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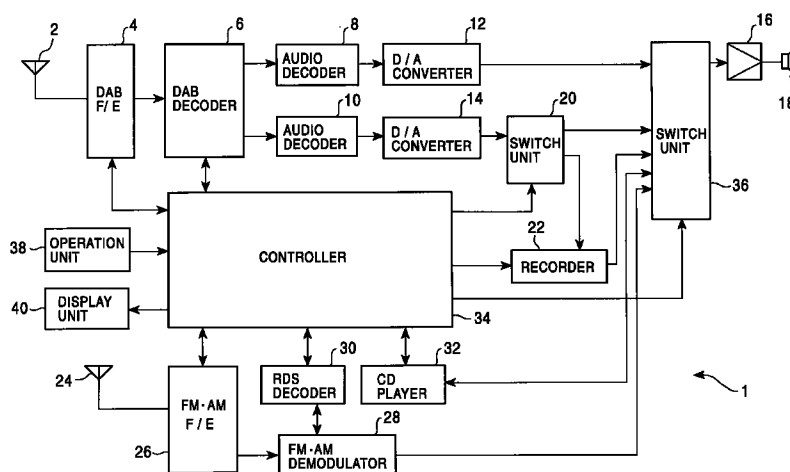
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(54) Receiver for Digital Audio Broadcast comprising a plurality of decoding means for independently decoding a plurality of programmes

(57) A DAB receiver (1) includes a DAB front/end unit (4), a DAB decoder (6), two audio decoders (8, 10), two D/A converters (12, 14), a recorder (22), a controller (34), an operation unit (38), and a display unit (40). When the voice of a service of DAB is formed and output by one audio decoder (8), and a broadcast of a pre-determined announcement included in the same

ensemble as that of the service is started, the voice of the announcement is formed by using the other audio decoder (10). As described above, two voices can be output, and the voice of the announcement is recorded on the recorder (22) or output while overlapping the voice of the service.

FIG. 1



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a multi-broadcasting receiver for selecting any one of a plurality of programs multiplexed on carrier waves having different frequencies.

2. Description of the Related Art

[0002] Today, a digital audio system is generally recognized for its excellent characteristics and good usability, and has been rapidly popularized. For this background, digitalization of audio broadcast has been active, Digital Audio Broadcasting (DAB) is practically used in Europe.

[0003] Such a receiver for DAB (DAB receiver) has an arrangement which is considerably complex more than that of a conventional VHF/FM receiver, but the receiver for DAB has many advantages. For example, tone quality equal to that of a CD can be assured even in a moving automobile, many broadcast program can be received, a program can be broadcasted in a plurality of languages, weather forecast or traffic information can be received without any interruption, and advertisement performed by a voice or an image can be received.

[0004] Broadcast channels of present DAB use idle frequencies between reception frequencies assigned to the channels of television broadcasting, and 64 channels are prepared as a whole. A carrier wave frequency group corresponding to broadcast channels is called an ensemble. A plurality of broadcast programs (services) are multiplexed on each ensemble.

[0005] A DAB signal transmitted from a broadcasting station includes not only a plurality of services consisting of various news programs or music programs but also announcements supported by the services. As an announcement broadcasted for DAB, an emergency broadcast, a traffic information broadcast, a weather forecast broadcast, or the like is known. Of these broadcasts, the emergency broadcast is supported by all the services. For this reason, when each service is received, an emergency broadcast or an announcement supported by another service can be listen. For example, it is assumed that a certain service supports the announcement of traffic information and a news broadcast. In this case, when an output voice is switched from the service to the announcement when the service is received, the announcement of traffic information or a news broadcast can be listened.

[0006] A DAB receiver can perform the following setting operation. That is, the type of a service or an announcement is designated in advance. When the designated service or the like is broadcasted, the present service can be automatically switched to the

designated service or the like. However, the services and the like are suddenly changed to each other in listening any one of the services. For this reason, the service which has been received until now is desired to be continuously listened, the new switched service or the like must be canceled each time the service is switched. The operation becomes cumbersome, and good operability cannot be obtained. In addition, even if a plurality of services or announcements are multiplexed on one signal, only one service or the like can be listened. For this reason, the broadcast hours of services which are desired to be listened overlap, only one of the services or the announcements can be listened. This is inconvenient.

SUMMARY OF THE INVENTION

[0007] The present invention has been made in consideration of the above points, and has as its object to provide a multi-broadcasting receiver being capable of outputting a plurality of multiplexed programs at once and having good operability.

[0008] In order to solve the above problems, a multi-broadcasting receiver according to the present invention has a plurality of decoding means. After a plurality of program data multiplexed on one signal are separated from each other, and the plurality of program data are parallel decoded, so that voices of the plurality of programs can be output at once. When the multi-broadcasting receiver further comprises decoded data storage means for storing decoded data output from any one of the plurality of decoding means, a voice or the like of a program is output on the basis of the decoded data output from any one of the plurality of decoding means, and, at the same time, decoded data output from the remaining decoding means can be stored in the background. In particular, after the storing operation is ended, it is notified that the storing operation is ended. When program reproduction is instructed by a user, the voice or the like of the program is output on the basis of the stored decoded data. In this manner, a plurality of programs broadcasted in the same period of time are output in different periods of time, both the programs can be enjoyed without failing to catch any program. In addition, the decoded data of any program is stored in the background as described above. For this reason, the voices of the remaining programs are not interrupted, and the programs are not switched each time setting for searching a desired program is performed. A cumbersome operation for returning the above state to the original state is not necessary, and operability can be improved.

[0009] Decoded data output from any one of the decoding means is not stored and then read to output the voice or the like of the program, but the voices of the plurality of programs may be output such that the tones of the programs are made different from each other. When the voices of the plurality of programs are output

at once as described above, the rough contents of a program having a low voice level can be known while mainly listening a program having a high voice level. Therefore, both the programs can be listened.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

FIG. 1 is a view showing the arrangement of a DAB receiver according to an embodiment to which the present invention is applied.

FIG. 2 is a view showing a frame structure used in the DAB receiver.

FIG. 3 is a flow chart showing a procedure performed when a designated announcement is broadcasted in outputting the voice of a service.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0011] A DAB receiver according to an embodiment to which a multi-broadcasting receiver of the present invention is applied comprises two audio decoders, and is characterized in that the voice of a program is output by using one of the audio decoders, and a program voice is recorded on the background by using the other. The program described above includes both the service and announcement of DAB. The DAB receiver according to an embodiment will be described below with reference to the accompanying drawings.

[0012] FIG. 1 is a view showing the arrangement of a DAB receiver according to an embodiment to which the present invention is applied. A DAB receiver 1 shown in FIG. 1 comprises a DAB antenna 2, a DAB front/end (F/E) unit 4, a DAB decoder 6, audio decoders 8 and 10, digital-analog converters (D/A converters) 12 and 14, an amplifier 16, a loudspeaker 18, switch units 20 and 36, a recorder 22, an FM-AM antenna 24, an FM-AM front/end unit 26, an FM-AM demodulator 28, an RDS (Radio Data System) decoder 30, a CD player 32, a controller 34, an operation unit 38, and a display unit 40.

[0013] The DAB front/end unit 4 extracts a desired reception frequency (tuning frequency) component from a signal received through the DAB antenna 2, and outputs an intermediate frequency signal obtained by performing frequency conversion to the extracted signal. The DAB decoder 6 performs an orthogonal demodulation process, an FFT (Fast Fourier Transform) demodulation process, and a decoding process to the intermediate frequency signal output from the DAB front/end unit 4 to demodulate interleaved transmission data. The DAB decoder 6 cancels this interleaving to return the data to the original data string, and then performs an error detecting/correcting process to output a data frame constituted by a fast information channel FIC including a service list or the like of ensembles representing the symbol positions of multiplexed broadcast programs or decoded data (MPEG audio data).

[0014] The audio decoders 8 and 10 perform an expanding process for returning decoded data (MPEG audio data) output from the DAB decoder 6 to an original state to output the expanded PCM audio data. The D/A converters 12 and 14 convert PCM audio data output from the audio decoder 8 or the audio decoder 10 into an analog signal to output the analog signal. The amplifier 16 amplifies analog audio signals output from the D/A converters 12 and 14 or analog audio signals output from the FM-AM demodulator 28 (to be described later) or the CD player 32. The amplified signals are output from the loudspeaker 18.

[0015] The switch unit 20 outputs an audio signal input from the D/A converter 14 towards the switch unit 36 or the recorder 22 such that the switch unit 36 and the recorder 22 are switched to each other according to a switching instruction from the controller 34. The recorder 22 records the audio signal input from the D/A converter 14 through the switch unit 20.

[0016] The FM-AM front/end unit 26 extracts a desired reception frequency (tuning frequency) component from a signal received through the FM-AM antenna 24, and amplifies an intermediate frequency signal obtained by performing frequency conversion to the extracted signal. The FM-AM demodulator 28 performs AM detection or FM detection to the intermediate frequency signal output from the FM-AM front/end unit 26 to output an analog audio signal. In addition, when an FM broadcast is received, the FM-AM demodulator 28 separates an FM multiple signal included in the signal after the detection to output the signal to the RDS decoder 30. The RDS decoder 30 performs comparison detection to the FM multiple signal output from the FM-AM demodulator 28 to reproduce a bit clock and demodulate a bit data string. The CD player 32 reproduces music or the like recorded on a CD to output an analog audio signal.

[0017] The controller 34 performs frequency turning control by the DAB front/end unit 4 or the FM-AM front/end unit 26 or performs a service switching instruction or the like to the DAB decoder 6 or the RDS decoder 30, thereby controlling the DAB receiver 1 as a whole. The controller 34 transmits a switching instruction to the switch unit 20 or 36 and instructs the recorder 22 to record or reproduce an audio signal. The switch unit 36 selectively outputs an audio signal input from any one of the D/A converter 12, the switch unit 20, the recorder 22, and the CD player 32 according to the switching instruction output from the controller 34. The operation unit 38 comprises various types of operation keys for inputting an operation instruction such as a program switching instruction by a user, and transmits operation states of the operation keys by the user to the controller 34. The display unit 40 displays a name given to a program of DAB received at present or displays the operation state of the operation unit 38 by a user.

[0018] The DAB front/end unit 4, the DAB decoder 6, and the controller 34 correspond to reception means,

the DAB decoder 6 corresponds to a separation means, the audio decoders 8 and 10 correspond to a plurality of decoding means, the recorder 22 corresponds to a decoded data storage means, the display unit 40 corresponds to a notification means, and the controller 34 corresponds to a program reproduction means.

[0019] FIG. 2 is a view showing the frame structure of mode II employed in the DAB receiver 1. A one-frame length is 24 ms. The frame is constituted by 2-symbol sync signal SYNC, a 3-symbol fast information channel FIC, and a 72-symbol data field DFL. The sync signal SYNC includes a null symbol and a phase reference symbol PRS used to recognize the start point of the frame.

[0020] The fast information channel FIC is constituted by three fast information blocks FIB. The data field DFL is divided into 72 data fields, and a broadcast signal of a predetermined service and a predetermined announcement is inserted into each data field, so that 6 to 8 services can be received from one broadcast wave at once. The correspondence between the data fields and the services is designated by arrangement data of services included in the fast information channel FIC.

[0021] The fast information block FIB is constituted by a plurality of fast information groups FIG. Each fast information group FIG is constituted by an FIG header and an FIG data field. The FIG header is constituted by an "FIG type" representing data included in the FIG data field and a "length" representing the byte length of the FIG data field. One bytes at the starts of the FIG data fields have different contents depending on the FIG types. An extension is included in one byte at the start of the FIG data field.

[0022] For example, in a type 0 field, one byte at the start of the FIG data field includes a C/N (Current/Next) flag, an OE (Other Ensemble) flag, a P/D flag, and an extension which are sequentially ordered from the upstream. The FIG type and the extension define the contents of detailed data included in the FIG data field. In the following, it is assumed that a data field corresponding to the extension 17 of the FIG type 0 field is represented by FIG (0/17).

[0023] A region of an FIG data field except for one byte at the start of the FIG data field includes various types of data specified by the FIG type and the extension. When the data are read, various types of reception controls can be performed. For example, FIG (0/5) includes a language code being in use, and FIG (1/0) and FIG (1/1) include text data corresponding to ensemble names and service names displayed on the display unit 40 in receiving a program.

[0024] A fast information data group FIG required for a reception operation in this embodiment will be described below. FIG (0/2) related to a service list in an ensemble is constituted by an ensemble identification Eld and a service identification Sld for identifying a service included in a concerned ensemble. When the FIG (0/2) related to the service lists in the ensembles

are analyzed, for example, the service identification Sld of each service included in an ensemble received at present can be known. When FIG (0/1) related to a sub-channel is analyzed, data for receiving the service can be detected.

[0025] FIG (0/17) related to a program type (PTy) is constituted by a service identification Sld, an Int (International) code, a coarse code, and a fine code. The service identification Sld is an identifier given to each service. The Int code represents the category of a basic program type such as "news" or "sports". In general, although only the Int code is transmitted from a broadcast station, a coarse code or a fine code representing more exact classification may be transmitted from the broadcast station.

[0026] FIG (0/18) related to an announcement support for an ensemble received at present is constituted by an announcement support (Asu) flag, the number of clusters, and a cluster Id. The Asu flag is a flag representing an announcement type supported by a service specified by the service identification Sld at the start. As the announcement type, an emergency broadcast, a traffic information broadcast, a news broadcast, a weather forecast broadcast, and the like are known. The number of clusters represents the number of cluster Ids subsequent to the number of clusters, and is a maximum of 23. The cluster Id is an identifier for identifying the group (announcement cluster) of an announcement supported by a service indicated by the service identification Sld.

[0027] FIG (0/19) related to announcement switching for an ensemble received at present is constituted by a cluster Id, an announcement switching (Asw) flag, a new flag, a region flag, and a sub-channel identification (SubChId). The Asw flag represents the broadcast state of an announcement cluster indicated by each cluster Id. When an announcement belonging to the cluster Id is broadcasted, in the Asw flag, the bit corresponding to an announcement type in a broadcasting state is set to be "1". When no announcement is broadcasted, all the Asw flags corresponding to the cluster Id are cleared to be "0". Since the new flag is a flag representing whether a concerned announcement is an announcement transmitted for the first time (flag = "1") or a retransmitted announcement (flag = "0") which was broadcasted.

[0028] When the FIG (0/18) related to an announcement support and the FIG (0/19) related to announcement switching are analyzed, announcements supported by the services can be known. In addition, it can be known whether the announcement is in a broadcasting state, if the announcement is in a broadcasting state, whether the announcement is a retransmitted announcement.

[0029] FIG (0/6) and FIG (0/21) related to frequency information of a service and an ensemble are constituted by service identifications Sld of services and the reception frequency of an ensemble at which a concerned service can be received. When the FIG (0/6) and FIG (0/21) are analyzed, for example, the reception

frequency of an ensemble at which a certain service can be received can be known.

[0030] FIG (0/25) related to an announcement support for an ensemble which is not received at present is constituted by an announcement support (Asu) flag and an ensemble identification Eld. The Asu flag is a flag representing an announcement type supported by a service (the service of an ensemble which is not received at present) specified by the service identification Sld at the start. For the ensemble identification Eld, an identification number corresponding to an ensemble which can receive a concerned announcement is set.

[0031] FIG (0/26) related to announcement switching for an ensemble which is not received at present is constituted by an announcement switching (Asw) flag, a new flag, a region flag, and an ensemble identification Eld. For the ensemble identification Eld, an identification number corresponding to an ensemble which can receive a concerned announcement is set.

[0032] The DAB receiver 1 according to this embodiment has the above arrangement. The operation of the DAB receiver 1 will be described below. FIG. 3 is a flow chart showing a procedure performed when, parallel to an operation of receiving the DAB service to output the voice of the service, an announcement included in the same service is received and recorded or output as a voice. Assume that the voice of any service is output from the loudspeaker 18 at present. The operation unit 38 is operated by a user to designate, e.g., an announcement to be searched such as a news broadcast or traffic information. It is assumed that an operation for searching the announcement (e.g., a searching operation in a watch mode for monitoring the presence/absence of a designated announcement and performing searching until the announcement is detected) is being executed.

[0033] The controller 34 monitors whether reproduction of a recorded announcement is instructed by the operation unit 38 operated by a user (step 101). If the reproduction is instructed, it is checked whether an audio signal corresponding to the announcement is recorded on the recorder 22 (step 102). When the audio signal of an announcement is recorded on the recorder 22, the controller 34 reads the recorded audio signal and transmits a switching signal to the switch unit 36 to output the audio signal output from the recorder 22 toward the amplifier 16, thereby reproducing a voice (step 103).

[0034] Upon completion of the above reproducing operation of the voice, when reproduction of the recorded announcement is not instructed (NO in step 101) or when the announcement recorded on the recorder 22 has no voice (NO in step 102), then the controller 34 checks whether a broadcast of an announcement serving as an object to be searched and designated by a user in advance is started (step 104). Whether the broadcast of a designated announcement is started is checked by the following manner. That is,

when an announcement having an Asw flag to be searched is detected from the FIG (0/19) related to announcement switching for an ensemble received at present, it is determined that the broadcast of the designated announcement is started.

[0035] When the broadcast of the designated announcement is started, the controller 34 checks whether an audio output of the designated announcement is instructed (step 105). If the audio output is not instructed, the controller 34 checks whether recording is instructed (step 106). These instructions are performed in advance as needed by the operation unit 38 operated by a user. If any instruction is not made, returning to step 101, a monitor state of the instruction for reproducing the recorded announcement is continued.

[0036] If audio recording of the designated announcement is instructed, the controller 34 starts the audio recording of the designated announcement (step 107). More specifically, the controller 34 switches the selection output from the switch unit 20 to the recorder 22, and outputs identification information corresponding to the announcement which begins to be broadcasted to the DAB decoder 6. The DAB decoder 6 extracts the MPEG audio data of the announcement corresponding to the output identification information to input the MPEG audio data to the audio decoder 10. The MPEG audio data is converted into PCM audio data by the audio decoder 10. The PCM audio data is converted into an analog signal by the D/A converter 14 to record the analog signal on the recorder 22.

[0037] When recording is started, the controller 34 monitors whether the broadcast of the designated announcement is ended (step 108). As described above, the FIG (0/19) related to announcement switching for an ensemble received at present includes an announcement which has an Asw flag to be searched and which is being broadcasted at present. For this reason, when the announcement having the Asw flag to be searched is not included in FIG (0/19), it is determined that the announcement is ended.

[0038] Upon completion of the broadcast of the designated announcement, the controller 34 ends audio recording of an announcement on the recorder 22 (step 109). The end of the audio recording is displayed on the display unit 40 to notify a user of the end of the audio recording (step 110). Thereafter, returning to step 101, it is monitored whether reproduction of the voice of the recorded announcement is instructed.

[0039] When the voice of the designated announcement is not recorded, and the voice is instructed to be output from the loudspeaker 18 (YES in step 105), the controller 34 decreases the volume of a service whose voice is output at present (step 111), and the voice of the designated announcement is output while overlapping the voice of the service (step 112). More specifically, the controller 34 switches the selection output of the switch unit 20 to the switch unit 36, and outputs identification information corresponding to the

announcement which begins to be broadcasted to the DAB decoder 6. The DAB decoder 6 extracts the MPEG audio data of the announcement corresponding to the output identification information to input the MPEG audio data to the audio decoder 10. The MPEG audio data is converted into PCM audio data by the audio decoder 10. The PCM audio data is converted into an analog signal by the D/A converter 14, and the voice of the announcement is output from the loudspeaker 18 together with the voice of the service. Since the volume of the output voice of the service is decreased in step 111, the voice of the announcement is output at a large volume, and the voice of the service is output at a small volume.

[0040] The controller 34 checks whether the broadcast of the announcement is ended (step 113). If the broadcast is not ended, the controller 34 checks whether the audio output of the announcement is canceled (step 114). If the audio output is not canceled, returning to step 113, monitoring of the end of the broadcast of the announcement is continued. If the broadcast of the announcement is ended, or the audio output of the announcement is canceled by a user, the controller 34 stops the audio output of the announcement (step 115) to increase the volume of the voice of the service whose volume has been decreased (step 116). Thereafter, returning to step 101, the controller 34 monitors whether reproduction of the voice of the recorded announcement is instructed.

[0041] In this manner, since the DAB receiver 1 according to this embodiment has the two audio decoders 8 and 10, even if the voice of the service is being output by using the audio decoder 8 which is one of the two audio decoders, an audio signal of the announcement is formed by using the other audio decoder 10. According to an instruction of a user, the voice of the announcement can be output while overlapping the voice of the service, or the voice of the service can be recorded on the background. For this reason, when the user listens the voice of the service, the voice is not suddenly switched to the voice of an announcement which is detected, and a cumbersome operation for returning the output voice switched as described above to the original voice is not necessary. Therefore, the operability can be improved. When the voice of the announcement is recorded, the user does not fail to listen the designated announcement, and, at the same time, the voice of the recorded announcement can be listened at favorite time, so that the DAB receiver 1 which can be easily used can be realized.

[0042] The present invention is not limited to the embodiment described above, and various embodiments of the present invention can be effected without departing from the spirit and scope of the invention. For example, in the above embodiment, the voice of a service is output, and the voice of the designated announcement is output while overlapping the voice of the service or recorded. However, other combinations can be

effected. For example, in outputting the voice of the service, the voice of another designated service may be output while overlapping the voice of the above service or recorded. In addition, in outputting the voice of an announcement, the voice of another designated announcement may be output while overlapping the voice of the above announcement or recorded. In contrast to the embodiment described above, in outputting the voice of an announcement, the voice of a designated service may be output while overlapping the voice of the above announcement or recorded.

[0043] A procedure performed when a designated service is searched to output or record the voice of the service is as follows. That is, with respect to searching for a service by the controller 34, as described above, Int codes representing the types of services are included in the FIG (0/17) related to a program type. For this reason, when the Int code is used, it can be examined whether another service in an ensemble including the service received at present coincides with a service to be searched.

[0044] With respect to an audio output of a service, the controller 34 acquires the service identification code SId of a service detected by searching for a service with reference to the FIG (0/17) related to the program type, and the controller 34 analyzes the FIG (0/2) related to the service list in the ensemble to check whether the service detected by the searching is included in the ensemble received at present. If the service is included in the ensemble received at present, the controller 34 outputs the service identification information of this service to the DAB decoder 6, and the DAB decoder 6 inputs the MPEG data of the service corresponding to the service identification information to the audio decoder 10. The MPEG audio data is converted into PCM audio data by the audio decoder 10, and the PCM audio data is converted into analog audio signal by the D/A converter 14. The analog audio signal is output from the loudspeaker 18 or recorded on the recorder 22.

[0045] In the above embodiment, when an announcement is recorded, it is displayed that the announcement is recorded. However, in place of this display, it may be notified by a voice from the loudspeaker 18 that the announcement is recorded. A means for notifying a user is not limited to the display.

[0046] In the above embodiment, in outputting the voice of a designated service of DAB, the voice of an announcement of DAB is output while overlapping the voice of the service or recorded. However, in outputting the voice of each service or the like received by an FM broadcast, an AM broadcast, or an RDS broadcast, or in outputting a reproduced voice from the CD player 32, the voice of a designated service of DAB or a designated announcement of DAB may be output while overlapping the voice of the above service or the reproduced voice or recorded. In this case, since the two audio decoders and the two D/A converters are prepared, the following embodiment can be effected. That is, for

example, when two programs of DAB are designated, one program which is detected first is output from the loudspeaker 18 by using the audio decoder 8 and the D/A converter 12 while overlapping the voice of an FM broadcast or the like. When the other program is detected in outputting the voice of the FM broadcast or the like, the voice of the other program is recorded on the recorder 22 by using the audio decoder 10 and the D/A converter 14.

[0047] In the above embodiment, decoded data output from the audio decoder 10 is converted into an analog audio signal by passing through the D/A converter 14, and the analog audio output is recorded on the recorder 22. However, data output from the audio decoder 10 or data output from the DAB decoder 6 before the data is input to the audio decoder 10 may be directly stored in various types of storage media such as a semiconductor memory, a hard disk, or a compact cassette tape. In the recorder 22, since a capacity used when the voice of a service is recorded is considerably different from a capacity used when the voice of an announcement is recorded, independent recording media can be used. In addition, both the voices of a service and an announcement need not be recorded, the voice of only an announcement having a short recording time may be recorded. In this case, the recorder 22 is preferably constituted by a semiconductor memory, and preferably stores digital data which is not input to the D/A converter 14. As the audio decoders 8 and 10, a plurality of audio decoders, i.e., three or more audio decoders may be arranged.

[0048] As has been described above, according to the present invention, after a plurality of program data multiplexed on one signal are separated from each other, the plurality of program data can be parallel decoded. For this reason, the voices of a plurality of programs can be output at once. The moment the voice of any program is output, the decoded data of the remaining programs are stored on the background. In this case, a plurality of programs broadcasted in the same period of time can be received at once. In particular, it is notified that the storage operation is ended after the storage operation is ended, the voice or the like of the program is output on the basis of the stored decoded data when reproduction of the program is instructed by a user. In this case, a plurality of programs broadcasted in overlapping periods of time can be output in different periods of time, both the programs can be enjoyed without failing to catch any program. In addition, the decoded data of any program is stored in the background as described above. For this reason, the voices of the remaining programs are not interrupted, and the programs are not switched each time setting for searching a desired program is performed. A cumbersome operation for returning the above state to the original state is not necessary, and operability can be improved. Furthermore, decoded data output from any one of the decoding means is not stored and then read to output the voice or the like of the

program, and the voices of the plurality of programs may be output such that the tones of the programs are made different from each other. In this case, both the programs can be listened.

Claims

1. A multi-broadcasting receiver characterized by comprising:

reception means (4, 6, 34) for receiving a signal on which a plurality of programs are multiplexed;

separation means for separating a plurality of program data multiplexed on the signal received by the reception means (4, 6, 34); and plurality of decoding means (8, 10) for independently decoding the plurality of program data separated by said separation means (6).

2. A multi-broadcasting receiver according to claim 1, characterized in that

said multi-broadcasting receiver is a DAB receiver;

said reception means is constituted by a DAB front/end unit (4) for receiving a signal on which at least a plurality of programs are multiplexed to output the received signal as an intermediate frequency signal, a DAB decoder (6) for decoding the intermediate frequency signal output from the DAB front/end unit (4), and controller (34) for performing various types of controls; said separation means, which is said DAB decoder (6), for independently decoding at least two programs selected from a plurality of received program data and separating and outputting the decoded programs as decoded data; and

said plurality of decoding means is constituted by at least two audio decoders (8, 10).

3. A multi-broadcasting receiver according to claim 2, characterized in that

said DAB decoder (6) performs signal processing such as an orthogonal demodulating process, an FFT demodulating process, a decoding process, and an error detecting/correcting process to the intermediate frequency signal output from the DAB front/end unit (4).

4. A multi-broadcasting receiver according to claim 1 or 2, characterized in that

said audio decoders (8, 10) perform an expanding process to the decoded data output from the DAB decoder (6) to independently out-

put PCM audio data.

5. A multi-broadcasting receiver according to any of claims 1 to 4 further comprising

5
decoded data storage means (22) for storing
decoded data output from one of said plurality
of decoding means (8, 10), and
characterized in that a storing operation of the
decoded data is performed by said decoded
data storage means (22) in parallel to a pro-
gram output operation based on the decoded
data output from said decoding means (8) to
which said decoded data storage means is not
connected. 10
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6. A multi-broadcasting receiver according to claim 5,
characterized by further comprising:

notification means (40) for, after a data storage 20
operation by the decoded data storage means
(22) is ended, notifying that the data storage
operation is ended; and
program reproduction means (34), when pre-
determined program reproduction is instructed 25
according to a notification by said notification
means (40), reading decoded data from said
decoded data storage means (22) prior to a
program output operation based on the
decoded data output from said decoding 30
means (8) to which said decoded data storage
means (22) is not connected, and performing a
program output operation on the basis of the
read decoded data. 35

7. A multi-broadcasting receiver according to claim 6,
characterized in that

said notification means (40) performs notifica-
tion by a display or a voice. 40

8. A multi-broadcasting receiver according to claim 6
or 7, characterized in that

said data storage means (22) is a recording 45
medium such as a semiconductor memory or a
hard disk.

9. A multi-broadcasting receiver according to any of
claims 1 to 8, further comprising 50

a switching unit (36) for selectively performing
a switching operation of signals, and
characterized in that, when decoded data is
stored in said decoded data storage means 55
(22), said controller (34) reads the stored
decoded data, transmits a switching signal to
said switching unit (36), and reproduces the

read decoded data.

10. A multi-broadcasting receiver according to any of
claims 1 to 9, characterized in that

voice output operations of a plurality of pro-
grams based on a plurality of decoded data
output from said plurality of decoding means
(8, 10) are parallel performed, a voice level of
any one of the plurality of programs is made
high, and voice levels of the remaining pro-
grams are made low.

FIG. 1

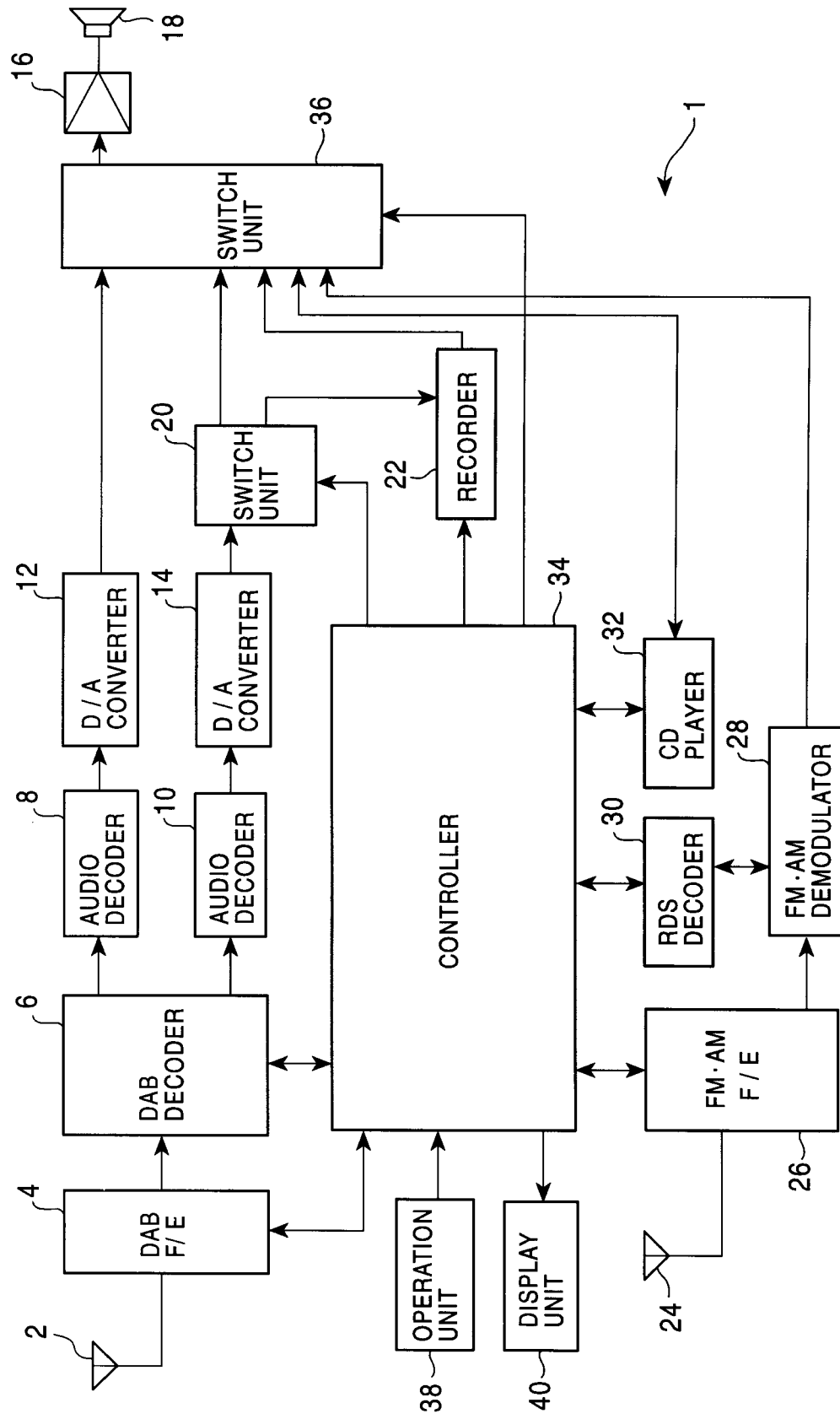


FIG. 2

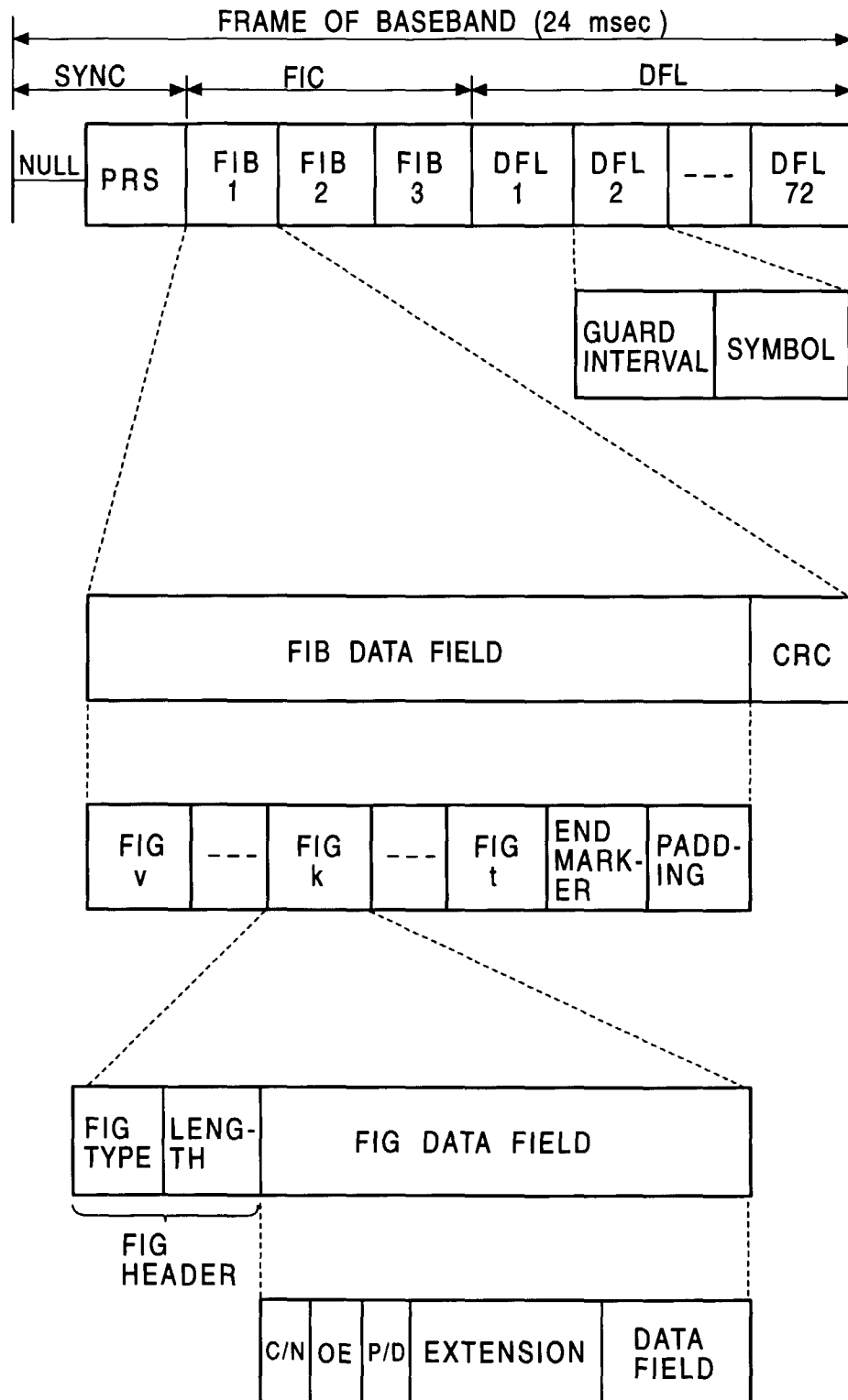


FIG. 3

