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(71) Applicant: **Faurecia Clarion Electronics Co., Ltd.**
**Saitama-shi, Saitama 330-0081 (JP)**

(72) Inventor: **MATSUKURA, Yuujirou**
**Saitama-shi, 330-0081 (JP)**

(74) Representative: **Lavoix**
**Bayerstraße 83**
**80335 München (DE)**

## (54) BROADCAST RECEIVER, BROADCAST RECEIVING METHOD, AND BROADCAST RECEIVING PROGRAM

(57) A broadcast receiver is configured to receive a digital broadcasting signal and an analog broadcasting signal of simulcasting having format different from format of the digital broadcasting signal. The broadcast receiver comprises an outputting means configured to output one of the digital broadcasting signal and the analog broadcasting signal to a predetermined outputting device, a judging means configured to judge whether a signal processing has been completed to the extent that the outputting means can output the digital broadcasting signal, and an output controlling means configured to cause the outputting means to output the analog broadcasting signal when the judging means does not judge that the signal processing has not been completed.

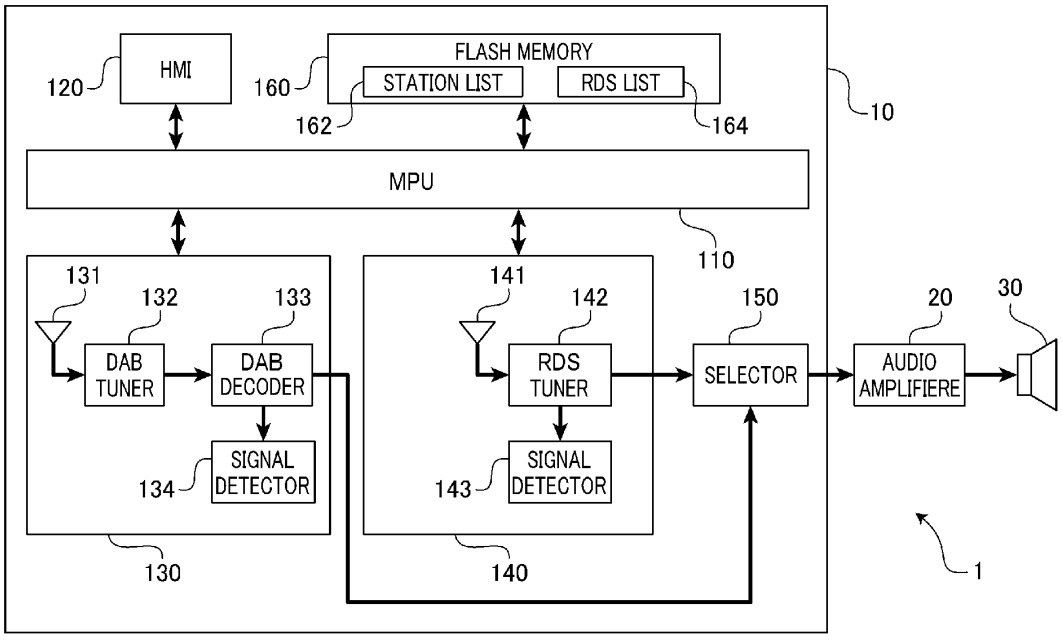


FIG. 1

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## Description

### Technical Field

**[0001]** The present invention relates to a broadcast receiver, a broadcast receiving method, and a broadcast receiving program.

### Related Art

**[0002]** A broadcast receiver capable of receiving both DAB (Digital Audio Broadcasting) ensemble signals and FM (Frequency Modulation) RDS (Radio Data System) broadcasting signals (hereinafter referred to as "RDS signals") is known. An example of such a broadcast receiver is disclosed in Japanese Patent Provisional Publication No. 2018-152653. In this type of broadcast receiver, for example, when the received signal quality of the ensemble signal deteriorates, the receiver automatically follows the simulcast that broadcasts the same service based on the SID (Service Identifier) of the broadcast service using the ensemble signal (hereinafter referred to as "DAB service") and the PI (Program Identifier) of the broadcaster that broadcasts the simulcast using the RDS signal (hereinafter referred to as "RDS simulcast"). In other words, when the received signal quality of the ensemble signal deteriorates, the broadcast to be reproduced is automatically switched from the DAB service to the RDS simulcast.

**[0003]** If the DAB service was being reproduced when the power was previously turned on, the broadcast receiver performs the station selection process for this DAB service when the power is turned on this time. When a station selection operation for a DAB service is performed, the broadcast receiver performs station selection process for the DAB service specified by the operation. In the station selection process, the ensemble signal is demodulated and the audio signal is decoded. As this audio signal is reproduced by the speaker, the user can listen to the DAB service.

### Summary

**[0004]** Demodulation of the ensemble signal takes time. Therefore, there is a problem that the DAB service is not reproduced for a while after the broadcasting receiver is turned on or the station selection operation is performed, and the silent state continues.

**[0005]** The present invention was made in consideration of the above circumstances, and it is an object of the present invention to provide a broadcast receiver, a broadcast receiving method, and a broadcast receiving program that can shorten the silent state that occurs after power-on of the broadcast receiver or after the station selection operation.

**[0006]** According to aspects of the present disclosures, , there is provided a broadcast receiver configured to receive a digital broadcasting signal and an analog broadcasting signal of simulcasting having format different from format of the digital broadcasting signal. The broadcast receiver comprises an outputting means configured to output one of the digital broadcasting signal and the analog broadcasting signal to a predetermined outputting device, a judging means configured to judge whether a signal processing has been completed to the extent that the outputting means can output the digital broadcasting signal, and an output controlling means configured to cause the outputting means to output the analog broadcasting signal when the judging means does not judge that the signal processing has not been completed.

**[0007]** According to the above configuration, even when digital broadcasting signals cannot be output due to, for example, signal processing not being completed after power-on or station selection operation of the broadcast receiver, since analog broadcasting signals for simulcasting can be output, so that the silent state that occurs after power-on of the broadcast receiver or after station selection operation can be shorten.

### Effect of the Invention

**[0008]** According to an embodiment of the present invention, in broadcast receiving method, a broadcast receiver, and a broadcast receiving program, the silent state that occurs after the power is turned on of a broadcast receiver or after a station selection operation can be shorten.

### Brief Description of the Drawing

**[0009]**

[Fig. 1] Fig. 1 is a block diagram of a broadcast receiving system according to an embodiment of the present invention.

[Fig. 2] Fig. 2 is a flowchart illustrating a broadcasting signal outputting process performed by an MPU (Micro Processing Unit) in an embodiment of the present invention.

### Detailed Description of the Embodiment

**[0010]** An embodiment of the present invention will be described below with reference to the drawings. As an embodiment of the present invention, the following description will take, as an example, a broadcast receiving system equipped with a broadcast receiver configured to receive DAB ensemble signals, which are digital broadcasting signals, and RDS signals, which are analog broadcasting signals.

**[0011]** Fig. 1 is a block diagram of a broadcast receiving system 1 according to an embodiment of the present invention. As shown in Fig. 1, the broadcast receiving system 1 according to the present embodiment is equipped with a broadcast receiver 10, an audio amplifier

20, and a speaker 30.

**[0012]** The broadcast receiver 10 is a device configured to receive DAB ensemble signals and simulcast RDS signals of which broadcast format differs from that of the ensemble signals. The broadcast receiver 10 is installed, for example, in a vehicle. The broadcast receiver 10 is not necessarily limited to in-vehicle devices, but can be ones configured to use, for example, with smartphones, feature phones, PHS (Personal Handy phone System), tablet terminals, notebook PCs, PDA (Personal Digital Assistant), PNDs (Portable Navigation Device), portable game machines, and other portable terminals.

**[0013]** As shown in Fig. 1, the broadcast receiver 10 is equipped with an MPU 110, an HMI (Human Machine Interface) 120, a DAB signal processing circuit 130, an RDS signal processing circuit 140, a selector 150 and a flash memory 160. The audio amplifier 20 and the speaker 30 are connected to a rear stage of the broadcast receiver 10 (specifically, the selector 150).

**[0014]** In Fig. 1, only main components necessary for the explanation of this embodiment are illustrated. For example, some components, such as a housing, which is an essential component of the broadcast receiver 10 but not necessary to explain the present invention, are omitted from the drawing as appropriate.

**[0015]** When an engine of a vehicle is turned on, power is supplied from the battery, which is not shown in the drawing, to each circuit of the broadcast receiver 10 through power supply lines. After the power is supplied, the MPU 110 retrieves a control program stored in an internal memory, loads the same into a work area, and executes the loaded control program to control the entire broadcast receiver 10.

**[0016]** The HMI 120 is an interface configured to exchange information between a user and the broadcast receiver 10, and includes, for example, a touch panel display and mechanical keys arranged around the touch panel display, a remote controller and the like. The MPU 110 outputs a reception control signal to the DAB signal processing circuit 130 and the RDS signal processing circuit 140 according to a station selection operation of the HMI 120.

**[0017]** The DAB signal processing circuit 130 is a circuit configured to receive the ensemble signals and is equipped with an antenna 131, a DAB tuner 132, a DAB decoder 133 and a signal detector 134.

**[0018]** The antenna 131 receives the ensemble signal. The DAB tuner 132 converts the ensemble signal received by the antenna 131 from an RF signal to a baseband signal according to the reception control signal input from the MPU 110, and outputs the converted signal to the DAB decoder 133.

**[0019]** The DAB decoder 133 performs an OFDM (Orthogonal Frequency Division Multiplexing) demodulation to the baseband signal input from the DAB tuner 132.

**[0020]** The ensemble signal roughly contains a synchronization channel used for frame synchronization during demodulation, a Fast Information Channel (FIC) that includes service configuration information and the like, and a Main Service Channel (MSC) that includes voice service and data service.

**[0021]** The FIC contains Fast Information Blocks (FIB), which include identifiers such as an SID, an EID (Ensemble Identifier), an SCIdS (Service Component Identifier within the Service), and label data associated with the identifiers (e.g., a service label indicating the name of the broadcasting service (name of the broadcasting program)). The FIB includes an FIG (Fast Information Group) and a CRC (Cyclic Redundancy Check). The FIGs are classified into eight types, from Type 0 to Type 7, depending on their usages.

**[0022]** The FIG contains the service linking information. The service linking information includes information indicating which one of the SIDs of the DAB and which one of the PIs of the RDS are linked. This service linking information allows the MPU 110 to identify the RDS stations that broadcast the same service as the currently received DAB station, not only for broadcasts of which the SID and the PI match, but also for broadcasts of which the SID and the PI do not match.

**[0023]** The DAB decoder 133 transmits the FIC obtained by the OFDM demodulation to the MPU 110. The MPU 110 selects, based on the information in the FIC, the DAB service to be reproduced from among multiple DAB services multiplexed in the ensemble signal.

**[0024]** The DAB decoder 133 decodes the audio data and the display data, which are included in the MSC, of the sub-channel corresponding to the DAB service selected by the MPU 110. The DAB decoder 133 then outputs the decoded audio data (hereinafter referred to as a "DAB audio signal") to the selector 150, and the decoded display data to the HMI 120.

**[0025]** The signal detector 134 detects information about the received signal quality based on the bit error rate (hereinafter referred to as "DAB received signal quality information").

**[0026]** The RDS signal processing circuit 140 is a circuit that performs a receiving process of the RDS signals and is equipped with an antenna 141, an RDS tuner 142 and a signal detector 143.

**[0027]** The antenna 141 receives the RDS signal. The RDS tuner 142 applies an MF demodulation to the RDS signal received by the antenna 141, in accordance with the reception control signal input from the MPU 110. The RDS simulcast selected by the FM demodulation is an RDS simulcast broadcast by a broadcast station having the same PI as the SID of the DAB service (hereinafter referred to as the "same PI simulcast") or an RDS simulcast broadcast by a broadcast station having the PI associated with the SID of the DAB service by the service linking information (hereinafter referred to as a "linked PI simulcast").

**[0028]** By the FM demodulation, the audio signals (hereinafter referred to as "RDS audio signals") and character information data are obtained. The RDS audio signal and the character information data obtained by the

FM demodulation are output to the audio amplifier 20 and the HMI 120, respectively.

**[0029]** The signal detector 143 is configured to detect information regarding the received signal quality (hereinafter referred to as "RDS received signal quality information") based on the reception level of the RDS simulcast and the like.

**[0030]** The MPU 110 outputs a selector signal to the selector 150. According to the selector signal input from the MPU 110, the selector 150 outputs the RDS audio signal when the received signal quality of the ensemble signal is in a degraded state (for example, when the bit error rate of the ensemble signal is above a predetermined threshold), and outputs the DAB audio signal when the received signal quality of the ensemble signal is in a good or improved state (for example, when the bit error rate of the ensemble signal is below the predetermined threshold). The audio signal output from the selector 150 is amplified by the audio amplifier 20 and reproduced by the speaker 30.

**[0031]** In this way, the selector 150 operates as an output means that is configured to output one of the digital and analog broadcasting signals to a predetermined output device (specifically, the speaker 30).

**[0032]** The MPU 110 checks the received signal quality of the ensemble signal based on the DAB received signal quality information detected by the signal detector 134, and also checks the received signal quality of the RDS signal based on the RDS received signal quality information detected by the signal detector 143. These received signal qualities are degraded when the vehicle in which the broadcast receiver 10 is installed is out of the receivable area or is affected by buildings, tunnels, or other shielding. When the received signal quality of the ensemble signal is degraded, the MPU 110 outputs the selector signal to the selector 150 to switch the broadcast to the RDS simulcast, which broadcasts the same content as the DAB service does.

**[0033]** Next, the station list of the DAB will be explained. The station list is list data that holds each information such as a frequency channel, an ensemble label, a service label, the SID, the SCIdS, the type (e.g., Primary, Secondary), hard link service information, an FI, an OE service and the like in an associated manner.

**[0034]** For example, the MPU 110 controls the DAB signal processing circuit 130 to seek all frequency channels that broadcast the DAB ensemble signal. In general, the MPU 110 outputs a reception control signal to the DAB signal processing circuit 130 to instruct to select one frequency channel. Then, the DAB signal processing circuit 130 performs the receiving process in accordance with the reception control signal input from the MPU 110. When the DAB signal processing circuit 130 detects the ensemble signal and the demodulation process has been performed successfully, the service configuration information necessary for creating the station list 162 is obtained and output to the MPU 110. When the MPU 110 has obtained the service configuration information from the DAB signal processing circuit 130, the MPU 110 instructs the DAB signal processing circuit 130 to select the next frequency channel and tries to obtain the service configuration information for the next frequency channel as well. When the MPU 110 has not obtained the service configuration information from the DAB signal processing circuit 130 within a certain period of time, the MPU 110 instructs the DAB signal processing circuit 130 to select the next frequency channel and tries to obtain the service configuration information. The MPU 110 performs this seek process for all the frequency channels that broadcast the ensemble signal.

**[0035]** When the MPU 110 obtains the results of acquiring or failing to acquire service configuration information for all the frequency channels that broadcast ensemble signals, the MPU 110 generates a station list 162 based on the acquired service configuration information and stores the generated station list 162 in the flash memory 160.

**[0036]** The service labels held by the station list 162 are displayed, for example, on the touch panel display of the HMI 120. The user can select a desired service label (in other words, a desired DAB service) from the station list 162 displayed on the touch panel display of the HMI 120 by a touching operation. When the DAB service on the station list 162 is selected, the MPU 110 receives the ensemble signal based on the frequency, the EID, the SID and the like of the ensemble signal stored in association with the selected DAB service, and causes the DAB audio signal of the DAB service of the selected station to be reproduced by the speaker 30 and causes the display data of the DAB service to be displayed on the touch panel display.

**[0037]** The service labels registered by preset operations (in other words, the DAB services) can also be displayed on the touch panel display of the HMI 120. The user can perform a selection operation for a preset registered DAB service to cause the DAB audio signal of this DAB service to be reproduced by the speaker 30 and to cause the display data of this DAB service to be displayed on the touch panel display.

**[0038]** The flash memory 160 also stores a list of the RDS simulcasts (hereinafter referred to as the "RDS list 164"). The RDS list 164 is list data that holds each information such as the frequency channel, the PI, the PS (Program Service) and the like associated in an associated manner. The MPU 110 performs a seek process to obtain each information for all the frequency channels that broadcast the RDS signals, as in the case of creating the station list 162, and generates the RDS list 164.

**[0039]** Thus, the flash memory 160 is a memory configured to store first identification information (i.e., the SID) that identifies the digital broadcasting signal and second identification information (i.e., the PI) that matches or is associated with the first identification information and identifies the analog broadcasting signal.

**[0040]** The flash memory 160 is configured to store information on the service lastly received by the broad-

cast receiver 10. In the case of the DAB service, such information includes at least the frequency channel and the SID, while in the case of the RDS simulcast, such information includes at least the frequency channel and the PI. Hereinafter, such information will be referred to as "lastly-received information." When the power is turned on, the MPU 110 reads the lastly-received information stored in the flash memory 160 and outputs a reception control signal to the DAB signal processing circuit 130 and the RDS signal processing circuit 140 for receiving the service indicated by the lastly-received information.

**[0041]** In the following description, an operation of the broadcast receiver 10 when the lastly-received information is the DAB service will be described.

**[0042]** When the power is turned on, the MPU 110 outputs the reception control signal for receiving the DAB service indicated by the lastly-received information to the DAB signal processing circuit 130. It is noted that the OFDM demodulation process takes several seconds, and depending on the received signal quality of the ensemble signal, it may take several tens of seconds. Therefore, the DAB service is not reproduced by the speaker 30 for a while after the power is turned on, and the silent state continues.

**[0043]** When the station selection operation is performed on the HMI 120 (e.g., an operation of selecting a DAB service from the station list 162 or selecting a preset DAB service), the OFDM demodulation process of the ensemble signal including the DAB service specified by the operation takes time. Therefore, the DAB service is not reproduced by the speaker 30 for a while after the selection operation, and the silent state continues. If this kind of silence continues for a long time, the user may feel dissatisfied.

**[0044]** Therefore, the broadcast receiver 10 according to the present embodiment is configured to suppress such silent states to be short by executing a process described below.

**[0045]** Fig. 2 is a flowchart illustrating a broadcasting signal outputting process performed by the MPU 110 in the present embodiment. The broadcasting signal outputting process shown in Fig. 2 is started when, for example, the power of the broadcast receiver 10 is turned on or the selection operation of the DAB service on the HMI 120 is performed.

**[0046]** The MPU 110 starts, in S101, the station selection process for the DAB service designated by the DAB service specified by the lastly-received information or by the station selection operation, and also starts, in S102, the station selection process for the RDS simulcast that broadcasts the same content as the DAB service.

**[0047]** When the reception control signal for receiving the DAB service indicated by the lastly-received information or the DAB service specified by the station selection operation is input from the MPU 110 to the DAB signal processing circuit 130, the station selection process for the DAB service is started. In addition, the reception control signal for receiving the same PI simulcast of which PI matches the SID included in the lastly-received information or the SID of the DAB service specified by the station selection operation, or the linked PI simulcast in which the SID and the PI are associated with each other is input from the MPU 110 to the RDS signal processing circuit 140, a station selection process for the RDS simulcast starts.

**[0048]** When the reception control signal for receiving the DAB service indicated by the lastly-received information or the DAB service designated by the station selection operation is input, the DAB signal processing circuit 130 converts the ensemble signal from the RF signal to the baseband signal, applies the OFDM demodulation to the baseband signal obtained by the conversion, and decodes the MSC obtained by the OFDM to obtain the DAB audio signal of the sub-channel corresponding to the DAB service. In other words, the DAB signal processing circuit 130 operates as a first station selection means configured to select a digital broadcasting signal based on the first identification information stored in the flash memory 160. Specifically, the DAB signal processing circuit 130 operates as a first station selection means configured to select a digital broadcasting signal based on the SID included in the lastly-received information or the SID of the DAB service specified by the station selection operation.

**[0049]** When the RDS signal processing circuit 140 receives the reception control signal for receiving the same PI simulcast or the link PI simulcast, the RDS signal processing circuit 140 applies the FM demodulation to the RDS signal to obtain the RDS audio signal. In other words, the RDS signal processing circuit 140 operates as a second station selection means that selects an analog broadcasting signal based on the second identification information (specifically, the PI contained in the RDS list 164) stored in the flash memory 160.

**[0050]** There may be a case where multiple broadcast stations broadcast the RDS simulcasts, not limited to a case where there is only a single station (e.g., only one station with a PI that matches the SID, or only one station with a PI associated by the service linking information). When there are multiple broadcasters that broadcast the RDS simulcast, the RDS signal processing circuit 140 repeats the station selection process for each station according to a predetermined priority order (for example, prioritizing the station with the PI that matches the SID over the station with the PI associated with the service linking information) until the RDS signal processing circuit 140 detects an RDS signal of which received signal quality exceeds a certain level.

**[0051]** The MPU 110 determines whether the signal processing has been completed until the DAB audio signal can be output to the selector 150 (S103). Specifically, the MPU 110 determines whether a series of processes (e.g., a conversion from the RF signal to the baseband signal, the OFDM demodulation of the baseband signal, and decoding of the audio data of the sub-channel) has

been completed in the DAB signal processing circuit 130, and whether the DAB audio signal of the sub-channel corresponding to the DAB service indicated by the lastly-received information or the DAB service designated by the station selection operation is input from the DAB signal processing circuit 130 to the selector 150.

**[0052]** As above, the MPU 110 operates as a judging means to judge whether the signal processing has been completed to the extent that the digital broadcasting signal can be output to the output unit.

**[0053]** When the signal processing has been completed to the extent that the DAB audio signal can be output to the selector 150 (in other words, when the above series of processes have been completed and the DAB audio signal has been input to the selector 150) (S103: YES), the MPU 110 outputs the selector signal to output the DAB audio signal to the selector 150 (S104). As a result, the DAB audio signal is output from the selector 150, amplified by the audio amplifier 20, and reproduced by the speaker 30.

**[0054]** However, since the OFDM demodulation of the baseband signal takes time, a negative determination is made in S103 for at least a few seconds. Until the signal processing is completed to the extent that the DAB audio signal can be output to the selector 150, the DAB audio signal cannot be reproduced, and the silent state continues.

**[0055]** Therefore, when the signal processing has not been completed to the extent that the DAB audio signal is output to the selector 150 (in other words, the DAB audio signal has not been input to the selector 150) (S103: NO), the MPU 110 determines whether the station selection process for the RDS signal has been completed and the RDS audio signal has been input from the RDS signal processing circuit 140 to the selector 150 (S105). When it is determined that the RDS audio signal has not been input to the selector 105 (S105: NO), the MPU 110 returns to the process of S103.

**[0056]** When the reception level of the ensemble signal is the minimum level at which the DAB audio signal can be reproduced, the DAB audio signal cannot be reproduced if the reception environment deteriorates even slightly. For this reason, when the reception level of the ensemble signal has not reached a level obtained by adding a predetermined margin to the above minimum level, the MPU 110 may proceed to S105 instead of S104 even when the above signal processing is completed (S103: YES).

**[0057]** When the RDS audio signal is input to the selector 150 (S105: YES), the MPU 110 outputs the selector signal to the selector 150 to output the RDS audio signal (S106). As a result, the RDS audio signal is output from the selector 150, amplified by the audio amplifier 20, and reproduced by the speaker 30.

**[0058]** As described above, the MPU 110 operates as an output control means configured to output analog broadcasting signals to the output means when it is determined that the judging means has not determined that the signal processing has not been completed to the extent that the output means is caused to output the digital broadcasting signal.

**[0059]** In this embodiment, the RDS simulcast is reproduced by the speaker 30 prior to the DAB service, which takes time to reproduce on the speaker 30 after the power is turned on or the station selection operation is performed. Therefore, the occurrence of the silent state caused by the time required for OFDM demodulation process is minimized.

**[0060]** The MPU 110 repeatedly determines, in S107, whether the signal processing has been completed to the extent that the DAB audio signal can be output by the selector 150 (S107) until the DAB audio signal is input to the selector 150 (S107).

**[0061]** When the DAB audio signal is input to the selector 150 (S107: YES), the MPU 110 outputs the selector signal to the selector 150 to cause the selector 150 to output the DAB audio signal (S104). As a result, the DAB audio signal is output from the selector 150, amplified by the audio amplifier 20, and reproduced by the speaker 30.

**[0062]** The selector 150 is equipped with a correlator that calculates the cross-correlation function between the DAB audio signal and the RDS audio signal, and a buffer with a variable delay amount to synchronize the timings of the DAB audio signal and the RDS audio signal. The selector 150 calculates the amount of delay to be given to the RDS audio signal based on the cross-correlation function calculated by the correlator, and sets the calculated amount of delay to the buffer. As a result, the output timings of the DAB audio signal and the RDS audio signal are synchronized. Therefore, when the selector signal to cause the selector 150 to output the DAB audio signal is input to the selector 150 in S104, the audio reproduced by the speaker 30 seamlessly switches from the audio of the RDS simulcast to the audio of the DAB service. Such a configuration reduces discomfort in the sense of hearing when the audio is switched. In order to further reduce this discomfort, a crossfade may be used in conjunction with the audio switching.

**[0063]** The above is explanation of an exemplary embodiment of the present inventions. Configurations of the present invention are not necessarily limited to those described above, and various modifications are possible within the scope of the technical concept of the present invention. For example, exemplary configurations of the embodiment described in the specification or combinations of obvious examples and the like as appropriate are also included in the embodiments of the present application.

## Claims

1. A broadcast receiver (10) configured to receive a digital broadcasting signal and an analog broadcasting signal of simulcasting having format different from format of the digital broadcasting signal,

the broadcast receiver (10) comprising:

an outputting means (150) configured to output one of the digital broadcasting signal and the analog broadcasting signal to a predetermined outputting device (30);
a judging means (110) configured to judge whether a signal processing has been completed to the extent that the outputting means (150) can output the digital broadcasting signal; and
an output controlling means (110) configured to cause the outputting means (150) to output the analog broadcasting signal when the judging means (110) does not judge that the signal processing has not been completed.

**2.** The broadcast receiver (10) according to claim 1, wherein the controlling means (110) is configured to cause the outputting means (150) to output the digital broadcasting signal when the judging means (110) judges that the signal processing has been completed.

**3.** The broadcast receiver (10) according to claim 1 or claim 2,
further comprises:

a memory (160) configured to store first identification information identifying the digital broadcasting signal and second identification information identifying the analog broadcasting signal that matches or is associated with the first identification information;
a first station selection means (130) configured to select the digital broadcasting signal based on the first identification information stored in the memory (160); and
a second station selection means (140) configured to select the analog broadcasting signal based on the second identification information stored in the memory (160),
wherein the judging means (110) is configured to judge whether the signal processing has been completed to the extent that the output means can output the digital broadcasting signal selected by the first station selection means (130),
wherein the output control means is configured to cause the output means (150) to output the analog broadcasting signal selected by the second station selection means (130) when the judging means (110) judges that the signal processing has not been completed.

**4.** A broadcast receiving method for a broadcast receiver (10) configured to receive a digital broadcasting signal and an analog broadcasting signal of a simulcast having a different broadcast format of format of the digital broadcasting signal, a broadcast receiver (10) including an outputting means (150) for outputting one of the received digital broadcasting signal and the received analog broadcasting signal to a predetermined output device (30),
the method comprises the steps of:

judging whether a signal processing is completed to the extent that the outputting means can output the digital broadcasting signal; and
controlling the outputting means to output the analog broadcasting signal when it is determined in the judging that the signal processing has not been completed.

**5.** A broadcast receiving program (10) comprising instructions which, when the program is executed by a computer, cause the computer to carry out the steps of the method of claim 4.

**6.** A data-processing device (10) comprising means for carrying out the steps of the method of claim 4.

**7.** A computer-readable storage medium comprising instructions which, when executed by a computer, cause the computer to carry out the steps of the method of claim 4.

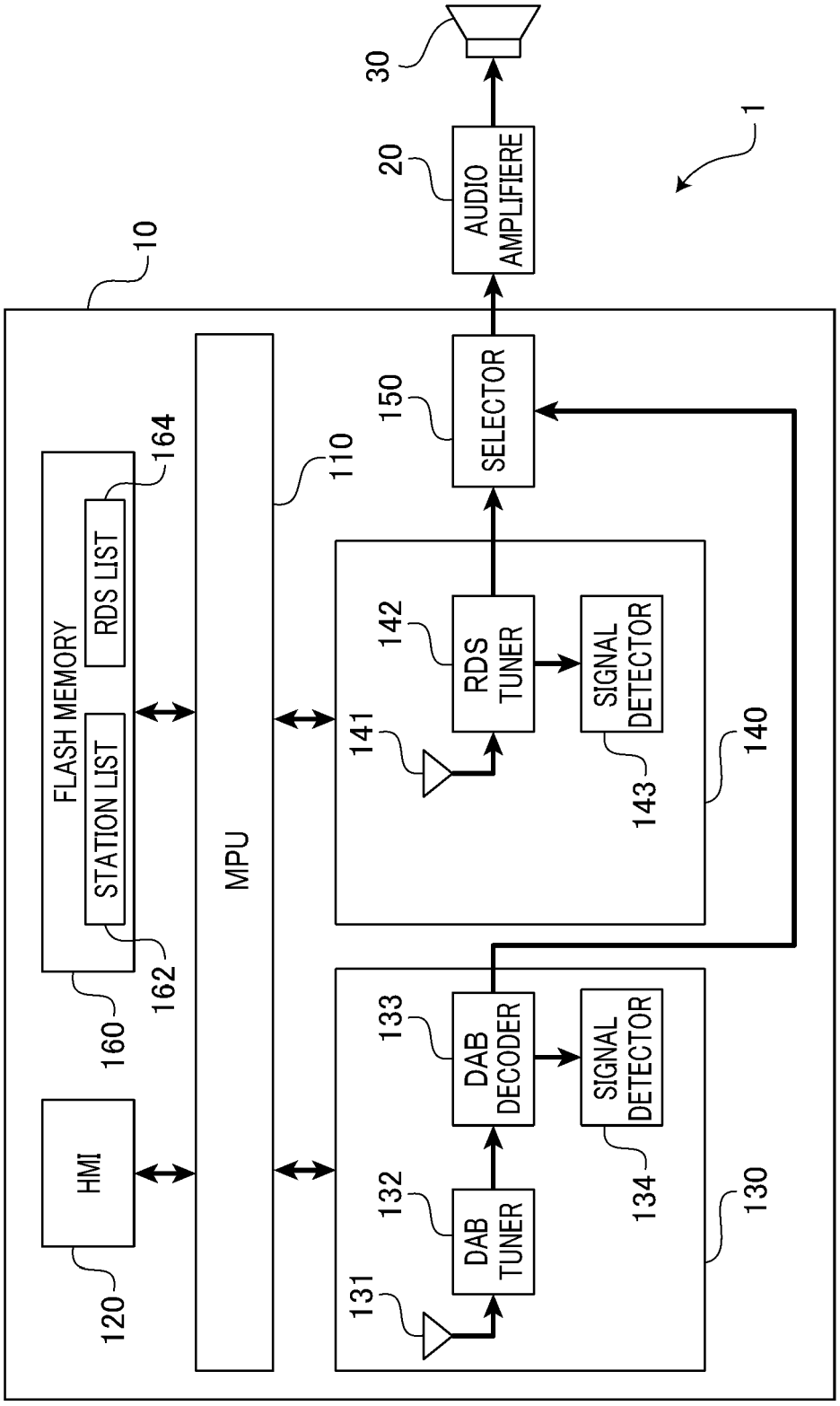
1
10
20
AUDIO AMPLIFIERE
30
150
SELECTOR
110
MPU
FLASH MEMORY
RDS LIST
164
STATION LIST
162
160
HMI
120
141
RDS TUNER
142
SIGNAL DETECTOR
143
140
131
DAB TUNER
132
DAB DECODER
133
SIGNAL DETECTOR
134
130

FIG. 1

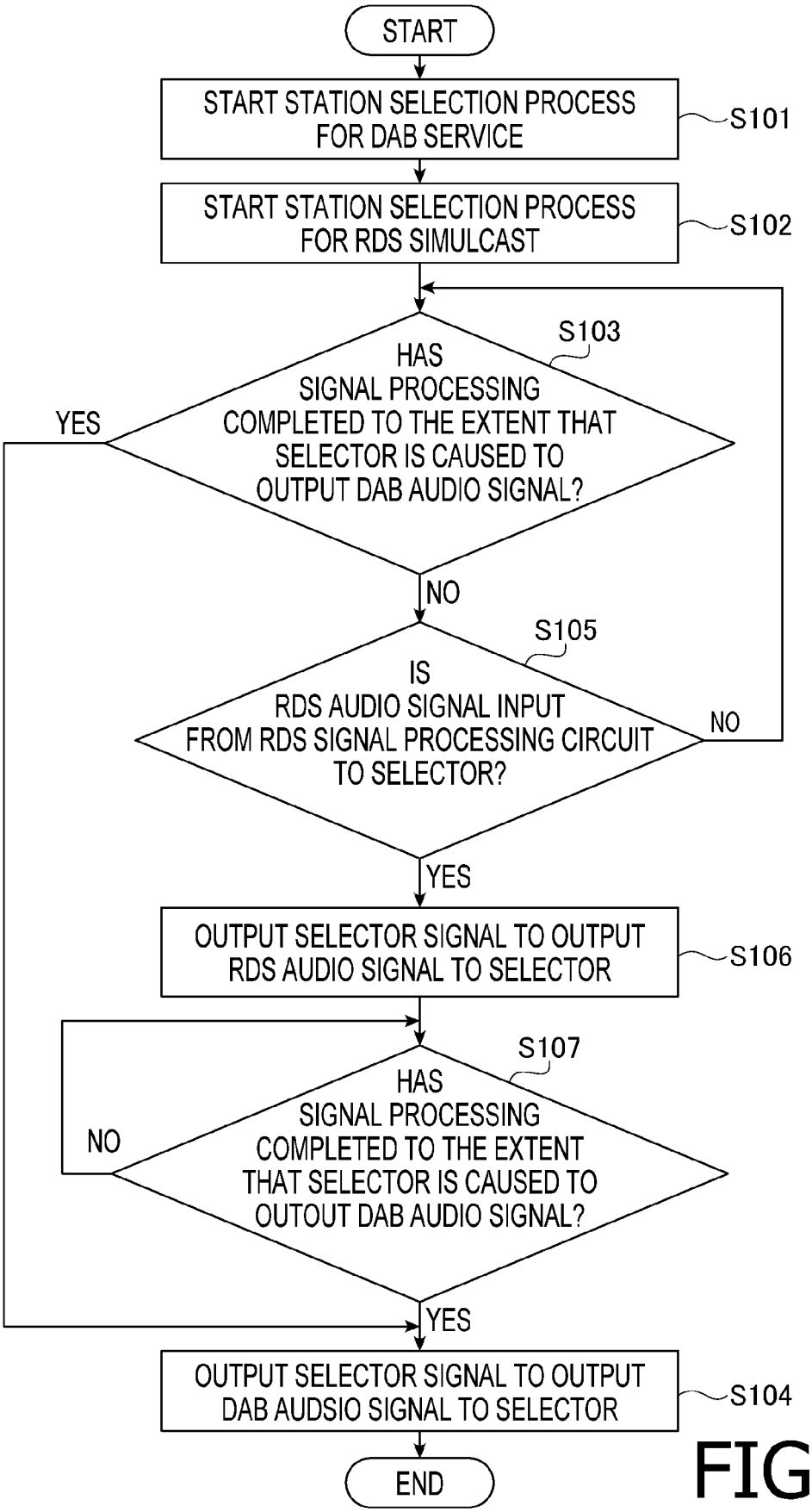
START
START STATION SELECTION PROCESS FOR DAB SERVICE
S101
START STATION SELECTION PROCESS FOR RDS SIMULCAST
S102
S103
HAS SIGNAL PROCESSING COMPLETED TO THE EXTENT THAT SELECTOR IS CAUSED TO OUTPUT DAB AUDIO SIGNAL?
YES
NO
S105
IS RDS AUDIO SIGNAL INPUT FROM RDS SIGNAL PROCESSING CIRCUIT TO SELECTOR?
NO
YES
OUTPUT SELECTOR SIGNAL TO OUTPUT RDS AUDIO SIGNAL TO SELECTOR
S106
S107
HAS SIGNAL PROCESSING COMPLETED TO THE EXTENT THAT SELECTOR IS CAUSED TO OUTOUT DAB AUDIO SIGNAL?
NO
YES
OUTPUT SELECTOR SIGNAL TO OUTPUT DAB AUDSIO SIGNAL TO SELECTOR
S104
END

FIG. 2

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# EUROPEAN SEARCH REPORT

Application Number
EP 21 19 5921

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
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| X | EP 2 747 314 A1 (NXP BV [NL]) 25 June 2014 (2014-06-25) * paragraphs [0002] - [0008], [0028], [0041] * | 1-7 | INV. H04H60/12 ADD. H04H20/22 H04H20/26 |
| X | US 2017/353251 A1 (MARTINEZ DIEZ SAUL [DE]) 7 December 2017 (2017-12-07) * paragraph [0038] * | 1,4-7 | |
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TECHNICAL FIELDS SEARCHED (IPC)
H04H

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| The Hague | 7 February 2022 | Van Hoorick, Jan |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

# ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 21 19 5921

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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07-02-2022

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

## REFERENCES CITED IN THE DESCRIPTION

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