

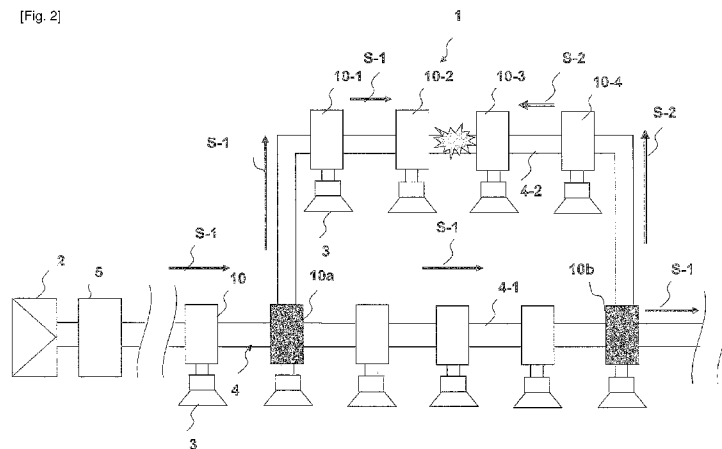


- (51) International Patent Classification:
H04R 29/00 (2006.01) G08B 29/06 (2006.01)
H04R 27/00 (2006.01)
- (21) International Application Number: PCT/JP2012/004639
- (22) International Filing Date: 20 July 2012 (20.07.2012)
- (25) Filing Language: English
- (26) Publication Language: English
- (71) Applicant (for all designated States except US): TOA CORPORATION [JP/JP]; 2-1, Minatojima-Nakamachi 7-chome, Chuo-ku, Kobe-shi, Hyogo, 6500046 (JP).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): JONAN, Tomohiro [JP/JP]; c/o TOA Corporation, 2-1, Minatojima-Nakamachi 7-chome, Chuo-ku, Kobe-shi, Hyogo, 6500046 (JP).
- (74) Agent: SHINJYU GLOBAL IP; South Forest Bldg., 1-4-19, Minamimori-machi, Kita-ku, Osaka-shi, Osaka, 5300054 (JP).

- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— with international search report (Art. 21(3))

(54) Title: PUBLIC ADDRESS SYSTEM AND MONITORING DEVICE FOR A PUBLIC ADDRESS SYSTEM



(57) Abstract: The public address system 1 comprises a transmission medium (4) including a main transmission path (4-1) and at least one branch transmission path (4-2) branching from the main transmission path (4-1), a plurality of loudspeakers (3) connected to the transmission medium (4), a first branch monitoring device (10a), and a second branch monitoring device (10b). The second branch monitoring device (10b) only transmits a transmission signal (S-2) from the main transmission path (4-1) into the branch transmission path (4-2) when the second branch monitoring device (10b) has detected that there is no transmission of the transmission signal (S-1) from the branch transmission path (4-2) to the second branch monitoring device (10b).

WO 2014/013530 A1

Description

Title of Invention: PUBLIC ADDRESS SYSTEM AND MONITORING DEVICE FOR A PUBLIC ADDRESS SYSTEM

Technical Field

[0001] The invention relates to a public address system having a number of loudspeakers. More specifically, the invention relates to a public address system including a branched transmission medium and a monitoring device for the public address system.

Background Art

[0002] Public address systems are known as sound broadcasting systems for informing and entertaining the public in buildings or facilities. A typical public address system includes a plurality of loudspeakers connected to an amplifier via a speaker line and respective controllers for monitoring connection in the speaker line, as disclosed in Patent Literature 1 (US2003/0063755A). In the event of an emergency, a public address system warns the public in buildings or facilities.

[0003] Public address systems used in Europe must meet EN (European Norm) 60849 which requires monitoring the connection and accuracy of a speaker line extending from an amplifier to an end point of the speaker line. EN 60849 specifies performance requirements for sound reinforcement systems that are used indoors or outdoors to broadcast information to protect those within specified areas in the event of an emergency. The EN 60849 standard requires a redundant system that assures operability of its alarm function even when a disconnection in the line is present.

Summary of Invention

Technical Problem

[0004] The public address system may include one or more branches of a speaker line so that signals are transmitted in a divergent manner. Previously there was no solution to redundantly secure a public address system with branched speaker line.

[0005] One object of the invention as disclosed herein is to achieve improved reliability for broadcasting from a public address system that utilizes a branched signal transmission path.

Solution to Problem

[0006] An embodiment of the invention includes a public address system comprising: a transmission medium including a main transmission path and at least one branch transmission path branching from the main transmission path, the transmission medium being configured to carry a transmission signal; a plurality of loudspeakers connected to the transmission medium; a first branch monitoring device connected to the transmission medium at a first branch point where the branch transmission path

begins; and a second branch monitoring device connected to the transmission medium at a second branch point where the branch transmission path ends. The first branch monitoring device is configured to transmit the transmission signal from the main transmission path into the branch transmission path while transmitting the transmission signal through the main transmission path. The second branch monitoring device is configured to transmit the transmission signal from the main transmission path into the branch transmission path while transmitting the transmission signal through the main transmission path.

[0007] Another embodiment of the invention provides for a monitoring device connectable to a public address system including a transmission medium configured to carry a transmission signal and a plurality of loudspeakers connected to the transmission medium, the transmission medium including a main transmission path and at least one branch transmission path branching from the main transmission path. The monitoring device comprises a branch monitoring unit and a switch. The branch monitoring unit is configured to monitor a transmission of the transmission signal from the branch transmission path to the monitoring device, when the monitoring device is arranged at a branch point where the branch transmission path ends. The switch is configured to allow passage of the transmission signal from the main transmission path into the branch transmission path when it is in a first position and to block passage of the transmission signal from the main transmission path into the branch transmission path when it is in a second position. The switch unit is switched from the second position to the first position when the branch monitoring unit detects that there is no transmission of the transmission signal.

[0008] According to still another embodiment of the invention, there is provided a monitoring device connectable to a public address system including a transmission medium configured to carry a transmission signal and a plurality of loudspeakers connected to the transmission medium, the transmission medium including a main transmission path and at least one branch transmission path branching from the main transmission path, the transmission signal including a communication signal and an audio signal. The monitoring device comprises a filter and a switch. The filter is connectable to the branch transmission path and configured to filter the transmission signal by attenuating the communication signal. The switch is configured to control the branch transmission path such that the transmission signal is filtered by the filter when the switch is in a first position, and the transmission signal is not filtered by the filter when the switch is in a second position.

Advantageous Effects of Invention

[0009] According to the above embodiments of the invention, it is possible to achieve

improved reliability for broadcasting from a public address system that utilizes a branched signal transmission path.

Brief Description of Drawings

- [0010] [fig.1]FIG. 1 is a schematic diagram of a public address system according to one embodiment;
- [fig.2]FIG. 2 is a schematic diagram of the public address system in a state that disconnection has occurred in a branched speaker line;
- [fig.3]FIG. 3 is a schematic diagram of a control device for the public address system shown in FIG. 1;
- [fig.4]FIG. 4 is a schematic diagram of a monitoring device for the public address system shown in FIG. 1;
- [fig.5]FIG. 5 is a schematic diagram of an isolating unit of the monitoring device shown in FIG. 4;
- [fig.6]FIG. 6 is a flow chart of an operation performed by the monitoring device shown in FIG. 4;
- [fig.7]FIG. 7 is a schematic diagram of a public address system according to Embodiment 2;
- [fig.8]FIG. 8 is a schematic diagram of a monitoring device according to Embodiment 2.

Description of Embodiments

- [0011] Selected embodiments of the present invention will now be explained with reference to the drawings. It will be apparent to those skilled in the art from this disclosure that the following descriptions of the embodiments of the present invention are provided for illustration only and not for the purpose of limiting the invention as defined by the appended claims and their equivalents.

<Embodiment 1>

<Public Address system 1>

- [0012] FIG. 1 schematically shows a public address system 1 (an example of a public address system) according to one embodiment of the invention. The public address system 1 is configured to be used in a large-scale facility or building. In this embodiment, the left side of the public address system 1 as shown in FIG. 1 is referred to as an "upstream side", which is nearer to the amplifier 2 along the speaker line 4. The right side of the public address system 1 as shown in FIG. 1 is referred to as a "downstream side".
- [0013] The public address system 1 includes an amplifier 2, a number of loudspeakers 3, a speaker line 4 (an example of a transmission medium), a control device 5, and a number of monitoring devices 10 each associated with a different loudspeaker 3.

[0014] The amplifier 2 is connected to the speaker line 4. Though not shown, the amplifier 2 is connected to the speaker line 4 via a transformer.

The monitoring devices 10 are connected to the speaker line 4 in series. The loudspeakers 3 are connected in parallel to the speaker line 4. The control device 5 is also connected to the speaker line 4.

[0015] The speaker line 4 may be a wire or a cable in a 2-wire form as shown in FIG. 1. The speaker line 4 includes a main transmission path 4-1 (an example of a main transmission path) and a branch transmission path 4-2 (an example of a branch transmission path) that is branched from the main transmission path 4-1. The branch transmission path 4-2 is connected to a plurality of loudspeakers 3. The branch transmission path 4-2 joins the main transmission path 4-1 on a downstream side of the speaker line 4 (which is the right side shown in FIG. 1). The main transmission path 4-1 of the speaker line 4 may be arranged in a loop.

[0016] The speaker line 4 may be a power line for the loudspeakers 3. The power supply in this embodiment is a DC (Direct Current) power supply.

In the public address system 1, the amplifier 2 outputs an audio signal to broadcast in the public address system 1. The audio signal may have a frequency lower than or equal to 20 kHz. The audio signal is superimposed on DC power supplied from a power source (not shown) and transmitted through the speaker line 4. The control device 5 produces and outputs a communication signal. The communication signal may have a frequency greater than or equal to 60 kHz. The communication signal is then superimposed on the audio signal and DC power transmitted through the speaker line 4. The superimposed signal (an example of a transmission signal) including an audio signal and a communication signal is sent through the speaker line 4.

[0017] The monitoring devices 10 are polled by the control device 5 intermittently or continuously. The polling signal, which is an example of a communication signal, is produced by and sent from the control device 5 to a designated monitoring device 10. The designated monitoring device 10 that receives the polling signal produces and sends a reply signal to the control device 5 through the speaker line 4. If a reply signal is not received within a predetermined time, it is assumed that the designated monitoring device 10 is not responding, and it may be concluded that there is a fault or disconnection in the public address system 1 due to short-circuiting and/or open-circuiting of speaker line 4.

<<Normal State>>

[0018] In a normal state, in which no fault or disconnection has been detected in the public address system 1 as shown in FIG. 1, the superimposed signal S-1 from the amplifier 2 is transmitted downstream through the speaker line 4. The superimposed signal S-1 is then carried by both the main transmission path 4-1 and the branch transmission path

4-2. The superimposed signal S-1 passes through the branch transmission path 4-2 until it reaches the monitoring device 10b. A monitoring device 10a is arranged at a branch point (an example of a first branch point) where the branch transmission path 4-2 begins as shown in FIG. 1 and FIG. 2. It transmits the superimposed signal S-1, received from the main transmission path 4-1, into the branch transmission path 4-2 while simultaneously letting the superimposed signal S-1 go through the main transmission path 4-1.

[0019] Another monitoring device 10b is arranged at another branch (an example of a second branch point) where the branch transmission path 4-2 ends, as shown in FIG. 1 and FIG. 2. The monitoring device 10b serves to receive the superimposed signal S-1 from the branch transmission path 4-2 while letting the superimposed signal S-1 go through the main transmission path 4-1. The monitoring device 10b monitors the superimposed signal S-1 received from the branch transmission path 4-2.

<<Disconnected State>>

[0020] When any fault or disconnection has occurred in the branch transmission path 4-2, as shown in FIG.2, the superimposed signal S-1 is not received by the monitoring device 10b from the branch transmission path 4-2. The monitoring device 10b detects whether the superimposed signal S-1 is received from the branch transmission path 4-2. When the monitoring device 10b detects that there was no transmission of the superimposed signal S-1 from the branch transmission path 4-2, the monitoring device 10b determines that there is some fault or disconnection in the branch transmission path 4-2, and then starts transmitting the superimposed signal S-2, from the main transmission path 4-1 into the branch transmission path 4-2. At the same time, the monitoring device 10b allows the superimposed signal S-1 received through the main transmission path 4-1 to be transmitted to its downstream side.

[0021] Accordingly, even if a disconnection or fault occurs in the branch transmission path 4-2 that disables the superimposed signal S-1 from passing through the branch transmission path 4-2, which is received from the monitoring device 10a located at a branch point where the branch transmission path 4-2 begins, the transmission of the superimposed signal through the branch transmission path 4-2 can be recovered by another monitoring device 10b located at another branch point where the branch transmission path 4-2 ends. As a result, the branch transmission path 4-2 can be kept more secure due to redundancy in the public address system 1.

A detailed description of each device connected to the speaker line 4 in the public address system 1 will now be made.

< Control Device 5 >

[0022] FIG. 3 schematically shows a structure of the control device 5. The control device 5 controls communication via the speaker line 4 according to a predetermined commu-

nication protocol. The control device 5 polls all monitoring devices 10 to check if a fault or disconnection has occurred in the public address system 1. The polling is an automatic, sequential testing that checks the operational statuses of the monitoring devices 10, the loudspeakers 3, and the speaker line 4. In the drawing, the speaker line 4 is shown as a single line for simplicity.

[0023] The control device 5 includes a filter unit 51, a receiver 53, a transmitter 54, an A/D converter 55, a D/A converter 56, and a CPU 57 (an example of a processor).

The filter unit 51 is connected to the speaker line 4. The filter unit 51 includes a band-pass filter that is designed to allow passage of a communication signal, including a reply signal, and attenuate any other signal.

[0024] The receiver 53 and the transmitter 54 are switched to one another to receive and send signals from and to the speaker line 4 by a switch (not shown) according to a command from the CPU 57. The receiver 53 receives a communication signal, for example a reply signal, from the respective monitoring devices 10 connected to the speaker line 4 via the filter unit 51. The receiver 53 then sends the communication signal to the CPU 57 via the A/D converter 55. The transmitter 54 sends a communication signal received from the CPU 57 to the monitoring devices 10 on the speaker line 4 via the D/A converter 56. The communication signal received from the CPU 57 is, for example, a polling signal.

[0025] The A/D converter 55 converts an analog communication signal into a digital communication signal to be processed by the CPU 57. The D/A converter 56 converts a digital communication signal that has been processed by the CPU 57 into an analog communication signal.

[0026] The CPU 57 controls the reception and transmission of a communication signal. The CPU 57 produces a polling signal and sends the polling signal to a designated monitoring device 10 connected to the speaker line 4. The polling signal includes address data of the designated monitoring device 10. The CPU 57 also receives a reply signal from the designated monitoring device 10.

[0027] The CPU 57 may sequentially send a polling signal to each monitoring device 10 and determines whether a corresponding reply signal from each of the designated monitoring device 10 has been received; thereby detecting the status of the public address system 1. The CPU 57 then outputs status information of the public address system 1. For example, the CPU 57 outputs fault data or information about the public address system 1 to an external management system which monitors and controls operation of the public address system 1 via a network. The CPU 57 may perform the above operations of the public address system 1 according to a program read from a memory (not shown).

<Monitoring Device 10>

[0028] FIG. 4 schematically shows a structure of the monitoring device 10. In this embodiment, the left side of the monitoring device 10 as shown in FIG. 4 is an upstream side, and the right side of the monitoring device 10 as shown in FIG. 4 is a downstream side. The monitoring device 10 may serve as a monitoring device 10a or a monitoring device 10b at a branch point, which is operated differently from monitoring devices not at branch points. The monitoring device 10a (hereinafter called a first branch monitoring device 10a) is provided at a beginning branch point from which the superimposed signal S-1 is transmitted into the branch transmission path 4-2, as shown in FIG. 1 and FIG. 2. The monitoring device 10b (hereinafter referenced as a second branch monitoring device 10b) is provided at an end branch point where the superimposed signal S-1 is received from both the main transmission path 4-1 and the branch transmission path 4-2.

[0029] The monitoring device 10 has its own unique address (for example, an IP address) or identification information for identifying the monitoring device 10. The monitoring device 10 includes an isolating unit 11 connected to the speaker line 4, a filter unit 12 (an example of a filter unit), a receiver 13, a transmitter 14, an A/D converter 15, a D/A converter 16, a CPU (Central Processor Unit) 17 (an example of a control unit), a main monitoring unit 18a, a branch monitoring unit 18b, and a DC power supply 19. The monitoring device 10 further includes a switch 20 (an example of a switch) to be connected to the branch transmission path 4-2 that is branched from the main speaker line 4-1 at a branch point 40. The monitoring device 10 also includes an input 60. The input 60 is operated by a user, and it produces and outputs a selection signal to the branch monitoring unit 18b. The branch monitoring unit 18b switches the switch 20 according to the selection signal from the input 60, as will be described later.

[0030] The isolating unit 11 is provided on the speaker line 4. As shown in FIG. 5, the isolating unit 11 includes a switch 111, a comparator 112, and a relay control 113. The speaker line 4 continuously carries direct current when in a normal state. The comparator 112 compares the voltages at both ends of the switch 111 and outputs a result of the comparison to the relay control 113. When any fault or disconnection has occurred between the monitoring devices 10 on the speaker line 4, the current flow is prevented so that the voltages at both ends of the switch 111 become different. The relay control 113 monitors and detects the change in voltage to determine whether a fault or disconnection in the speaker line 4 has occurred. When the relay control 113 determines that a fault or disconnection in the speaker line 4 has occurred, the relay control 113 controls the switch 111 to open, so that the monitoring device 10 is isolated from the speaker line 4. Accordingly, the isolated monitoring device 10 is no longer able to send a communication signal, and the control device 5 can determine that a fault or disconnection occurred near the monitoring device 10 when no reply

signal is received.

- [0031] The filter unit 12 shown in FIG. 4 is connected to the speaker line 4. The filter unit 12 includes a band-pass filter that is designed to allow a communication signal to pass, and attenuate other signals.
- [0032] The receiver 13 and the transmitter 14 are switched to one another to receive signals from and send signals to the speaker line 4 by a switch (not shown) according to a command from the CPU 17. The receiver 13 receives a communication signal; for example, a polling signal from the control device 5. The receiver 13 then sends the communication signal to the CPU 17 via the A/D converter 15. The transmitter 14 sends a communication signal received from the CPU 17 via the D/A converter 16, a reply signal for example, to the control device 5.
- [0033] The A/D converter 15 converts an analog communication signal into a digital communication signal to be processed by the CPU 17. The D/A converter 16 converts a digital communication signal that has been processed by the CPU 17 into an analog communication signal. The A/D converter 15 and the D/A converter 16 are switched according to a command from the CPU 17.
- [0034] The CPU 17 is connected to the receiver 13 and the transmitter 14 via the A/D and D/A converters 15, 16. The CPU 17 determines whether the received communication signal is directed to the monitoring device 10 itself by determining whether the address data of the monitoring device 10 matches the data included in the received communication signal. If the address data matches its own address, the CPU 17 produces a reply signal and sends it to the control device 5. The CPU 17 also controls its associated loudspeaker 3. The CPU 17 may perform these operations according to a program read from a memory (not shown).
- [0035] The main monitoring unit 18a is connected to the main transmission path 4-1 of the speaker line 4. The main monitoring unit 18a monitors the transmission of the superimposed signal S-1 through the main transmission path 4-1.
- [0036] The branch monitoring unit 18b is connected to the branch transmission path 4-2 of the speaker line 4 at a branch point 40 where the branch transmission path 4-2 is branched from the main transmission path 4-1. The branch monitoring unit 18b is operated only when the monitoring device 10 is set up as a second branch monitoring device 10b. The branch monitoring unit 18b monitors the transmission of the superimposed signal S-1 from the branch transmission path 4-2 to the switch 20. The transmission of the superimposed signal S-1 may be detected by monitoring, for example, voltage shift. When the branch monitoring unit 18b detects that there is no transmission of the superimposed signal S-1 from the branch transmission path 4-2, the branch monitoring unit 18b produces a signal to switch the switch 20 to the ON position.

[0037] The DC power supply 19 receives a DC signal, which is received from the speaker line 4. The DC signal is rectified to power the monitoring device 10.

The switch 20 allows passage of the superimposed signal S-1 from the main transmission path 4-1 into the branch transmission path 4-2 when it is in the ON position (an example of a first position). When the switch 20 is in the OFF position (an example of a second position), the passage of the superimposed signal S-1 from the main transmission path 4-1 into the branch transmission path 4-2 is blocked. The ON and OFF positions may be applied vice versa. When the monitoring device 10 is a first branch monitoring device 10a, the switch 20 is in the ON position to allow the superimposed signal S-1 from the main transmission path 4-1 into the branch transmission path 4-2. When the monitoring device 10 is a second branch monitoring device 10b, the switch 20 is initially in the OFF position to prevent the superimposed signal S-1 from the main transmission path 4-1 into the branch transmission path 4-2.

[0038] At the second branch monitoring device 10b, the branch monitoring unit 18b is operated to monitor the transmission of the superimposed signal S-1 from the branch transmission path 4-2 to the switch 20. When the branch monitoring unit 18b detects that there is no transmission of the superimposed signal S-1 from the branch transmission path 4-2, it is assumed to indicate a disconnection or fault has occurred in the branch transmission path 4-2. The branch monitoring unit 18b then sends a signal to the switch 20 to switch to the ON position, which allows passage of the superimposed signal S-1 from the main transmission path 4-1 into the branch transmission path 4-2. When the monitoring device 10 is neither a first branch monitoring device 10a nor a second branch monitoring device 10b (hereinafter referenced as a non-branch monitoring device 10), the switch 20 is switched to the OFF position.

[0039] The second branch monitoring device 10b produces and sends a detection signal to the control device 5 via the main transmission path 4-1 when it has detected that there is no transmission of the superimposed signal S-1 from the branch transmission path 4-2. Upon receiving the detection signal from the second branch monitoring device 10b, the control device 5 determines that a disconnection or fault has occurred in the branch transmission path 4-2 connected to the branch monitoring device 10b. Therefore, the control device 5 is able to identify which branch path has a disconnection or fault based on the address data included in the detection signal sent from the second branch monitoring device 10b.

[0040] The input 60 is operated manually or by any other means. The input 60 is operated by a user, and it produces and outputs a selection signal to the branch monitoring unit 18b. According to the selection signal from the branch monitoring unit 18b, the switch 20 is switched to the ON or OFF position so that the monitoring device 10 can be set

up as a first branch monitoring device 10a, a second branch monitoring device 10b, or a non-branch monitoring device 10.

[0041] The selection signal may be:

(i) a signal that activates the branch monitoring unit 18b to hold the switch 20 in the ON position when the monitoring device 10 is set up as a first branch monitoring device 10a that is located at a branch point where the branch transmission path 4-2 begins;

[0042] (ii) a signal that activates the branch monitoring unit 18b to hold the switch 20 in the OFF position and monitor the branch transmission path 4-2 when the monitoring device 10 is set up as a second branch monitoring device 10b that is located at a branch point where the branch transmission path 4-2 ends; or

[0043] (iii) a signal that activates the branch monitoring unit 18b to keep the switch 20 in the OFF position when the monitoring device 10 is set up as a non-branch monitoring device 10 that is not located at a branch point.

The monitoring device 10 is operated in accordance with the setting of input 60.

<Operation of Public Address System 1>

[0044] During operation of the public address system 1, a superimposed signal S-1 including an audio signal and a communication signal is sent from the amplifier 2 and the control device 5. The superimposed signal S-1 is transmitted through the main transmission path 4-1. At a first branch monitoring device 10a, the superimposed signal S-1 is transmitted into the branch transmission path 4-2 and simultaneously transmitted through the main transmission path 4-1. The superimposed signal S-1 is then transmitted through the branch transmission path 4-2 to a second branch monitoring device 10b. .

[0045] When the branch monitoring unit 18b of the branch monitoring device 10b detects that there is no transmission of the superimposed signal S-1 due to a disconnection or fault having occurred in the branch transmission path 4-2, the switch 20 is switched to the ON position by the branch monitoring unit 18b of the branch monitoring device 10b. Then, the superimposed signal S-2, which is branched from the superimposed signal S-1 transmitted through the main transmission path 4-1, is transmitted to the branch transmission path 4-2 by the second branch monitoring device 10b. The superimposed signal S-2 is then transmitted through the branch transmission path 4-2 to the first branch monitoring device 10a and then to the main transmission path 4-1.

<Operation of Monitoring Device 10>

[0046] FIG. 6 shows a flow chart of processes performed by a branch monitoring device 10b according to Embodiment 1 as shown in FIG. 4.

When the monitoring device 10 is set up as a second branch monitoring device 10b, the processes steps S101 to S105 are performed. Although not described below, the

main monitoring unit 18a of each monitoring device 10 always monitors the transmission path whether or not the monitoring device 10 is a branch monitoring device.

[0047] Step S101: When the monitoring device 10 is a second branch monitoring device 10b, the process goes to step S102.

Step S102: A superimposed signal S-1 including an audio signal and a communication signal is received by the branch monitoring device 10b from the branch transmission path 4-2. At this step, the switch 20 is held in the OFF position so that the superimposed signal S-1 is blocked from passing through the switch 20. Also at this step, the branch monitoring unit 18b is monitoring the branch transmission path 4-2.

[0048] Step S103: The branch monitoring unit 18b determines whether it has detected a transmission of the superimposed signal S-1 through the branch transmission path 4-2. If no transmission of the superimposed signal S-1 is detected, the process goes to step S104.

[0049] Step S104: The branch monitoring unit 18b switches the switch 20 to the ON position, so that the superimposed signal S-2 is allowed to pass through the switch 20 from the main transmission path 4-1 into the branch transmission path 4-2.

[0050] Step S105: A detection signal is then produced and sent to the control device 5 via the main transmission path 4-1.

In addition, when a first branch monitoring device 10a receives the polling signal as a communication signal included in the superimposed signal S-1, and the polling signal is determined to be designated to the first branch monitoring device 10a based on the address data, the polling signal is transmitted to neither the main transmission path 4-1 on its downstream side nor the branch transmission path 4-2. If the polling signal is determined to be designated to a monitoring device other than the first branch monitoring device 10a, the polling signal is transmitted to both the main transmission path 4-1 on its downstream side and the branch transmission path 4-2.

[0051] Similarly, when a second branch monitoring device 10b receives the polling signal and the polling signal is determined to be designated to the second branch monitoring device 10b, the polling signal is not transmitted to the main transmission path 4-1 on the downstream side of the second branch monitoring device 10b. If the polling signal is determined to be designated to a monitoring device other than the second branch monitoring device 10b, the polling signal is transmitted to the main transmission path 4-1 on its downstream side.

<Advantageous Effects of Embodiment 1>

[0052] According to the public address system 1 of the above-described embodiment, the second branch monitoring device 10b allows an superimposed signal S-2 to be transmitted into the branch transmission path 4-2 only when the second branch

monitoring device 10b has detected that there is no transmission of the superimposed signal S-1 from the branch transmission path 4-2. Accordingly, even if a disconnection or fault occurs in the branch transmission path 4-2 that disables the superimposed signal S-1 to pass through the branch transmission path 4-2, the transmission of the superimposed signal S-1 through the branch transmission path 4-2 can be recovered by another branch monitoring device 10b. As a result, the branch transmission path 4-2 of the public address system 1 can be kept more secure using redundancy.

[0053] Furthermore, since the branch monitoring device 10b is provided with a switch 20 that is held in the OFF position to block the superimposed signal S-1 from passing from the branch transmission path 4-2 to the main transmission path 4-1 when in a normal state, it is possible to prevent a communication signal from being sent to monitoring devices 10 on the downstream side through both the main transmission path 4-1 and the branch transmission path 4-2.

[0054] In operation, the public address system 1 according to Embodiment 1 acts as follows. In a normal state, no fault or disconnection is being detected in the public address system 1 as shown in FIG. 1. In this normal state, the first branch monitoring device 10a, in which the switch 20 is held in the ON position, allows passage of the superimposed signal S-1 to both the main transmission path 4-1 and the branch transmission path 4-2. The branch monitoring device 10b, in which the switch 20 is held in the OFF position, monitors a transmission of the superimposed signal S-1 from the branch transmission path 4-2 to the branch monitoring device 10b while keeping allowing passage of the superimposed signal S-1 through the main transmission path 4-1. The non-branch monitoring device 10, in which the switch 20 is held in the OFF position, allows passage of the superimposed signal S-1 through the main transmission path 4-1. In this normal state, the superimposed signal S-1 is able to reach each monitoring device 10 and its corresponding loudspeaker 3. Therefore, all the loudspeakers 3 connected to the main transmission path 4-1 and the branch transmission path 4-2 are able to output sounds based on the audio signal included in the superimposed signal S-1.

[0055] In a disconnected state in which a fault or disconnection has occurred, for example, at a point between the monitoring device 10-2 and the monitoring device 10-3 on the branch transmission path 4-2, as shown in FIG.2, the superimposed signal S-1 does not reach the branch monitoring device 10b via the branch transmission path 4-2. When the branch monitoring unit 18b of the branch monitoring device 10b detects there is no transmission of the superimposed signal S-1 from the branch transmission path 4-2, the branch monitoring unit 18b then switches the switch 20 from the OFF position to the ON position, which enables the superimposed signal S-2 to pass from the main transmission path 4-1 into the branch transmission path 4-2 through the switch 20. At

this time, as shown in FIG.2, the monitoring devices 10-1 and 10-2 on the branch transmission path 4-2 receive the superimposed signal S-1 from the branch monitoring device 10a, and the monitoring devices 10-3 and 10-4 on the branch transmission path 4-2 receive the superimposed signal S-2 from the branch monitoring device 10b. Accordingly, the sound broadcasting through the branch transmission path 4-2 can be maintained even when a disconnection has occurred in the branch transmission path 4-2.

[0056] With the public address system 1, therefore, it is possible to achieve improved reliability for broadcasting from the public address system 1 that utilizes a branched signal transmission path.

<Modified Example of Embodiment 1>

[0057] The monitoring device 10 may not include a branch monitoring unit 18b. Alternatively, the CPU 17 may be connected to the switch 20 and send an activation signal to the switch 20. The CPU 17 switches the switch 20 to the ON position by the activation signal when the CPU 17 has received a command signal (an example of a communication signal) from the control device 5. In this example, the input 60, which is operated by a user, is connected to the switch 20. The input 60 produces and outputs a selection signal to the switch 20, so that the monitoring device 10 can be set up as a first branch monitoring device 10a, a second branch monitoring device 10b, or a non-branch monitoring device 10, in the same way as the above description in Embodiment 1.

[0058] In this example, the control device 5 stores identification information for identifying not only a monitoring device 10 itself but also whether or not the monitoring device 10 is on the branch transmission path 4-2.

The control device 5 polls each monitoring device 10 based on the identification information. For example, when a fault or disconnection has occurred at a point between the monitoring device 10-2 and the monitoring device 10-3 on the branch transmission path 4-2, as shown in FIG.2, the control device 5 is able to receive a reply signal from the monitoring device 10-2 but not from the monitoring device 10-3. Upon detection of no reply from the monitoring device 10-3, the control device 5 determines whether the monitoring device 10-3 is on the branch transmission path 4-2 based on the identification information. When the control device 5 could not receive a reply signal from the polled monitoring device 10-3 and has determined that the polled monitoring device 10-3 is on the branch transmission path 4-2, it can then determine that the branch transmission path 4-2 has a fault or disconnection near the monitoring device 10-3.

[0059] The control device 5 then produces and sends a command signal via the main transmission path 4-1 to the branch monitoring device 10b connected at a branch

where the branch transmission path 4-2 ends. Upon receiving the command signal from the control device 5, the CPU 17 of the branch monitoring device 10b sends an activation signal to the switch 20 to switch to the ON position. Accordingly, the switch 20 allows the superimposed signal S-2 to pass through the branch monitoring device 10b from the main transmission path 4-1 into the branch transmission path 4-2.

<Embodiment 2>

< Public Address system 201>

[0060] FIG. 7 schematically shows a public address system 201 according to Embodiment 2. Those members having the same functions as Embodiment 1 will be numbered the same and will not be described in detail.

[0061] In this embodiment, the second branch monitoring device 210b always transmits a superimposed signal from a main transmission path 4-1 into a branch transmission path 4-2, regardless of whether a fault or disconnection in the branch transmission path 4-2 has been detected in the branch transmission path 4-2.

<Monitoring Device 210>

[0062] FIG. 8 schematically shows a monitoring device 210 according to Embodiment 2. The monitoring device 210 is structurally different from the monitoring device 10 of Embodiment 1, and it includes a filter 225 (an example of a filter) and a switch 227 (an example of a switch) connected to the branch transmission path 4-2. The filter 225 is designed to attenuate a communication signal included in the superimposed signal S-1. The switch 227 activates and deactivates the filter 225. When the filter 225 is activated, the superimposed signal S-1 passes through the path 4-2R with the filter 225. When the filter 225 is deactivated, the superimposed signal S-1 passes through the path 4-2F without the filter 25.

[0063] The input 260 is operated by a user, and it produces and outputs a selection signal to the switch 227. According to the selection signal from the input 260, the switch 227 is switched to the ON or OFF position so that the monitoring device 10 can be set up as a first branch monitoring device 210a, a second branch monitoring device 210b, or a non-branch monitoring device 210. The selection signal may be:

[0064] (i) a signal that holds the switch 227 in the ON position (an example of a first position) to activate the filter 225 when the monitoring device 210 is set up as a second branch monitoring device 210b that is located at a branch point where the branch transmission path 4-2 ends;

[0065] (ii) a signal that holds the switch 227 in the OFF position (an example of a second position) to deactivate the filter 225 when the monitoring device 10 is set up as a first branch monitoring device 210a that is located at a branch point where the branch transmission path 4-2 begins; or

[0066] (iii) a signal that keeps the switch 227 in the OFF position when the monitoring

device 10 is set up as a non-branch monitoring device 10 that is not located at a branch point.

[0067] The ON and OFF positions above may be applied vice versa.

In this example, since the superimposed signal is transmitted bi-directionally through the branch transmission path 4-2 at any given time, the monitoring device 210 may not be provided with a branch monitoring unit 18b for monitoring the signal transmission and a switch 20 as Embodiment 1.

<Operation of Public Address system 201>

[0068] During operation of the public address system 201, a superimposed signal S-1 including an audio signal and a communication signal is sent from the amplifier 2 and the control device 5. Like Embodiment 1, the superimposed signal S-1 is transmitted through the main transmission path 4-1. At a first branch monitoring device 210a, the superimposed signal S-1 is transmitted into the branch transmission path 4-2 and simultaneously transmitted through the main transmission path 4-1. When transmitted from the first branch monitoring device 210a, the superimposed signal S-1 passes through a path 4-2F with no filter, which is set up in advance using the switch 227. The superimposed signal S-1 is then carried by the branch transmission path 4-2 to a second branch monitoring device 210b. At the second branch monitoring device 210b, the superimposed signal S-1 passes through a path 4-2R provided with a filter 225, which is set up in advance using the switch 227. At the same time, the second branch monitoring device 210b keeps allowing the superimposed signal S-1 to pass through the main transmission path 4-1.

[0069] A filtered transmission signal S-2 (an example of a transmission signal), which has been filtered from the superimposed signal S-1 by the filter 225, is transmitted into the branch transmission path 4-2 by the second branch monitoring device 210b. At the second branch monitoring device 210b, the superimposed signal S-1 passes through the path 4-2R which includes a filter 225. The filter 225 attenuates the communication signal included in the superimposed signal S-1. The remainder of the signal (i.e. other than the communication signal), which is mainly an audio signal, is transmitted through the second branch monitoring device 210b as the filtered transmission signal S-2. The filtered transmission signal S-2 is then transmitted through the branch transmission path 4-2 to the first branch monitoring device 210a. At the first branch monitoring device 210a, the filtered transmission signal S-2 passes through the path 4-2F with no filter.

[0070] With the public address system 201, each monitoring device 210 connected to the branch transmission path 4-2 (for example, monitoring devices 210-1 to 210-4 as shown in FIG. 7) sends a reply signal to the control device 5 in response to a polling signal included in the superimposed signal S-1. No reply signal is produced in response

to the filtered transmission signal S-2 because the filtered transmission signal S-2 includes no communication signal. In other words, the control device 5 receives reply signals only in response to the superimposed signals S-1. The control device 5 is thus able to properly detect fault or disconnection in the branch transmission path 4-2.

[0071] Assuming that the monitoring device 10b allows the superimposed signal S-2 to pass through the path 4-2F without the filter 225 so that all of the monitoring devices 210-1 to 210-4 on the branch transmission path 4-2 receive the polling signals contained in the superimposed signals S-1 and S-2. The monitoring devices 210-1 to 210-4 would then send a reply signal back to the control device 5 in response to each of the superimposed signals S-1 and S-2. In this case, even when a fault or disconnection has occurred in the branch transmission path 4-2 and the control device 5 could not receive a reply signal in response to the superimposed signal S-1, the control device 5 is still able to receive a reply signal in response to the superimposed signal S-2. Therefore, in this case, the control device 5 would not be able to properly detect the fault or disconnection.

<Advantageous Effects of Embodiment 2>

[0072] According to Embodiment 2, in addition to the effects of Embodiment 1, the second branch monitoring device 210b does not need to monitor or detect the transmission of the superimposed signal S-1 from the branch transmission path 4-2 to the second branch monitoring device 210b. Therefore, it is possible for the public address system 1 to utilize a redundant branched transmission path with simpler operation than Embodiment 1.

[0073] In operation, the public address system 201 according to Embodiment 2 acts as follows.

In a normal state, no fault or disconnection has been detected in the public address system 201 as shown in FIG. 7. In this normal state, the first branch monitoring device 210a, in which the switch 227 is held in the OFF position to deactivate the filter 225, allows passage of the superimposed signal S-1 to both the main transmission path 4-1 and the branch transmission path 4-2. The branch monitoring device 210b, in which the switch 227 is held in the ON position to activate the filter 225, allows passage of the superimposed signal S-1 only through the activated filter 225. At the same time, the second branch monitoring device 210b keeps allowing the superimposed signal S-1 to pass through the main transmission path 4-1. The filter 225 attenuates the communication signal included in the superimposed signal S-1 received from the main transmission path 4-1, and the remainder of the signal, which is mainly an audio signal, is transmitted through the second branch monitoring device 210b as a filtered transmission signal S-2. In this normal state, the superimposed signal S-1 is able to reach each monitoring device 10 and its corresponding loudspeaker 3. Therefore, all

the loudspeakers 3 connected to the main transmission path 4-1 and the branch transmission path 4-2 are able to output sounds based on the audio signal included in the superimposed signal S-1. Furthermore, the polling signal is included only in the superimposed signal S-1. The monitoring devices 210-1, 210-2, 210-3, and 210-4 connected to the branch transmission path 4-2 as shown in FIG. 7 produce and send a reply signal to a communication signal included in the superimposed signal S-1 sent from the first branch monitoring device 210a when the monitoring devices 210-1, 210-2, 210-3, and 210-4 are polled by the communication signal.

[0074] In a disconnected state in which any fault or disconnection has occurred, for example, at a point between the monitoring device 210-2 and the monitoring device 210-3 on the branch transmission path 4-2 shown in FIG.7, the monitoring devices 210-3 and 210-4 are not able to receive the superimposed signal S-1 and therefore, do not produce and send a reply signal. When having received no reply signal from the polled monitoring device 210-3 or 210-4, the control device 5 determines that a fault or disconnection has occurred in the branch transmission path 4-2 on an upstream side of the monitoring device 210-3 or 210-4. Even in this disconnected state, the monitoring devices 210-3 and 210-4 are still able to receive the transmission signal S-2 from the second branch monitoring device 210b. Therefore, the loudspeakers 3 connected to the monitoring devices 210-3 and 210-4 are able to output sounds based on the audio signal carried by the transmission signal S-2. Accordingly, the sound broadcasting through the branch transmission path 4-2 can be maintained even when a fault or disconnection has occurred in the branch transmission path 4-2.

<Other Embodiments>

[0075] The above embodiments can be applied to a public address system with a speaker line having two or more branches. For example, a branch transmission path 4-2 (FIG. 1) may be further branched into one or more branch transmission paths, in which case the branch transmission path 4-2 is a main transmission path with respect to a branch transmission path that branches from the branch transmission path 4-2.

[0076] The main or branch monitoring unit 18a or 18b may not be included in a monitoring device, or may be connected to the speaker line 4 alone or with some other device.

[0077] AC (Alternating Current) may be supplied to the speaker line 4 instead of DC.

Digital audio signals may be applied to the public address system 1. In this case, the audio signals are converted from digital into analog, and are then modulated and superimposed on a DC power on the speaker line 4. The modulated audio signals include address data for one or more monitoring devices 10, and are transmitted to one or more designated monitoring devices 10.

<General Interpretation of Terms>

[0078] In understanding the scope of the present disclosure, the term "comprising" and its

derivatives, as used herein, are intended to be open ended terms that specify the presence of the stated features, elements, components, groups, integers, and/or steps, but do not exclude the presence of other unstated features, elements, components, groups, integers and/or steps. The foregoing also applies to words having similar meanings such as the terms, "including", "having" and their derivatives.

[0079] The term "configured" as used herein to describe a component, section, or part of a device includes hardware and/or software that is constructed and/or programmed to carry out the desired function.

[0080] While only selected embodiments have been chosen to illustrate the present invention, it will be apparent to those skilled in the art from this disclosure that various changes and modifications can be made herein without departing from the scope of the invention as defined in the appended claims. For example, the size, shape, location or orientation of the various components can be changed as needed and/or desired. Components that are shown directly connected or contacting each other can have intermediate structures disposed between them. The functions of one element can be performed by two, and/or vice versa. The structures and functions of one embodiment can be adopted in another embodiment. Some of the steps in flowchart can be performed in a different order. It is not necessary for all advantages to be present in a particular embodiment at the same time. Every feature which is unique from the prior art, alone or in combination with other features, also should be considered a separate description of further inventions by the applicant, including the structural and/or functional concepts embodied by such features. Thus, the foregoing descriptions of the embodiments according to the present invention are provided for illustration only, and not for the purpose of limiting the invention as defined by the appended claims and their equivalents.

Industrial Applicability

[0081] The invention may be utilized as a public address system used in a large-scale facility or building.

Reference Signs List

- [0082]
- 1 Public address system
 - 2 Amplifier
 - 3 Loudspeaker
 - 4 Speaker line (an example of a transmission medium)
 - 5 control device
 - 10 Monitoring device
 - 10a First branch monitoring device (an example of a first branch monitoring device)

10b Second branch monitoring device (an example of a second branch monitoring device)

11 Isolating unit

12 Filter unit (an example of a filter unit)

13 Receiver

14 Transmitter

15 A/D converter

16 D/A converter

17 CPU (an example of a control unit)

18a Main monitoring unit

18b Branch monitoring unit

19 DC supply

20 Switch (an example of a switch)

40 Branch point

51 Filter unit

53 Receiver

54 Transmitter

55 A/D converter

56 D/A converter

57 CPU

60 Input

201 Public address system

210 Monitoring device

225 Filter

227 Switch

260 Input

Citation List

Patent Literature

[0083] [PATENT LITERATURE 1] US2003/0063755A

Claims

- [Claim 1] A public address system comprising:
a transmission medium including a main transmission path and at least one branch transmission path branching from the main transmission path, the transmission medium being configured to carry a transmission signal;
a plurality of loudspeakers connected to the transmission medium;
a first branch monitoring device connected to the transmission medium at a first branch point where the branch transmission path begins; and
a second branch monitoring device connected to the transmission medium at a second branch point where the branch transmission path ends,
wherein the first branch monitoring device is configured to transmit the transmission signal from the main transmission path into the branch transmission path while transmitting the transmission signal through the main transmission path, and
the second branch monitoring device is configured to transmit the transmission signal from the main transmission path into the branch transmission path, while transmitting the transmission signal through the main transmission path.
- [Claim 2] The public address system according to claim 1, wherein
the second branch monitoring device is configured to detect a transmission of the transmission signal from the branch transmission path to the second branch monitoring device, and
the second branch monitoring device only transmits the transmission signal from the main transmission path into the branch transmission path when the second branch monitoring device has detected that there is no transmission of the transmission signal from the branch transmission path to the second branch monitoring device.
- [Claim 3] The public address system according to claim 1, wherein
the second branch monitoring device transmits the transmission signal from the main transmission path into the branch transmission path at any given time.
- [Claim 4] A monitoring device connectable to a public address system including a transmission medium configured to carry a transmission signal and a plurality of loudspeakers connected to the transmission medium, the transmission medium including a main transmission path and at least

one branch transmission path branching from the main transmission path,

the monitoring device comprising:

a branch monitoring unit configured to monitor a transmission of the transmission signal from the branch transmission path to the monitoring device, when the monitoring device is arranged at a branch point where the branch transmission path ends; and

a switch configured to allow passage of the transmission signal from the main transmission path into the branch transmission path when it is in a first position and block passage of the transmission signal from the main transmission path into the branch transmission path when it is in a second position,

wherein the switch is switched from the second position to the first position when the branch monitoring unit detects that there is no transmission of the transmission signal.

[Claim 5]

A monitoring device connectable to a public address system including a transmission medium configured to carry a transmission signal and a plurality of loudspeakers connected to the transmission medium, the transmission medium including a main transmission path and at least one branch transmission path branching from the main transmission path, the transmission signal including a communication signal and an audio signal,

the monitoring device comprising:

a filter connectable to the branch transmission path and configured to filter the transmission signal by attenuating the communication signal, and

a switch configured to control the branch transmission path such that the transmission signal is filtered by the filter when the switch is in a first position and the transmission signal is not filtered by the filter when the switch is in a second position.

[Claim 6]

The monitoring device according to claim 4 or 5, further comprising:

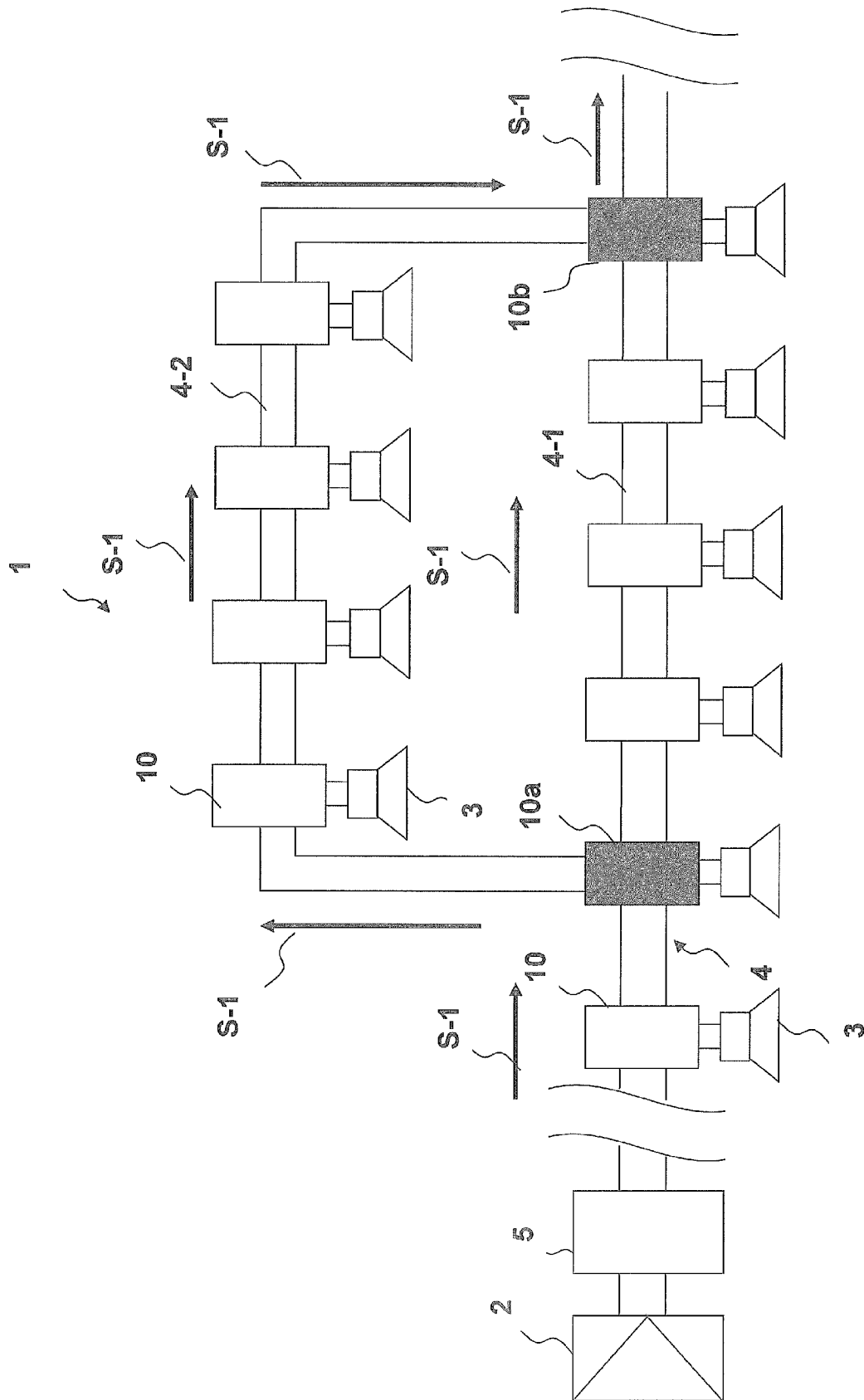
a filter unit configured to filter the transmission signal so as to allow passage of a communication signal and attenuate an audio signal, the communication signal and the audio signal included in the transmission signal; and

a control unit configured to receive and identify the communication signal via the filter unit,

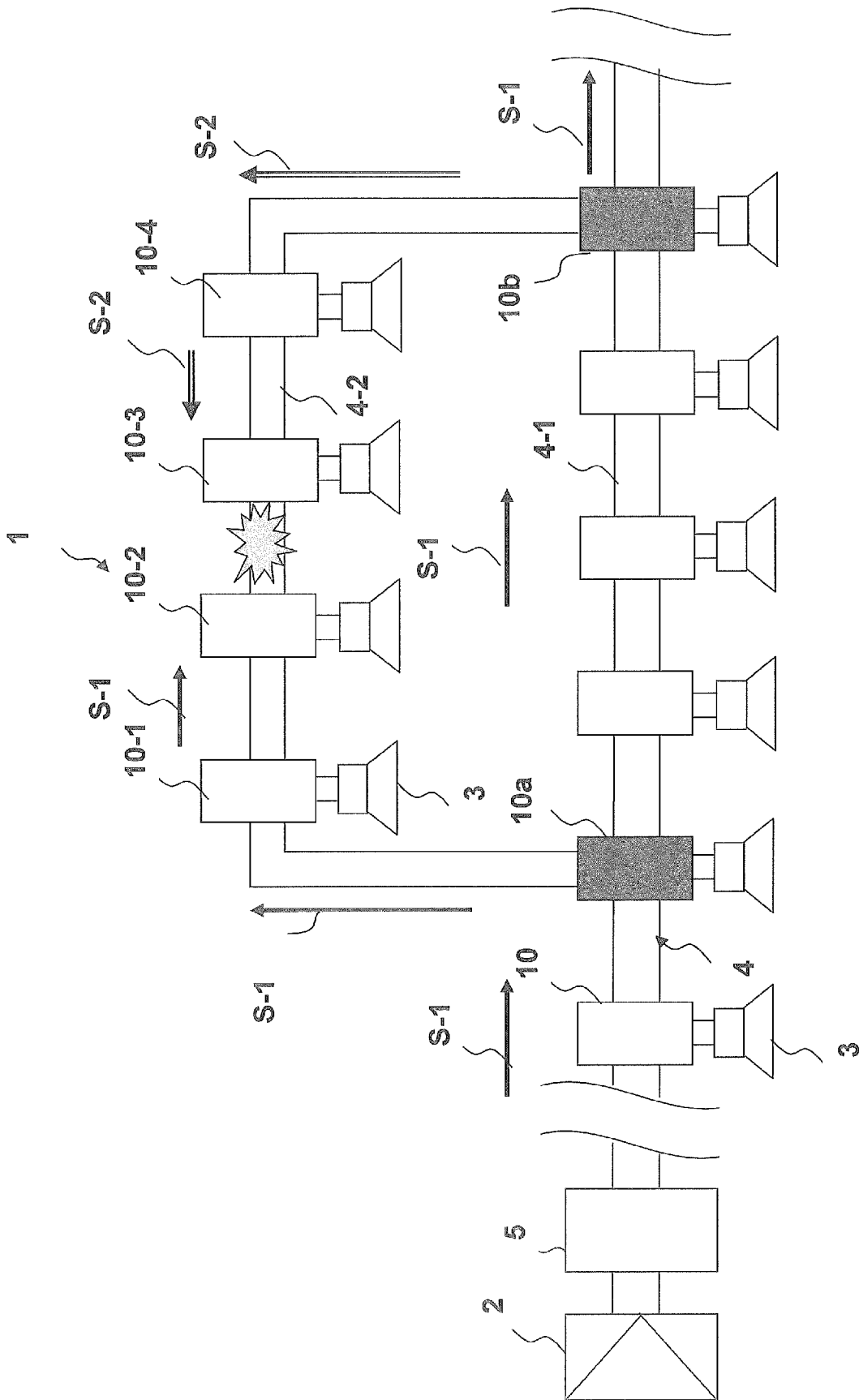
wherein the filter unit and the control unit are arranged upstream of the

transmission medium with respect to the switch.

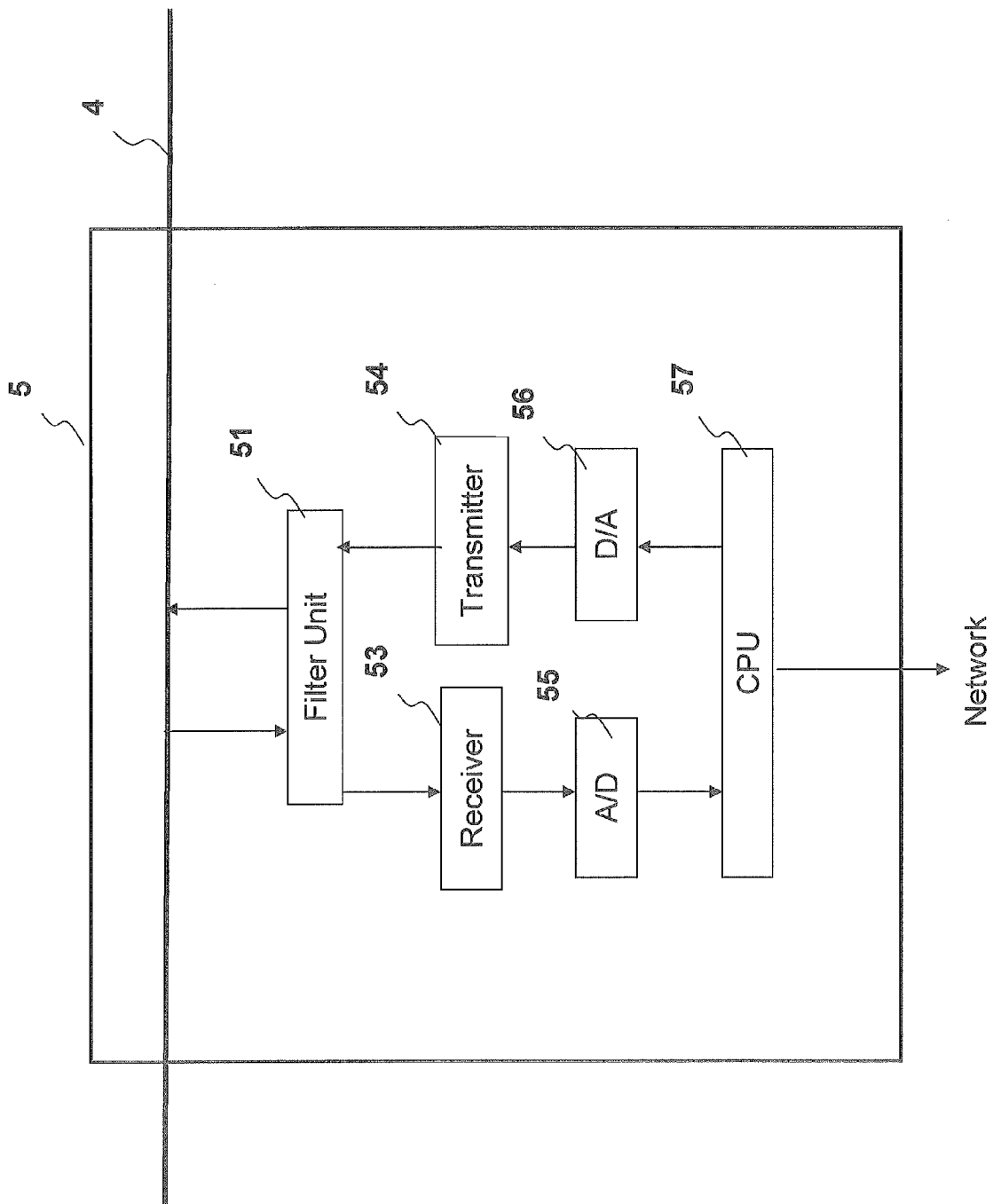
[Fig. 1]



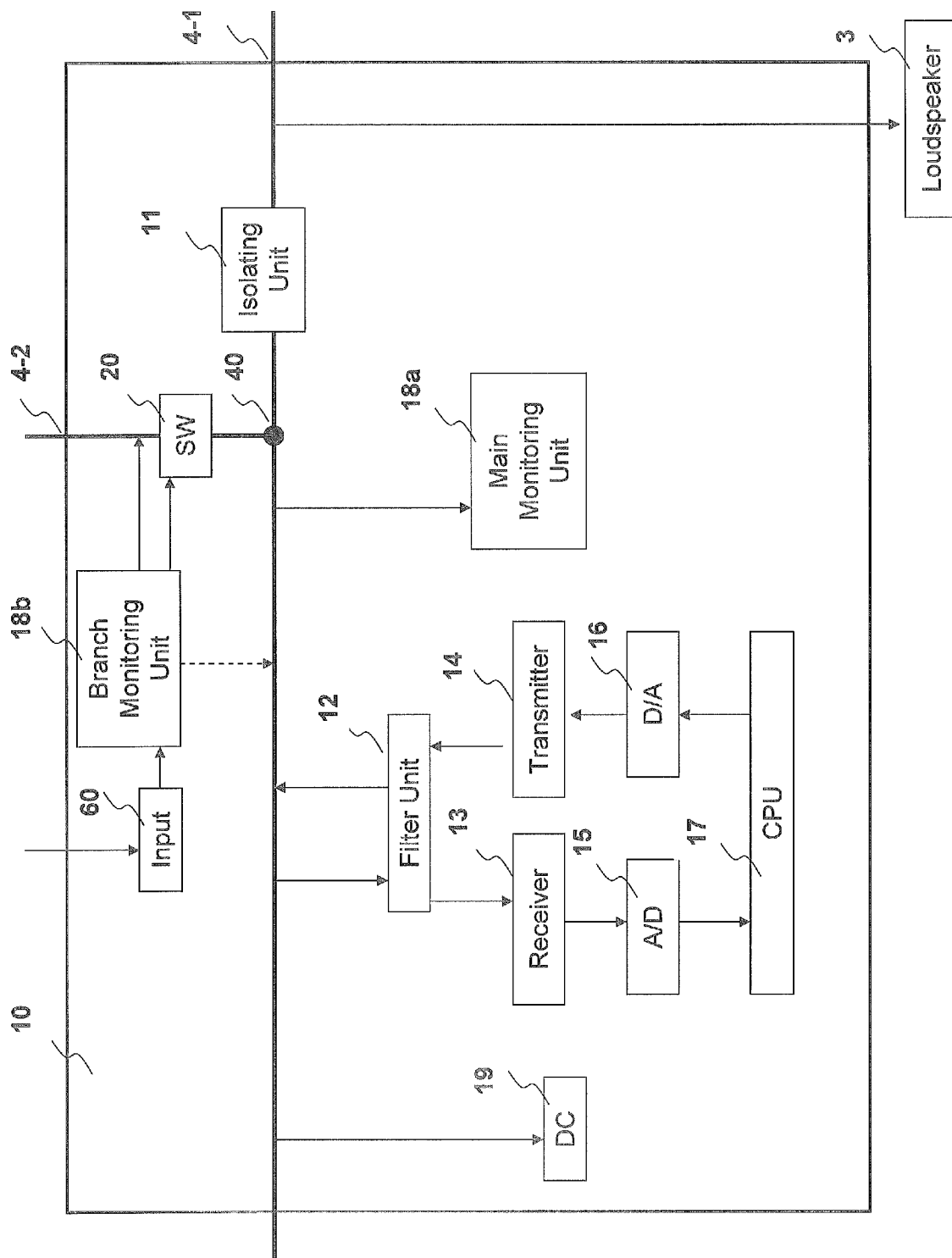
[Fig. 2]



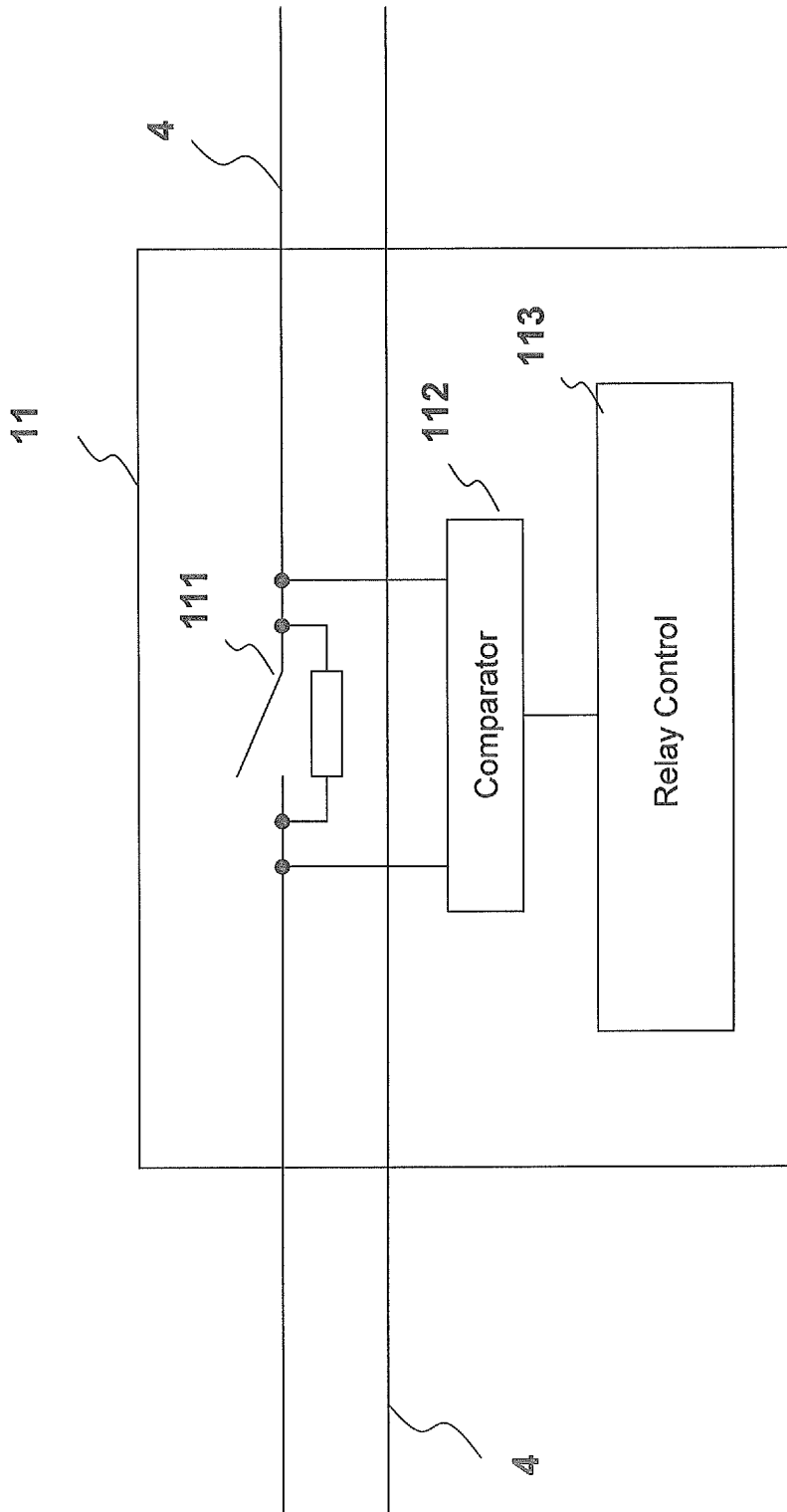
[Fig. 3]



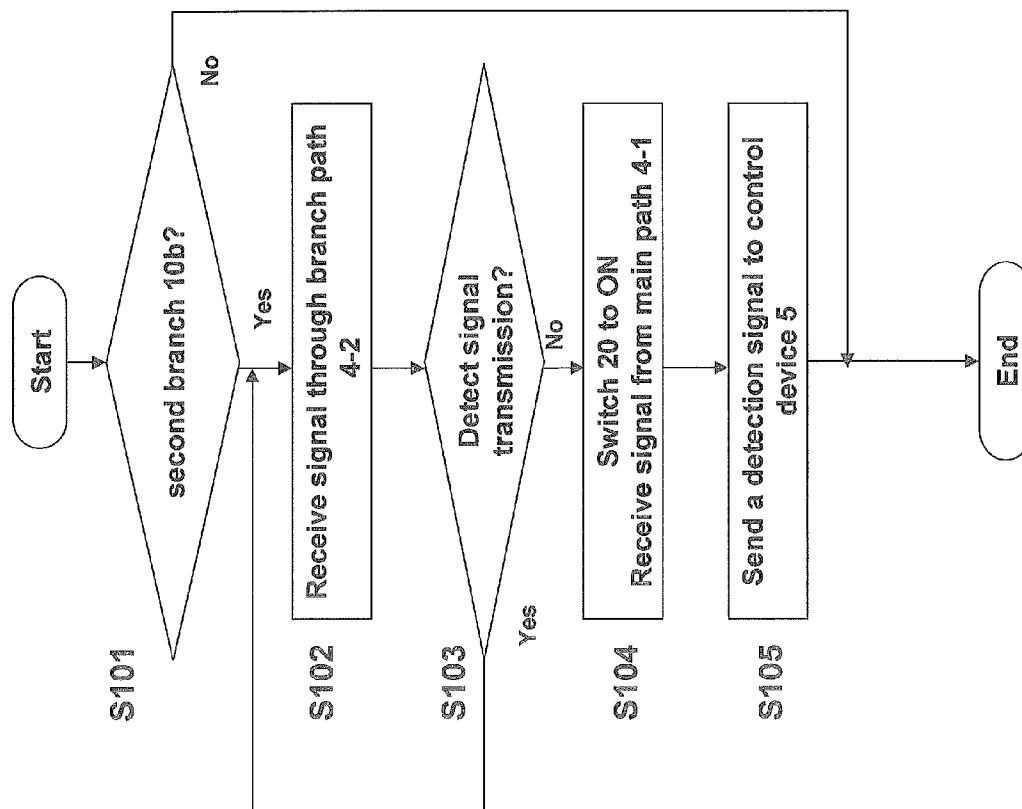
[Fig. 4]



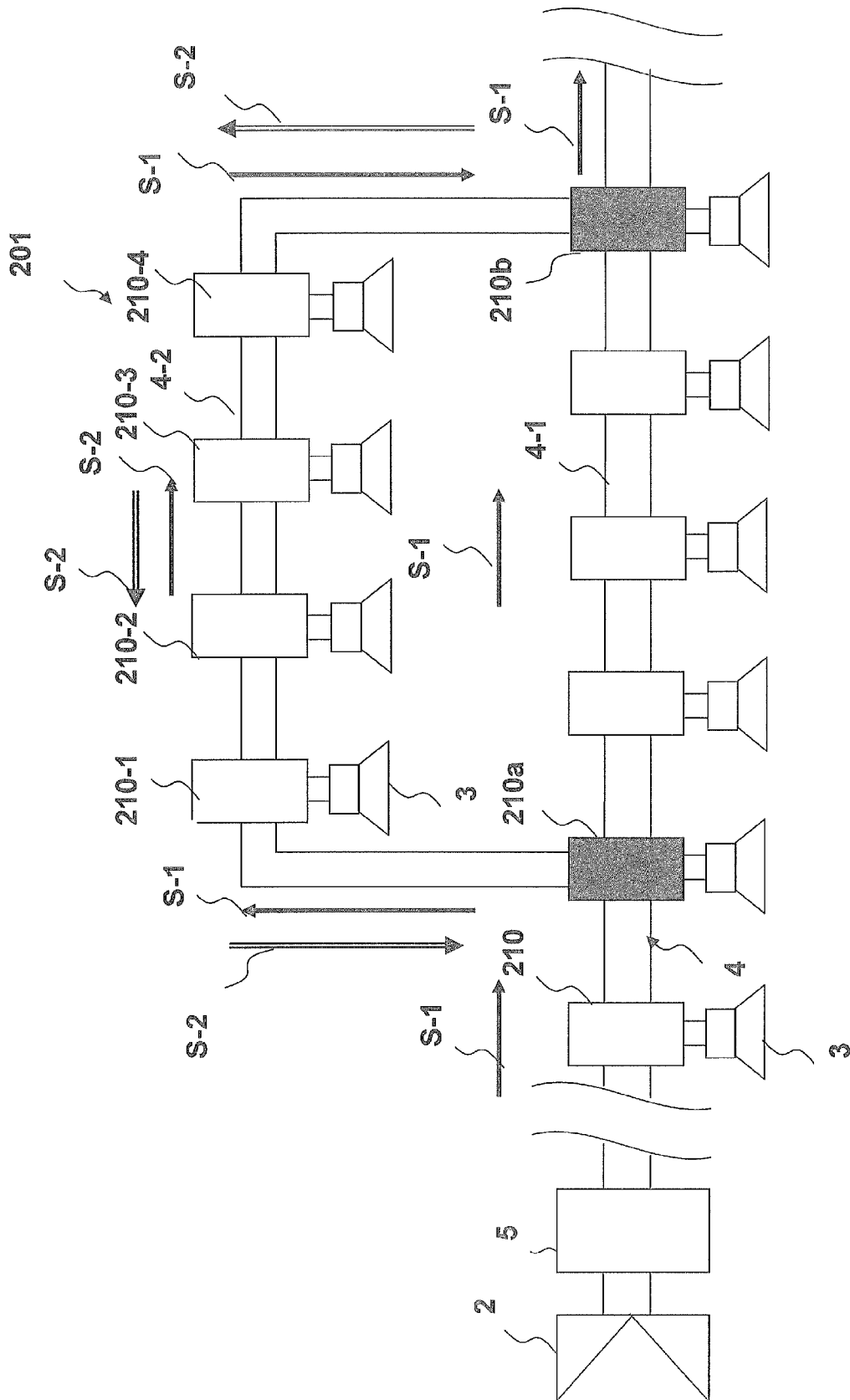
[Fig. 5]



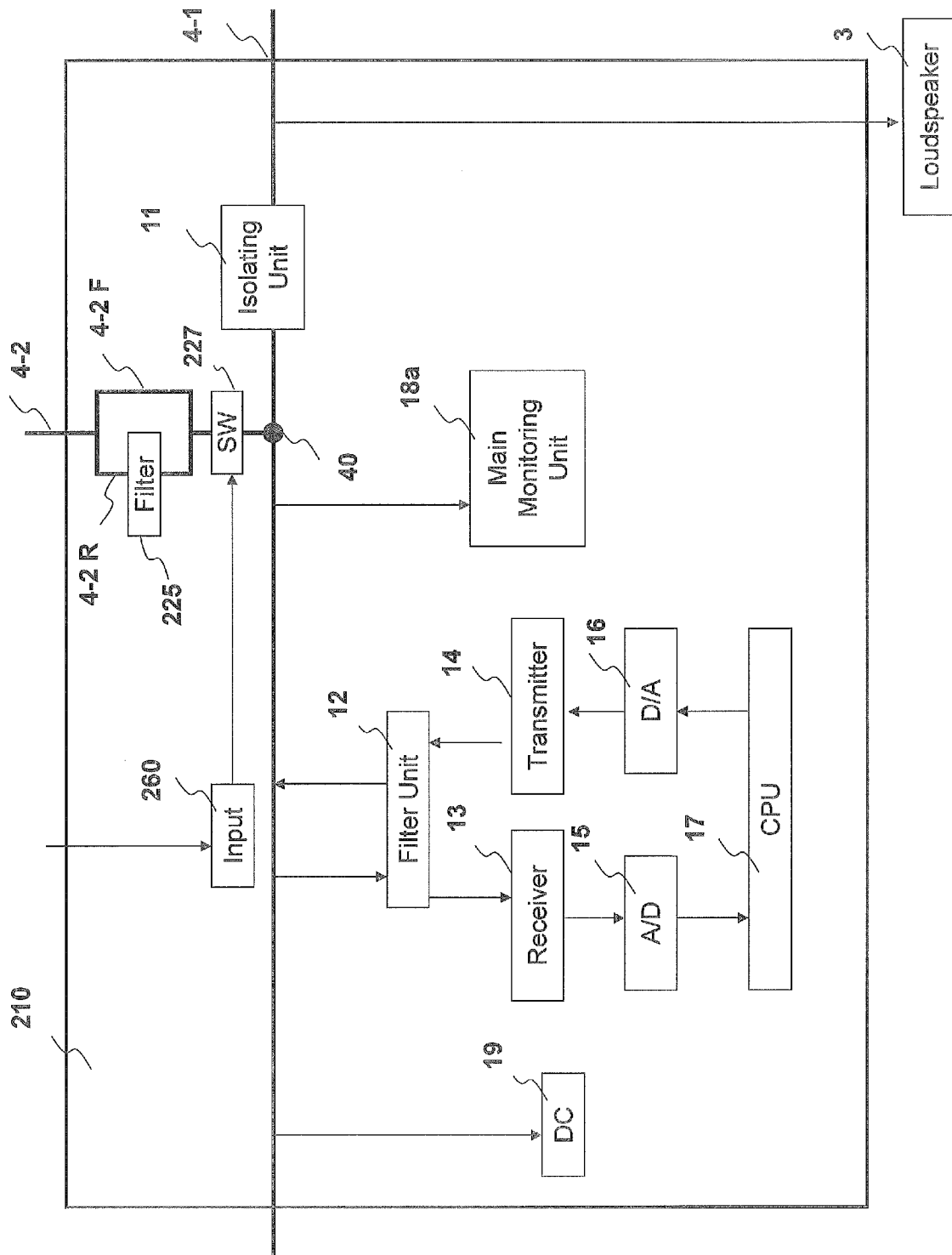
[Fig. 6]



[Fig. 7]



[Fig. 8]



INTERNATIONAL SEARCH REPORT

International application No
PCT/JP2012/004639

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04R29/00 H04R27/00 G08B29/06
ADD.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
H04R G08B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4 528 610 A (PAYNE ROGER D [GB]) 9 July 1985 (1985-07-09) column 1, lines 5-11 column 2, lines 12-14 figures 4-8	1-3
Y	US 2007/035407 A1 (CAPOWSKI ANTHONY J [US] ET AL) 15 February 2007 (2007-02-15) paragraphs [0035], [0036], [0038], [0302]; claim 1 figures 6,7,10,11	1-3
A	EP 0 967 833 A2 (PROTEC FIRE DETECTION PLC [GB]) 29 December 1999 (1999-12-29) paragraphs [0003] - [0031]	1-3
A	DE 10 2004 045942 A1 (SIEMENS AG [DE]) 6 April 2006 (2006-04-06) paragraph [0001]; figure 3	1-3

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search 4 April 2013	Date of mailing of the international search report 17/07/2013
--	---

Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Fachado Romano, A
--	--

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/004639

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-3

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-3

Public address system.

2. claim: 4

Monitoring device for a public address system comprising a branch monitoring unit and a switch for allowing transmission of a signal from a main transmission path to a branch transmission path.

3. claims: 5, 6

Monitoring device for a public address system comprising a filter and a switch for activating or deactivating said filter.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/JP2012/004639

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4528610	A	09-07-1985	US RE34643 E 21-06-1994
			US 4528610 A 09-07-1985

US 2007035407	A1	15-02-2007	NONE

EP 0967833	A2	29-12-1999	NONE

DE 102004045942	A1	06-04-2006	DE 102004045942 A1 06-04-2006
			WO 2006032645 A1 30-03-2006
