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DIGITAL BROADCASTING RECEIVER

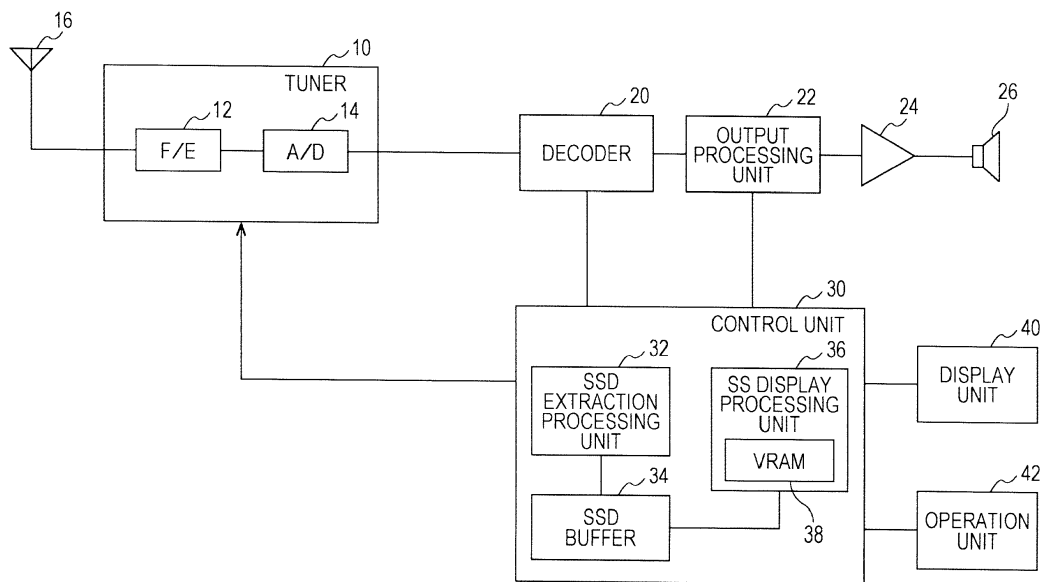
(57)

A digital broadcasting receiver that can suppress the delay of the updating period of image is provided.

A DAB receiver includes a tuner (10) and a decoder (20) that receive slide show data in order of distribution, a slide show data extraction processing unit (32) that stores the received slide show data in a slide show data buffer (34) having a predetermined capacity, and a slide show display processing unit (36) that reads and displays a plurality of slide show data after the plurality of slide

show data corresponding to one image is received and stored. When the slide show data extraction processing unit (32) has received first slide show data corresponding to a second image before receipt of a plurality of slide show data corresponding to a first image is completed, the slide show data extraction processing unit discards the slide show data corresponding to the first image stored until then, and starts an operation to store the slide show data corresponding to the second image.

FIG. 1



Description

[0001] The present invention relates to a digital broadcasting receiver that receives program data according to digital audio broadcasting (DAB) broadcasting standard, and the like.

[0002] Conventionally, DAB receivers that receive digital radio broadcasting conforming to an European standard are known (for example, see Patent Literature 1). The DAB receivers have a function of slide show to display images, which are being sent, in order of receipt, in addition to a function to receive broadcasting data and output audio. This slide show receives slide show data having a predetermined capacity (8 Kbytes), to which segment numbers in ascending order are allocated, in numerical order, and displays one image when a capacity reaches data capacity of the one image (up to 50 Kbytes). In this way, an image to be displayed is sequentially updated every time receipt of data of each one image is completed.

Citation List

Patent Literature

[0003] Patent Literature 1: JP 2011-114478 A

[0004] By the way, in the DAB receiver disclosed in Patent Literature 1, a plurality of images is received in order and displayed. There is a problem that, when first slide show data that configures a second image is received before last slide show data that configures a first image is received, the data that configure these two images are discarded, and an updating period of image is substantially delayed. If the updating period of image is delayed, correspondence between the image, and a sound output in parallel deviate, and display content becomes unnatural. Therefore, it is not desirable.

[0005] The present invention has been made in view of the foregoing, and an objective of the present invention is to provide a digital broadcasting receiver that can suppress the delay of the updating period of image.

[0006] The invention relates to a digital broadcasting receiver according to claim 1. Embodiments are disclosed herein below and in the dependent claims.

[0007] According to an aspect, a digital broadcasting receiver according to the present invention that receives a plurality of divided data and displays an image, the divided data being obtained such that image data necessary for displaying one image is divided and distributed, includes a data receiving unit configured to receive the divided data in distributed order, a divided data storing processing unit configured to store the divided data received by the data receiving unit to a storage unit having a predetermined capacity, and an image display unit configured to read and display the plurality of divided data from the storage unit, after the plurality of divided data corresponding to one image is received and stored in the storage unit. When first divided data corresponding to a

second image has been received by the data receiving unit before receipt of the plurality of divided data corresponding to a first image is completed, the divided data storing processing unit discards the divided data corresponding to the first image stored in the storage unit until then, and starts an operation to store the divided data corresponding to the second image to the storage unit.

[0008] Even if the divided data corresponding to the second image has been received before the receipt of the divided data corresponding to the first image is completed, only the divided data of the first image is discarded, and the second image can be displayed. Therefore, the delay of the updating period of image can be suppressed, compared with a case where both the two images are not displayed.

[0009] Further, according to an embodiment a data amount of each image is determined for each image, and the divided data storing processing unit desirably discards the divided data corresponding to the first image stored in the storage unit until then, when the first divided data corresponding to the second image has been received before a total value of received data amounts of the divided data corresponding to the first data reaches the data amount of the first image. Accordingly, whether discarding the divided data can be easily determined based on a result of comparison between the total value of the data amounts of the received divided data and the data amount of the image.

[0010] Further, according to an embodiment the plurality of divided data is associated with identification information that identifies a corresponding image, and the divided data storing processing unit desirably identifies which of the first and second images the divided data corresponds, based on the identification information. Accordingly, which image the divided data corresponds can be easily determined.

[0011] Further, according to an embodiment the divided data storing processing unit desirably withholds the discard of the divided data corresponding to the first image stored in the storage unit until then, when the first divided data corresponding to the second image has been received by the data receiving unit and a capacity of an unused area of the storage unit is a predetermined value or more at that point, before the receipt of the plurality of divided data corresponding to the first image is completed. Especially, the predetermined value is desirably the same as the data amount of the divided data. When there is a sufficient free space of the storage unit, the discard of the divided data is withheld, whereby the first image may be able to be displayed. In this case, lack of the image can be avoided.

[0012] Further, according to an embodiment the divided data storing processing unit desirably discards the divided data, after instructing the display unit to display the first image using the divided data before discarding the divided data corresponding to the first image stored in the storage unit until then, when the first divided data corresponding to the second image has been received

by the data receiving unit before the receipt of the plurality of divided data corresponding to the first image is completed. Accordingly, the first image, of which receipt of all the divided data is not completed, can be forcibly displayed, and lack of the entire first image can be avoided.

[0013] Further, according to an embodiment the predetermined capacity of the storage unit is desirably the same as a maximum data amount of one image. Accordingly, the capacity of the storage unit can be made small and reduction of cost can be achieved, and the delay of the updating period of image can be suppressed.

Brief Description of Drawings

[0014]

FIG. 1 is a diagram illustrating a configuration of a DAB receiver of an embodiment.

FIG. 2 is a diagram illustrating a frame configuration of a DAB broadcasting signal.

FIG. 3 is a flowchart illustrating an operation procedure of displaying images of a slide show in order of receipt.

FIG. 4 is a flowchart illustrating an operation procedure of a modification of displaying images of a slide show in order of receipt.

FIG. 5 is a flowchart illustrating an operation procedure of another modification of displaying images of a slide show in order of receipt.

Description of Embodiments

[0015] Hereinafter, a digital audio broadcasting (DAB) receiver of an embodiment to which a digital broadcasting receiver of the present invention is applied will be described with reference to the drawings. FIG. 1 is a diagram illustrating a configuration of a DAB receiver of an embodiment. As illustrated in FIG. 1, the DAB receiver of the present embodiment includes a tuner 10, a decoder 20, an output processing unit 22, an amplifier 24, a speaker 26, a control unit 30, a display unit 40, and an operation unit 42. This DAB receiver is mounted on a vehicle.

[0016] The tuner 10 and the decoder 20 are used to receive a broadcasting program. To be specific, the tuner 10 and the decoder 20 receive a digital broadcasting signal (DAB broadcasting signal) broadcasted in a multi-carrier system using orthogonal frequency division multiplexing (OFDM) as a modulation system, and perform demodulation processing and decoding processing for the received signal to reproduce sound data. For example, the tuner 10 includes a front end (F/E) 12 and an analog-digital converter (A/D) 14. The front end 12 converts the broadcasting signal received through an antenna 16 into an intermediate frequency signal. The analog-digital converter 14 converts the analog intermediate frequency signal into digital data (intermediate frequency data). The decoder 20 performs demodulating processing and decoding processing for the intermediate frequency data, and extracts a service (an audio service or a data service) specified by a user by operating the operation unit 42.

quency data, and extracts a service (an audio service or a data service) specified by a user by operating the operation unit 42.

[0017] In present embodiment, after the intermediate frequency signal output from the front end 12 is converted into the digital data, the demodulating processing and the decoding processing are performed by the decoder 20. However, up to which part is processed in the analog processing and from which part is processed in the digital processing can be appropriately changed.

[0018] FIG. 2 is a diagram illustrating a frame configuration of the DAB broadcasting signal. As illustrated in FIG. 2, a frame of the DAB broadcasting signal is configured from a synchronization channel, a first information channel FIC, and a main service channel MSC.

[0019] The synchronization channel is made of a NULL symbol and a phase reference symbol PRS, and is used to detect a head portion of the frame and synchronize the frame. The first information channel FIC is an area that describes content of the main service channel MSC, and includes time/date data, array data of a service (program), a label (name) of a service, a service identification code SID, and the like. A plurality of first information groups (FIGs) is energy-spread, and configures one first information block (FIB) that is a predetermined information unit. Further, each FIB is convolutionally encoded, and three convolutionally-encoded FIBs configure one FIG. The main service channel MSC includes audio data and the like respectively corresponding to a plurality of services. This main service channel MSC includes a plurality of energy-spread, convolutionally-encoded, and time-interleaved sub channels (SubChs).

[0020] The output processing unit 22 is input the audio data output from the decoder 20, and performs variable control of the volume, superimposing processing of another sound (for example, an operation sound), and the like. The amplifier 24 amplifies the audio data output from the output processing unit 22 and outputs a sound after amplification from the speaker 26. In reality, the audio data subjected to various types of processing in the output processing unit 22 needs to be converted into an analog sound signal. This conversion processing may be performed in the output processing unit 22. However, a digital/analog converter may be provided in a subsequent stage of the output processing unit 22, and the conversion may be performed.

[0021] The control unit 30 controls a receiving operation of the entire DAB receiver and performs image display processing based on slide show data. Therefore, the control unit 30 includes a slide show data (SSD) extraction processing unit 32, a slide show data (SSD) buffer 34, and a slide show (SS) display processing unit 36. Note that configurations related to control of usual receiving operations (a configuration necessary for an operation to select a service (program) to be received, an operation to display received content about the service being in receipt, and the like) are not illustrated.

[0022] The slide show data extraction processing unit

32 extracts slide show data from the frame of the DAB broadcasting signal received using the tuner 10 and the decoder 20, the slide show data being one of data services. A slide show is images made of still images (JPEG data, bitmap data, or the like), moving images, and the like corresponding to sounds (music) being in output. In the slide show to be processed in the present embodiment, image data corresponding to still images, which are being sent, is received and is displayed in order of receipt.

[0023] Image data corresponding to each image has a data amount of up to 50 Kbytes, and is configured from a plurality of slide show data, each slide show data being fixed length data of 8 Kbytes. Each image is associated with a different transport ID. Further, segment numbers in ascending order from "0" are attached to the plurality of slide show data that configures each image data, and a necessary number of the slide show data is received in order of the segment numbers "0", "1", "2" Further, the size (data amount) of each image data is included in the first information channel FIC as header information, and when a total value of the data amounts of the slide show data received in order of the segment numbers reaches the aforementioned size, receipt of all data of the image data is considered to be completed, and the processing is moved onto display processing.

[0024] The slide show data buffer 34 temporarily stores, before display, the slide show data received by the tuner 10 and the decoder 20, and extracted by the slide show data extraction processing unit 32. For example, the slide show data buffer 34 has the same capacity as 50 Kbytes that is the maximum data amount of one image. Note that the capacity of the slide show data buffer 34 may not necessarily be the same as 50 Kbytes that is the maximum data amount of one image. However, the capacity of the slide show data buffer 34 is favorably 50 Kbytes, which is the minimum capacity by which one image can be reliably displayed, in the perspective of cost reduction. The slide show data buffer 34 may be provided outside the control unit 30.

[0025] After the plurality of slide show data corresponding to one image is received and stored in the slide show data buffer 34, the slide show display processing unit 36 reads the plurality of slide show data from the slide show data buffer 34 and displays the plurality of slide show data in the display unit 40. For example, the slide show display processing unit 36 includes a video RAM (VRAM) 38 corresponding to a display screen of the display unit 40, and reads the plurality of slide show data corresponding to one image stored in the slide show data buffer 34 and writes the plurality of slide show data to the video RAM 38, so that the image display processing of the slide show for the display unit 40 is performed.

[0026] The above-described tuner 10 and decoder 20 correspond to a data receiving unit, the slide show data extraction processing unit 32 corresponds to a divided data storing processing unit, the slide show data buffer 34 corresponds to a storage unit, and the slide show dis-

play processing unit 36 corresponds to an image display unit, respectively. Further, the above-described slide show data corresponds to divided data, and the transport ID corresponds to identification information that identifies an image, respectively.

[0027] The DAB receiver of the present embodiment has such a configuration. Next, an image display operation of the slide show will be described.

[0028] FIG. 3 is a flowchart illustrating an operation procedure of displaying images of a slide show in order of receipt. The slide show data extraction processing unit 32 determines whether having received (extracted) the slide show data (step 100). In a case where no slide show data has been received, negative determination is performed and the determination is repeated.

[0029] When the slide show data has been received, affirmative determination is performed in the determination of step 100. Next, the slide show data extraction processing unit 32 determines whether the segment number of the extracted slide show data is "0" (step 102). When the segment number is "0", that is, when first slide show data that configures the image data has been received, the affirmative determination is performed. In this case, the slide show data extraction processing unit 32 holds the transport ID corresponding to the slide show data (step 104). Further, the slide show data extraction processing unit 32 discards the slide show data of the transport ID held corresponding to a previous image, from the slide show data buffer 34 (step 106), and then stores the slide show data extracted this time to the slide show data buffer 34 (step 108). Next, the slide show data extraction processing unit 32 determines whether all the slide show data of the same transport ID have been completed (step 110). This determination is performed by checking whether the total value of the data amounts of the slide show data received in order of the segment numbers has reached the size of the image data corresponding to these slide show data. When unreceived slide show data exists, the negative determination is performed in the determination of step 110, and the processing is returned to step 100 and the receiving determination of the slide show data is repeated.

[0030] Further, when the segment number of the received slide show data is a number other than "0", the negative determination is performed in the determination of step 102. Next, the slide show data extraction processing unit 32 determines whether the transport ID of the slide show data received this time is the same as the transport ID held before in step 104 (step 112). When the transports ID are the same, the affirmative determination is performed, and the processing is moved onto step 108 and the slide show data received this time is stored in the slide show data buffer 34. Meanwhile, when the transport ID is different, the negative determination is performed in the determination of step 112. In this case, the slide show data extraction processing unit 32 does not store the slide show data received this time and discard the data (step 114). Following that, the processing

is returned to step 100, and the receiving determination of the slide show data is repeated.

[0031] Further, when all the slide show data of the same transport ID has been completed, the affirmative confirmation is performed in the determination of step 110. Next, the slide show display processing unit 36 reads all the slide show data corresponding to one image stored in the slide show data buffer 34, and displays the slide show data in the display unit 40 (step 116). Following that, the slide show display processing unit 36 (or the slide show data extraction processing unit 32) discards the slide show data in the slide show data buffer 34 (step 118). Following that, the processing is returned to step 100, and the receiving determination of the slide show data is repeated.

[0032] As described above, in the DAB receiver of the present embodiment, even when the slide show data corresponding to the second image is received before receipt of the slide show data (divided data) corresponding to the first image is completed, only the slide show data of the first image is discarded, and the second image can be displayed using the slide show data received thereafter. Therefore, the delay of the updating period of image can be suppressed, compared with a case where these two images are not displayed.

[0033] Further, the data amount of each image is determined for each image, and when the first slide show data corresponding to the second image has been received before the total value of the received data amounts of the slide show data corresponding to the first image reaches the data amount of the one image, the slide show data corresponding to the first image stored in the slide show data buffer 34 until then is discarded. In this way, whether the slide show data is discarded can be easily determined based on a comparison result of the total value of the data amounts of the received slide show data and the data amount of the image.

[0034] Further, the plurality of slide show data is associated with the transport ID as the identification information that identifies the corresponding image, and the slide show data extraction processing unit 32 identifies which image the slide show data corresponds, based on the transport ID. Accordingly, which image the slide show data corresponds can be easily determined.

[0035] Further, the storage capacity of the slide show data buffer 34 is set equal to the maximum data amount of one image (for example, 50 Kbytes). Accordingly, the storage capacity of the slide show data buffer 34 can be made small and the cost reduction can be achieved, and the delay of the updating period of image can be suppressed.

[0036] FIG. 4 is a flowchart illustrating an operation procedure of a modification of displaying images of a slide show in order of receipt. A data amount of each image is up to 50 Kbytes. However, it is rare that image data of that data amount is sent, and typically the image data is about 20 to 30 Kbytes. Therefore, it can be considered that, when the data amount of a first image is

small and there is a sufficient free space in a slide show data buffer 34, slide show data of the first image may not be immediately discarded because the slide show data of a second image has been received. The operation procedure illustrated in FIG. 4 reflects the above idea. The operation procedure illustrated in FIG. 4 is different from the operation procedure illustrated in FIG. 3 in that step 105 is added to between steps 104 and 106, and steps 112 and 114 are replaced with step 112A. Hereinafter, description will be given, focusing on operations of these added and replaced steps 105 and 112A.

[0037] In a case where a segment number of received slide show data is "0" (affirmative determination in determination of step 102) and after a transport ID is held (step 104), a slide show data extraction processing unit 32 determines whether the slide show data buffer 34 has a free space (a capacity of an unused area is a predetermined value or more) (step 105). For example, since the data amount of each slide show data is 8 Kbytes, when the free space is 8 Kbytes or more (the capacity being in use of the slide show data buffer 34 is 42 Kbytes or less), one slide show data can be stored in the slide show data buffer 34. When the free space is a predetermined value (= 8 Kbytes) or more, the affirmative determination is performed in the determination of step 105 and the processing is moved onto step 108 without performing the operation of step 106 (discard of the slide show data), and the slide show data extraction processing unit 32 stores the slide show data extracted this time to the slide show data buffer 34. Further, when the free space is smaller than the predetermined value, negative determination is performed in the determination of step 105. In this case, the processing is moved onto step 106, and the slide show data extraction processing unit 32 discards the slide show data of the transport ID held corresponding to a previous image, from the slide show data buffer 34.

[0038] Further, when the segment number of the received slide show data is a number other than "0", and the negative determination is performed in the determination of step 102, next, the slide show data extraction processing unit 32 determines whether the slide show data buffer 34 has a free space (the capacity of the unused area is a predetermined value or more, this free space is 8 Kbytes, which is the same as the case of step 105) (step 112A). When the free space is the predetermined value or more, the affirmative determination is performed and the processing is moved onto step 108, and the slide show data extraction processing unit 32 stores the slide show data extracted this time to the slide show data buffer 34. Further, when the free space is smaller than the predetermined value, the negative determination is performed in the determination of step 112A. In this case, the processing is moved onto step 106, and the slide show data extraction processing unit 32 discards the slide show data of the transport ID held corresponding to a previous image, from the slide show data buffer 34.

[0039] As described above, the discard of the slide

show data is withheld when there is a sufficient free space of the slide show data buffer 34, so that first image may be able to be displayed. In this case, lack of an image can be avoided.

[0040] FIG. 5 is a flowchart illustrating an operation procedure of another modification of displaying images of a slide show in order of receipt. In the operation procedure illustrated in FIG. 3, when the first slide show data corresponding to the second image has been received before receipt of all the slide show data corresponding to the first image is completed, the slide show data corresponding to the first image is discarded. However, the first image may be forcibly displayed before the slide show data is discarded. In a case where the image data of the first image is in the bitmap format, or the like, even if a part of slide show data is unreceived, the first image (having a partial deficit) can be displayed using received slide show data. The operation procedure illustrated in FIG. 5 is different from the operation procedure illustrated in FIG. 3 in that step 105A is added to between steps 104 and 106. Hereinafter, description will be given, focusing on an operation of step 105A.

[0041] When a segment number of received slide show data is "0" (affirmative determination in determination of step 102), and after a transport ID is held (step 104), a slide show display processing unit 36 reads the slide show data of the transport ID held corresponding to a previous image, from a slide show data buffer 34, and displays the slide show data in a display unit 40 (step 105A). Following that, the processing is moved onto step 106, and a slide show data extraction processing unit 32 discards the slide show data of the transport ID held corresponding to the previous image, from the slide show data buffer 34.

[0042] As described above, the first image, of which receipt of all the slide show data is not completed, is forcibly displayed, whereby lack of the first image can be avoided even when the slide show data corresponding to the second image is received first.

[0043] Note that the present invention is not limited to the above-described embodiment, and various modifications can be made within the scope of the claims of the present invention. In the above-described embodiment, a case of realizing the function of a slide show by the DAB receiver has been described. However, the present invention can be applied to a case of displaying one image after a plurality of divided data, which is to be received in order, is received in other receivers.

[0044] As described above, according to the present invention, even if the divided data corresponding to the second image is received before the receipt of the divided data corresponding to the first image is completed, only the divided data of the first image is discarded, and the second image can be displayed. Therefore, the delay of the updating period of image can be suppressed, compared with a case where these two images cannot be displayed.

Reference Signs List

[0045]

5	10	tuner
	20	decoder
	22	output processing unit
	30	control unit
	32	slide show data (SSD) extraction processing unit
10	34	slide show data (SSD) buffer
	36	slide show (SS) display processing unit
	40	display unit
	42	operation unit

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Claims

1. A digital broadcasting receiver that is configured to receive a plurality of divided data and to display an image, the divided data being obtained such that image data necessary for displaying one image is divided and distributed, the digital broadcasting receiver comprising:

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a data receiving unit (10, 20) configured to receive the divided data in distributed order;

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a divided data storing processing unit (32) configured to store the divided data received by the data receiving unit (10, 20) to a storage unit (34) having a predetermined capacity; and

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an image display unit (36) configured to read and display the plurality of divided data from the storage unit (34), after the plurality of divided data corresponding to one image is received and stored in the storage unit (34), wherein, when first divided data corresponding to a second image has been received by the data receiving unit (10, 20) before receipt of the plurality of divided data corresponding to a first image is completed, the divided data storing processing unit is configured to (32) discard the divided data corresponding to the first image stored in the storage unit (34) until then, and to start an operation to store the divided data corresponding to the second image to the storage unit (34).

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2. The digital broadcasting receiver according to claim 1, wherein

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a data amount of each image is determined for each image, and

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the divided data storing processing unit (32) is configured to discard the divided data corresponding to the first image stored in the storage unit (34) until then, when the first divided data corresponding to the second image has been received before a total value of received data amounts of the divided data corresponding to the first image reaches the data amount of the first image.

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3. The digital broadcasting receiver according to claim 1 or 2, wherein the plurality of divided data is associated with identification information that identifies a corresponding image, and the divided data storing processing unit (32) is configured to identify which of the first and second images the divided data corresponds, based on the identification information. 5 10
4. The digital broadcasting receiver according to one of claims 1 to 3, wherein the divided data storing processing unit (32) is configured to withhold the discard of the divided data corresponding to the first image stored in the storage unit (34) until then, when the first divided data corresponding to the second image has been received by the data receiving unit (10, 20) and a capacity of an unused area of the storage unit (34) is a predetermined value or more at that point, before the receipt of the plurality of divided data corresponding to the first image is completed. 15 20
5. The digital broadcasting receiver according to claim 4, wherein the predetermined value is the same as the data amount of the divided data. 25
6. The digital broadcasting receiver according to one of claims 1 to 5, wherein the divided data storing processing unit (32) is configured to discard the divided data, after instructing the display unit to display the first image using the divided data before discarding the divided data corresponding to the first image stored in the storage unit (34) until then, when the first divided data corresponding to the second image has been received by the data receiving unit (10, 20) before the receipt of the plurality of divided data corresponding to the first image is completed. 30 35 40
7. The digital broadcasting receiver according to one of claims 1 to 6, wherein the predetermined capacity of the storage unit (34) is the same as a maximum data amount of one image. 45

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FIG. 1

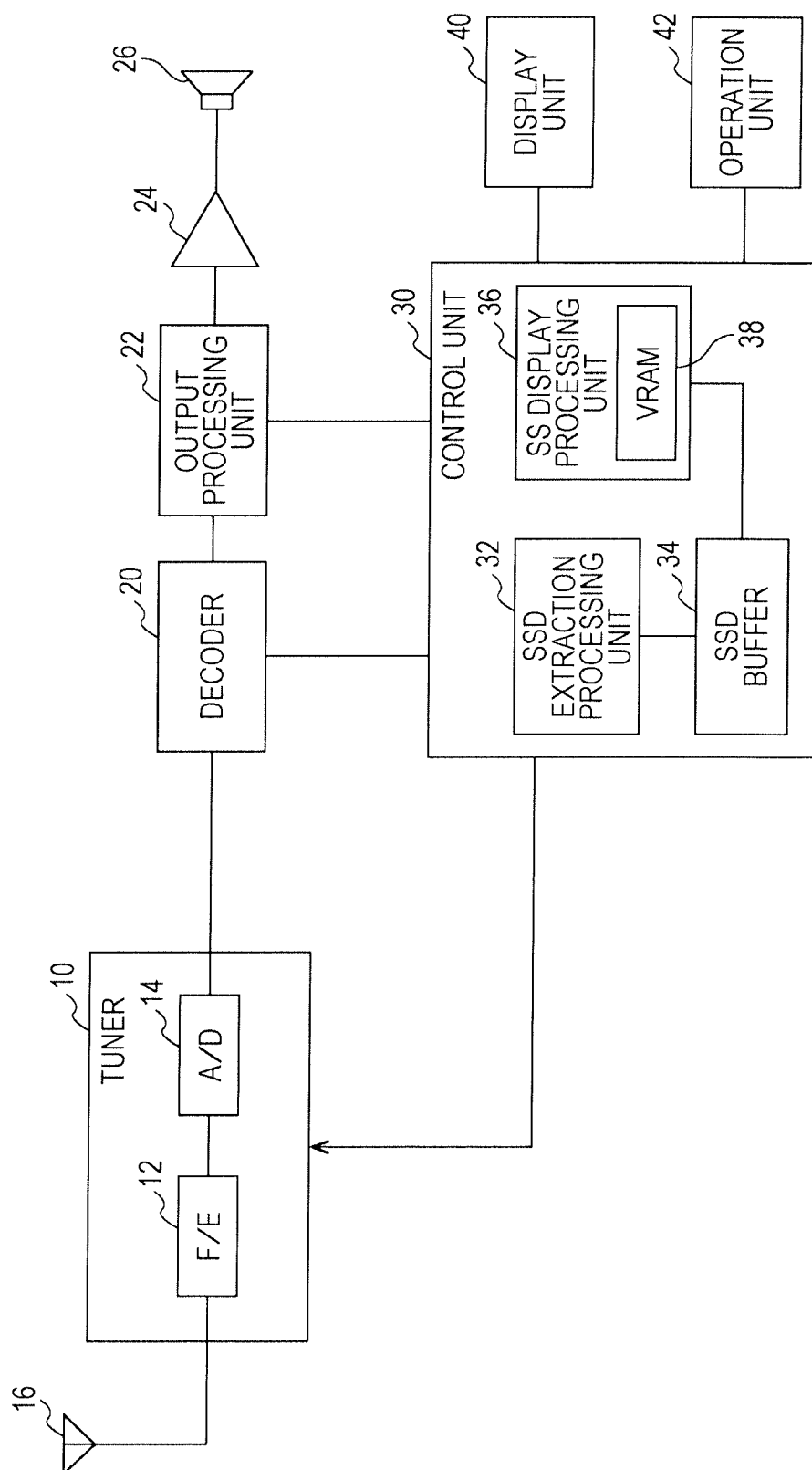


FIG. 2

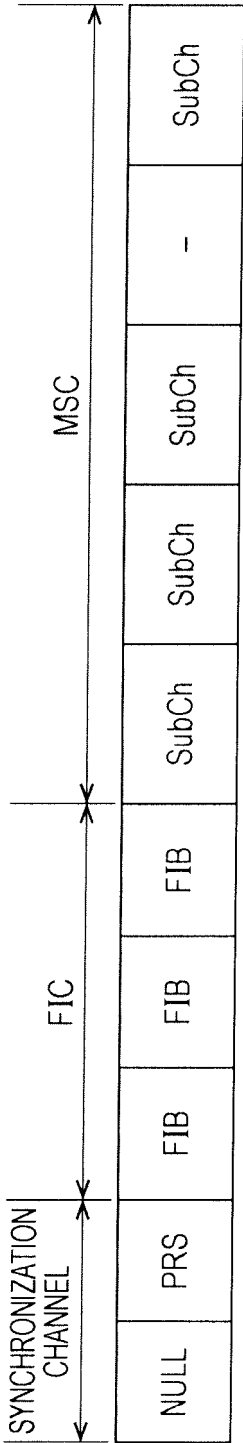


FIG. 3

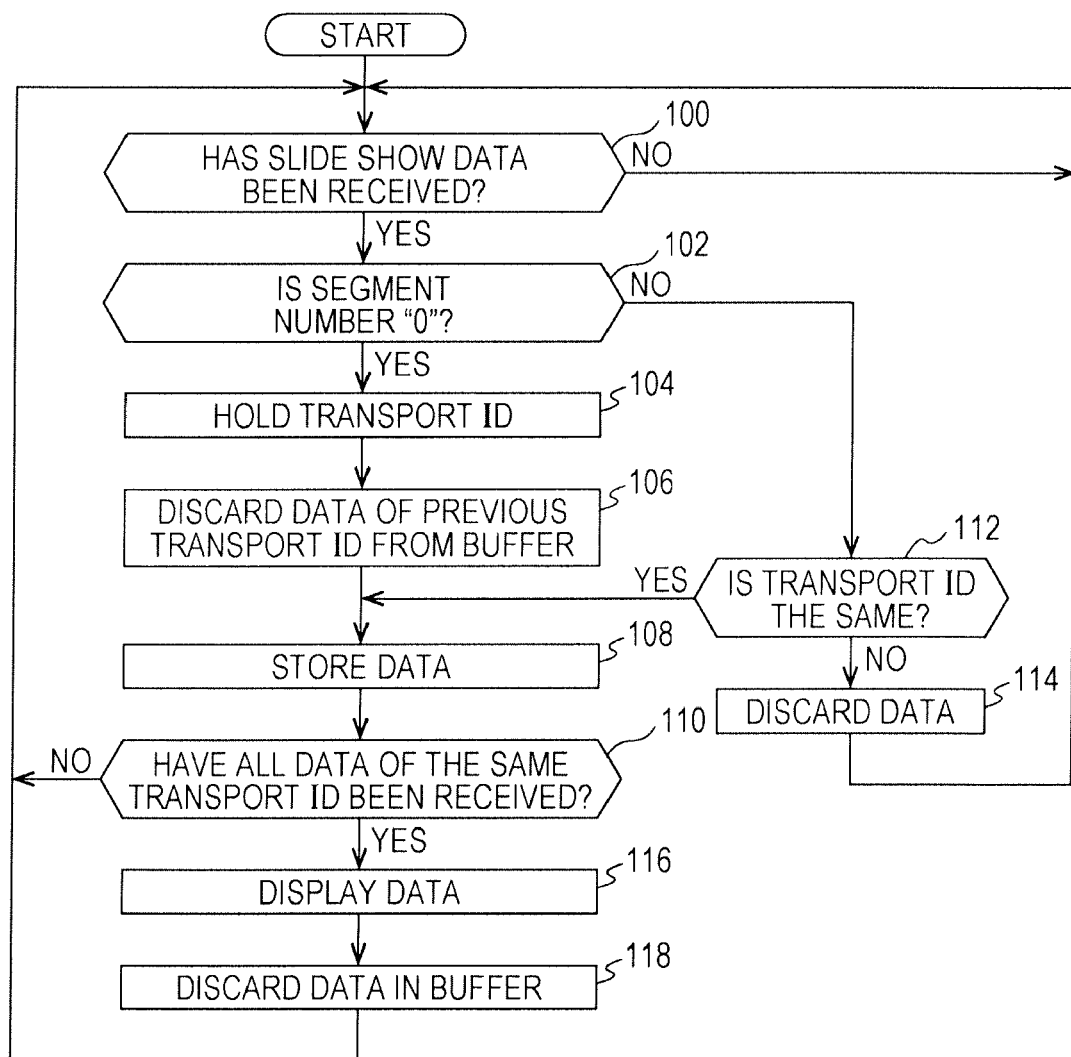


FIG. 4

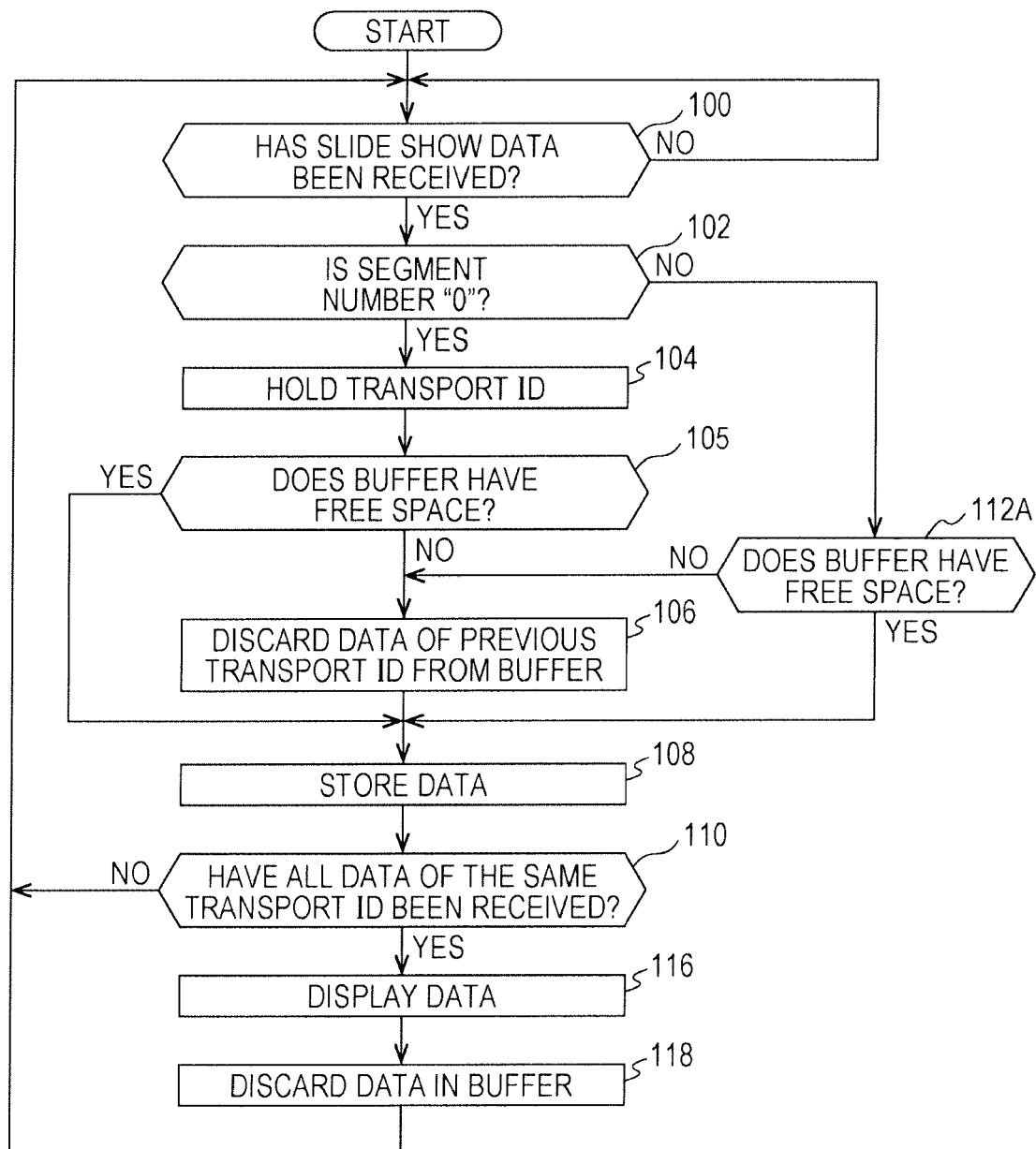
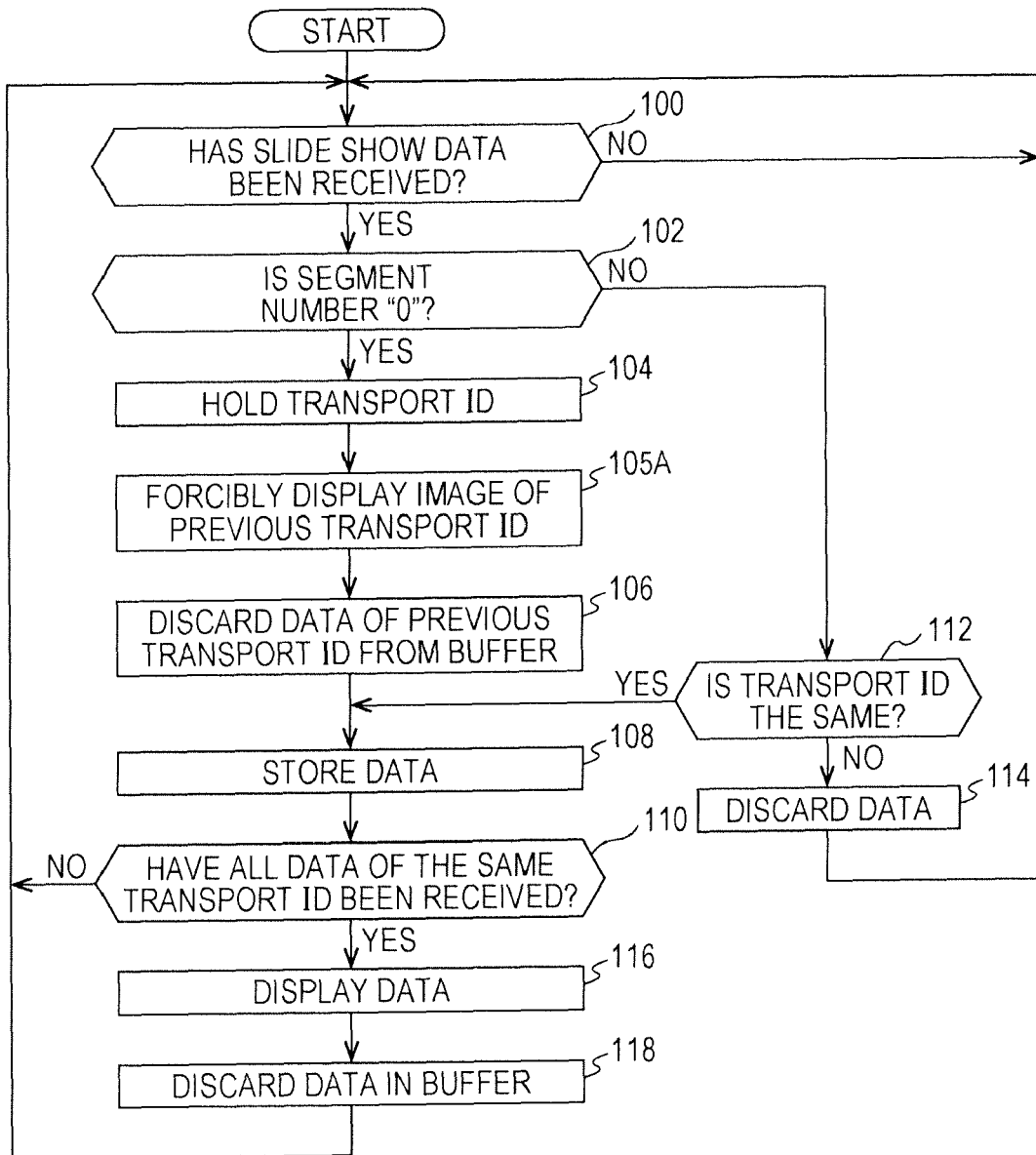


FIG. 5





EUROPEAN SEARCH REPORT

Application Number
EP 16 16 4258

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2012/189069 A1 (IANNUZZELLI RUSSELL [US] ET AL) 26 July 2012 (2012-07-26) * paragraphs [0047], [0063] - [0067], [0147], [0298] - [0299], [0301], [0305], [0311], [0315] * -----	1-7	INV. H04H20/42
			TECHNICAL FIELDS SEARCHED (IPC)
			H04H
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 26 September 2016	Examiner Iovescu, Vladimir
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			

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EPO FORM 1503 03.02 (P04C01)

26-09-2016

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2012189069	A1	26-07-2012	NONE

EPO FORM P0459

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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