said primary audio amplifier, a signal current generating device coupled electrically across said input side such that the audio signals pass through said signal current generating device, a current inducing device disposed adjacent to said signal current generating device for generating induced audio signals when the audio signals pass through said signal current generating device, an auxiliary amplifier coupled electrically to said current inducing device for amplifying and outputting the induced audio signals generated thereby, and a loudspeaker coupled electrically to said auxiliary amplifier for reproducing the induced audio signals amplified by said auxiliary amplifier;

an auxiliary signal loop coupled electrically across said output side of said primary audio amplifier,

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permitting the audio signals from said primary audio amplifier to pass therethrough, and having a plurality of test nodes; and

a plurality of normally-open test switches, each of which is connected electrically between a respective one of said test nodes and a junction of a corresponding adjacent pair of said auxiliary audio amplifiers, and is operable so as to switch from an OFF-state to an ON-state, where the respective one of said test nodes is connected electrically to said junction of the corresponding adjacent pair of said auxiliary audio amplifiers therethrough, thereby permitting transmission of the audio signals from said primary audio amplifier to bypass a defective one of said auxiliary audio amplifiers via said auxiliary signal loop.

7. The audio reproduction apparatus of Claim 6, wherein said current inducing device includes a coiled core.

8. The audio reproduction apparatus of Claim 7, wherein said coiled core is elongated and is disposed parallel to said signal current generating device.

9. The audio reproduction apparatus substantially as hereinbefore described with reference to and as illustrated in Figure 4 of the accompanying drawings.

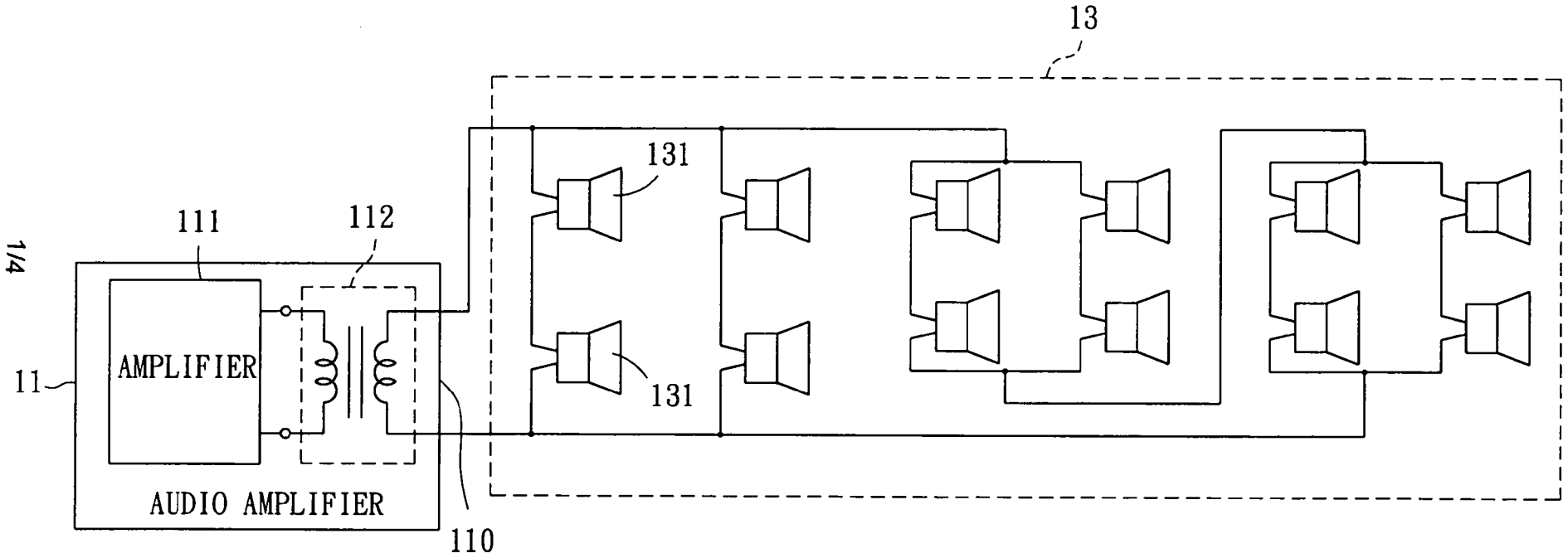

FIG. 1
PRIOR ART

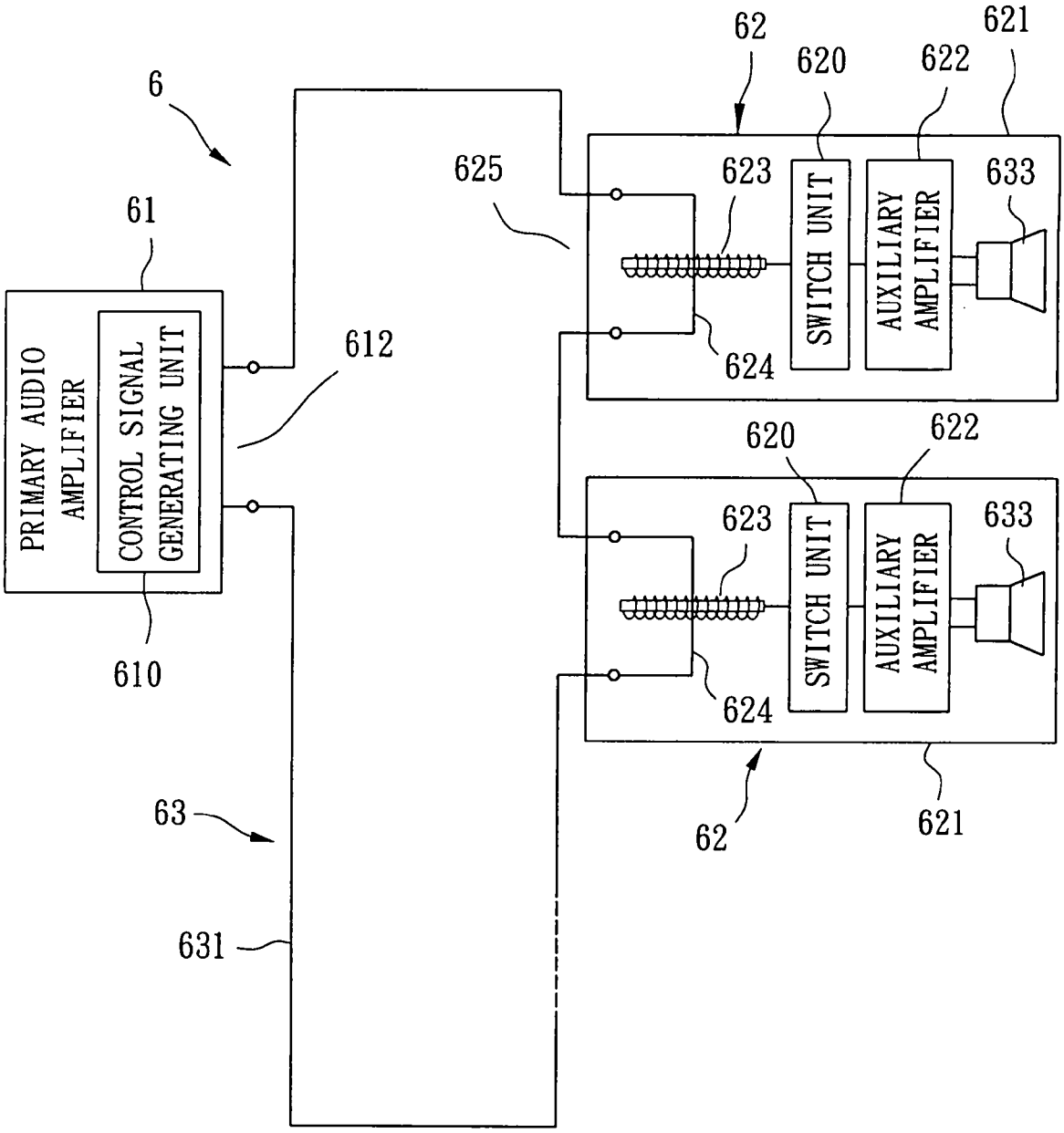
6
61
PRIMARY AUDIO AMPLIFIER
CONTROL SIGNAL GENERATING UNIT
610
612
63
631
62
620
622
621
625
623
SWITCH UNIT
AUXILIARY AMPLIFIER
633
624
62
620
622
623
633
624
621

FIG. 2

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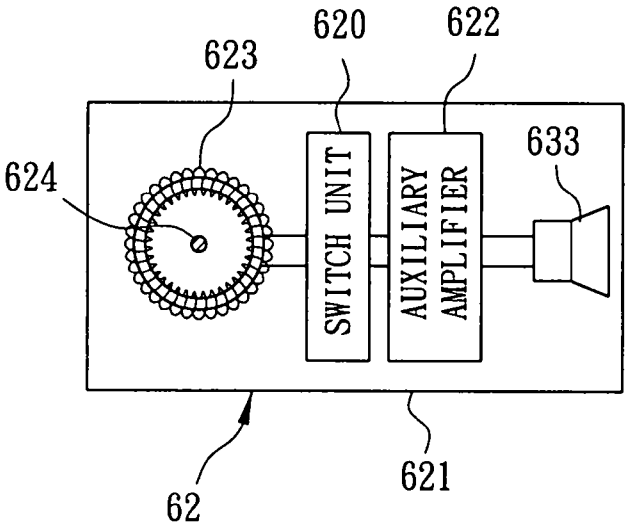

FIG. 3

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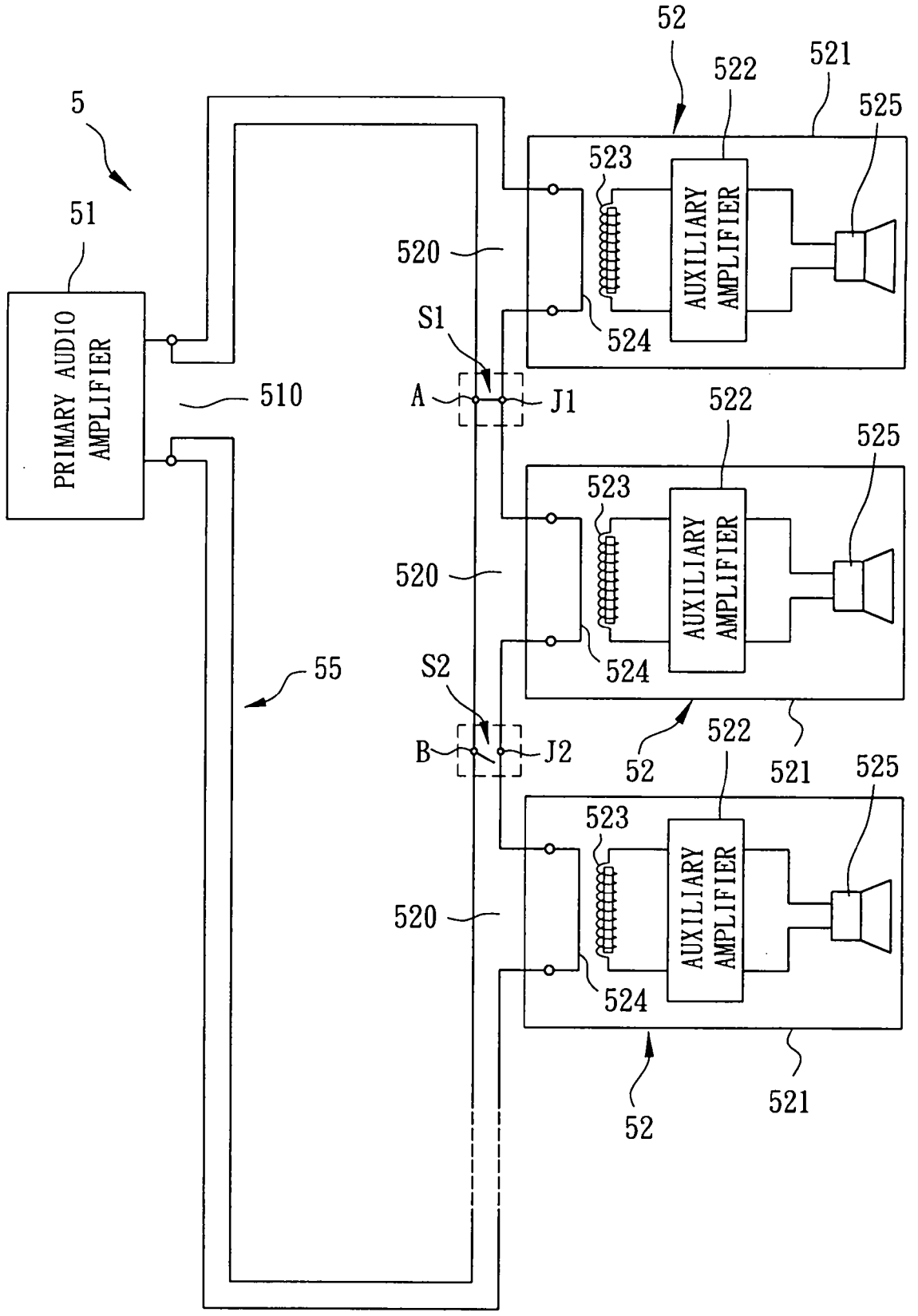

FIG. 4