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(54) **Digital broadcast receiving apparatus and digital broadcast receiving method**

Digitale Rundfunkempfangsvorrichtung und digitales Rundfunkempfangsverfahren

Récepteur de diffusion numérique et procédé de réception de diffusion numérique

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**EP-A1- 1 659 711 EP-A2- 1 148 641**  
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## Description

**[0001]** The present invention relates to a digital broadcast receiving apparatus and a digital broadcast receiving method, and is particularly applied to a digital broadcast receiving apparatus having a function of appropriately updating channels registered in a preset memory with movement of a vehicle.

**[0002]** In an in-vehicle digital broadcast receiving apparatus, when a vehicle moves and crosses into a different broadcast area, a digital broadcast of a channel being viewed and listened to until then is no longer able to be received. In response to this problem, there is provided a function in which, if a reception strength of the channel being viewed and listened to decreases to a predetermined value or lower, a channel scan of all frequencies is started in the background, and channels registered in a preset memory are automatically updated.

**[0003]** For example, as illustrated in Fig. 4, in the case where a vehicle is moving from a broadcast area of Fukushima prefecture into a broadcast area of Ibaraki prefecture, because a reception strength of a channel being viewed and listened to until then decreases to a predetermined value or lower near the border between Fukushima and Ibaraki prefectures which the vehicle crosses, a scan is performed and channels registered in a preset memory are automatically updated.

**[0004]** In this case, because the scan is performed at the border, some channels in Fukushima prefecture may be scanned and preset even though the vehicle is moving away from Fukushima prefecture. However, even if the channels are preset, the preset channels are not able to be received immediately because the vehicle is moving away from the broadcast area of Fukushima prefecture.

**[0005]** In addition, a technique has been suggested in which it is determined whether or not a detected frequency of a broadcasting station is the same as a specific frequency (for example, 1620 kHz for traffic information), and the frequency is not stored in a preset memory if it is determined that the frequency is the same as the specific frequency (see, for example, JP 6-303108 A). This technique may prevent a frequency of a traffic information broadcasting station for which a dedicated switch is provided from being unnecessarily stored in the preset memory, and prevent a range of channel selection using a preset switch from narrowing.

**[0006]** EP 1 659 711 A1 discloses a vehicle entertainment and information processing system comprising a tuning receiver for receiving broadcast signals from at least one of a plurality of broadcast stations, a navigation unit for outputting position data in real time according to the vehicle's movement, a database containing broadcast station information, and means for determining a reception quality parameter of at least one of the plurality of broadcast stations based on the position data and the broadcast station information. EP 1 659 711 A1 further discloses a corresponding method.

**[0007]** According to EP 1 148 641 A2 a controller with

a memory is contained in a navigation device or in a first RDS receiver and can be part of a vehicle's on-board computer. Input and output devices can form a structural unit and be operated via a touch-screen display. A second RDS receiver has a tuner, an RDS decoder and a radio receiver comprising a GSM mobile telephone with an antenna and an interface connecting the mobile telephone to the controller.

**[0008]** US 2008/182533 A1 discloses a method for determining a region where a broadcasting receiver is located by detecting the signal strength of a plurality of channels. When a user takes the broadcasting receiver from region A to region B, the broadcasting receiver provides a list of regions including region B when the broadcasting receiver is turned on. When the user chooses to change the current region to region B, and after the channel scan is performed, the user can effortlessly view the broadcast programs of region B.

**[0009]** US 5 280 642 A describes provides a radio receiver which is capable of automatically identifying the region from which a specific frequency is being received, for example, the name of a city or the like only by receiving the frequency therefrom. In the radio receiver according to the present invention as above, first all the reception frequencies within a broadcast reception band are swept to detect the relationship between each of the reception frequencies and level of the electric field intensity of each reception frequency, whereby all the reception frequencies are divided into two groups; the first and second groups, depending on the level of the electric field of each reception frequency. Whereafter, within the region codes stored in the first memory means, those having more number of reception frequencies defined in the first group than a predetermined number are selected, then the nearby regions of the thus selected region codes are searched from the second memory means, so that in the case that the nearby region also includes more number of the reception frequencies defined in the second group than a predetermined number, the region of the thus selected region code is determined as a frequency reception region of this moment.

**[0010]** A technique called "area preset" also exists in which area preset information representing a list of receivable channels is stored in a database in advance for each broadcast area and area preset information of a broadcast area corresponding to a current location of a vehicle is read out and stored in a preset memory. However, there are problems that, because the accuracy of area preset information is poor, some channels are not able to be received immediately after they have been preset, and that a preset channel is not able to be received with movement of the vehicle even in the same broadcast area.

**[0011]** The present invention has been accomplished in order to solve such problems, and an object thereof is to perform, in accordance with a decrease in a reception strength of a channel being viewed and listened to, a scan so as to prevent an unnecessary channel from being

preset which is more likely not to be able to be received immediately when channels registered in a preset memory are automatically updated.

**[0012]** The invention relates to a digital broadcast receiving apparatus and a method for receiving a digital broadcast according to the independent claims. Embodiments are disclosed in the dependent claims.

**[0013]** According to the present invention, if a reception strength of a channel has become a predetermined value or lower, receivable channels are scanned, except for channels whose area codes coincide with an area code of a channel currently being received, and the receivable channels extracted by performing the scan are stored in a preset memory.

**[0014]** According to the present invention configured as described above, while a vehicle is moving and crossing into a different broadcast area, when automatic updating in a preset memory is performed because a reception strength of a channel being received in a broadcast area of an origin of movement has decreased, channels involved in the broadcast area of the origin of movement are not preset, and only channels involved in a broadcast area which is likely to be a destination of movement are preset. This may prevent unnecessary channels which are more likely not to be able to be received immediately with movement of the vehicle from being preset.

#### BRIEF DESCRIPTION OF THE DRAWINGS

##### **[0015]**

Fig. 1 illustrates an example of the configuration of a digital broadcast receiving apparatus according to an embodiment;

Figs. 2A to 2D illustrate an example of operations performed by the digital broadcast receiving apparatus according to the embodiment;

Fig. 3 is a flowchart illustrating an example of operations performed by the digital broadcast receiving apparatus according to the embodiment; and

Fig. 4 illustrates an example of a situation in which automatic updating in a preset memory is performed because of a decrease in a reception strength.

**[0016]** An embodiment of the present invention will be described below with reference to the drawings.

**[0017]** Fig. 1 illustrates an example of the configuration of a digital broadcast receiving apparatus according to the embodiment. In the configuration of the digital broadcast receiving apparatus illustrated in Fig. 1, an antenna 1 receives radio waves of digital broadcasts modulated using a digital modulation method complying with an Integrated Services Digital Broadcasting (ISDB) standard or Digital Audio Broadcasting (DAB) standard. A tuner 2 selectively extracts, from the radio waves of the digital broadcasts received by the antenna 1, a broadcast wave signal of a reception frequency which matches an intend-

ed channel, and outputs the broadcast wave signal.

**[0018]** An OFDM demodulation unit 3 performs Orthogonal Frequency-Division Multiplexing (OFDM) demodulation on the broadcast wave signal received with the tuner 2 and obtains a transport stream (hereinafter referred to as a TS). An error correction unit 4 performs error correction on the TS obtained through demodulation performed by the OFDM demodulation unit 3 so as to correct an error having occurred in a transmission line.

**[0019]** A demultiplexer unit 5 divides the multiplexed TS to obtain an audio stream, a video stream, and a data stream. Then, the demultiplexer unit 5 outputs the audio stream to an audio decoder unit 6, outputs the video stream to a video decoder unit 7, and outputs the data stream to a data decoder unit 8. In the data stream here, information on a channel, such as the name of a broadcasting station and a physical channel (reception frequency) of the broadcasting station, and an area code representing an area in which a broadcast wave of the channel can be received are contained.

**[0020]** In addition, in the ISDB standard, which is a Japanese digital broadcast method, the area code is composed of 12-bit data. The first 1 to 6 bits of 12 bits are assigned as an identifier of a general area (including a wide area). This enables unique identification of all general areas, which are, for example, 47 prefectures in Japan, island regions, and wide areas. In addition, the first 7 to 12 bits of 12 bits are assigned as a region identifier of a small area in a general area (including a wide area). This enables unique identification of 64 regions in the general area.

**[0021]** Furthermore, in the DAB standard, which is a European digital radio broadcast method, this area code is contained in an identification code, which is referred to as a service identifier (Sid) for identifying a broadcasting station, composed of four hexadecimal digits. The area code is assigned to the second digit of the four-hexadecimal-digit code. In addition, the first digit denotes a country code, and the third and fourth digits denote a broadcasting station code. For example, when a Sid is C201, C denotes a country code, 2 denotes an area code, and 01 denotes a broadcasting station code.

**[0022]** The audio decoder unit 6 decodes the input audio stream and outputs it as an audio signal. The video decoder unit 7 decodes the input video stream and outputs it as a video signal. The data decoder unit 8 decodes the input data stream and outputs it as control data.

**[0023]** In response to the user's operation of an operation unit, which is not illustrated, a channel switching unit 9 selects a channel to be received by the tuner 2 and switches to it. A preset memory 10 associates pieces of information on a plurality of receivable channels with a plurality of preset numbers and stores them. For each preset number, information on a physical channel and an area code of a broadcasting station is stored in this preset memory 10.

**[0024]** When the user operates a preset selection button (not illustrated) of the operation unit to optionally se-

lect any preset number, the channel switching unit 9 sets, for the tuner 2, as a reception channel, a physical channel that is associated with the selected preset number and stored in the preset memory 10.

**[0025]** A reception strength determination unit 11 determines whether or not a reception strength of a channel currently being received by the tuner 2 has become a predetermined value or lower. This determines whether or not a vehicle is moving and crossing into a different broadcast area. That is, as illustrated in Fig. 4, when the vehicle is moving and crossing into a different broadcast area, a reception strength of a channel being viewed and listened to until then decreases. Thus, if the reception strength becomes the predetermined value or lower, it may be determined that the vehicle is moving from a current broadcast area into a different broadcast area. In addition, the reception strength may be detected by utilizing, for example, a carrier-to-noise ratio (C/N) and a bit error rate (BER).

**[0026]** If the reception strength determination unit 11 determines that the reception strength has become the predetermined value or lower, a scan processing unit 12 scans receivable channels whose reception strengths exceed the predetermined value, except for channels whose area codes coincide with an area code of the channel currently being received. A scan process is a process in which a reception frequency of the tuner 2 is changed and channels that can be received at a current location are detected to generate a channel list. When the scan process is performed, the scan processing unit 12 acquires, from the data decoder unit 8, information on physical channels and area codes of broadcasting stations that can be received at the current location.

**[0027]** In a typical scan process, a scan of all frequencies (all channels) is performed. On the other hand, in the embodiment, a scan of channels is performed, except for channels whose area codes coincide with an area code of a channel currently being received. The area code of the channel currently being received is acquired from the data decoder unit 8. For example, as illustrated in Fig. 4, while the vehicle is moving from the broadcast area of Fukushima prefecture into the broadcast area of Ibaraki prefecture, in the case where a scan process is performed because a reception strength of a channel currently being received has decreased, the scan processing unit 12 performs a scan process on only channels other than channels to which an area code of Fukushima prefecture (hereinafter referred to as a Fukushima code) is assigned.

**[0028]** A preset update unit 13 performs updating and stores receivable channels extracted by the scan processing unit 12 in the preset memory 10. As described above, information to be stored is information on physical channels and area codes of broadcasting stations extracted as receivable channels by the scan processing unit 12.

**[0029]** Here, in the case where the scan processing unit 12 extracts a larger number of receivable channels

than the number of channels that can be registered in the preset memory 10, for example, the preset update unit 13 stores the channels in the preset memory 10 in order of highest to lowest reception strength. In this case, as for a plurality of receivable channels to be stored in the preset memory 10, there may exist channels associated with a plurality of area codes in a mixed state.

**[0030]** For example, as illustrated in Fig. 4, in the case where the vehicle is moving from the broadcast area of Fukushima prefecture toward the broadcast area of Ibaraki prefecture, there is the possibility that the scan processing unit 12 may extract channels to which an area code of Tochigi prefecture (hereinafter referred to as a Tochigi code) is assigned in addition to channels to which an area code of Ibaraki prefecture (hereinafter referred to as a Ibaraki code) is assigned. In this case, the preset update unit 13 stores the channels having the Ibaraki code and the channels having the Tochigi code in the preset memory 10 in order of highest to lowest reception strength.

**[0031]** Alternatively, the preset update unit 13 may store, in the preset memory 10, only channels having the most frequently extracted area code among receivable channels extracted by the scan processing unit 12. For example, it is assumed that, among receivable channels extracted by the scan processing unit 12, the number of extracted channels having the Ibaraki code is largest. In this case, even if the scan processing unit 12 extracts channels having the Tochigi code, the preset update unit 13 does not store these channels in the preset memory 10, and stores only the channels having the Ibaraki code in the preset memory 10.

**[0032]** A reception strength of a channel currently being received varies depending on the driving environment at the moment. Because of this, even though the vehicle is not crossing into a different broadcast area, the reception strength may become the predetermined value or lower only for an unspecified time period. Therefore, the reception strength determination unit 11 may determine whether or not a state in which the reception strength of the channel currently being received is the predetermined value or lower has lasted for a predetermined time period or longer. Even if this is done, however, when the vehicle is traveling through, for example, an area dense with buildings or a mountainous area, the state in which the reception strength of the channel currently being received is the predetermined value or lower may last for the predetermined time period or longer even though the vehicle is not crossing into a different broadcast area.

**[0033]** Thus, if it is determined that the reception strength of the channel currently being received has become the predetermined value or lower, the reception strength determination unit 11 may further determine whether or not, among channels currently stored in the preset memory 10, reception strengths of channels whose area codes coincide with an area code of the channel currently being received have become the predetermined value or lower. The area code of the channel cur-

rently being received is acquired from the data decoder unit 8. If the reception strength determination unit 11 determines that the reception strength of the channel currently being received and the reception strengths of a predetermined proportion or more of the channels whose area codes coincide with the area code of the channel currently being received have become the predetermined value or lower, the scan processing unit 12 performs a scan process on receivable channels.

**[0034]** This enables more accurate detection of the fact that the vehicle is moving and crossing into a different broadcast area. That is, as illustrated in Fig. 4, in the case where the vehicle is moving from the broadcast area of Fukushima prefecture into the broadcast area of Ibaraki prefecture, there is a high possibility that reception strengths of other channels to which the area code of Fukushima prefecture is assigned as well as the reception strength of the channel currently being received will decrease to the predetermined value or lower. On the other hand, when the vehicle is traveling through an area between buildings, a mountainous area, or the like, although reception strengths of some channels decrease, not all reception strengths of a predetermined proportion or more of channels having the same area code decrease. Hence, the employment of the above-described determination method enables more accurate detection of the fact that the vehicle is moving and crossing into a different broadcast area.

**[0035]** Figs. 2A to 2D illustrate an example of operations performed by the digital broadcast receiving apparatus according to the embodiment configured as described above. Fig. 2A illustrates an example of information stored in the preset memory 10 before updating. In the example of Fig. 2A, eleven receivable channels can be registered in the preset memory 10, and channels having the Fukushima code and channels having the Ibaraki code are stored in a mixed state. It is assumed that "ch 18" having the Fukushima code among these channels is a channel currently being received.

**[0036]** It is assumed that the vehicle is moving from the broadcast area of Fukushima prefecture into the broadcast area of Ibaraki prefecture and the reception strength determination unit 11 determines that a reception strength of the channel currently being received has become the predetermined value or lower. In this case, as illustrated in Fig. 2B, the reception strength determination unit 11 continues to determine whether or not, among the channels currently stored in the preset memory 10, reception strengths of channels having the Fukushima code which is the same as the area code of the channel currently being received have become the predetermined value or lower.

**[0037]** Then, if the reception strength determination unit 11 determines that, among nine channels having the Fukushima code stored in the preset memory 10, reception strengths of the predetermined proportion or more of the channels have become the predetermined value or lower, the scan processing unit 12 performs a scan

process on channels, except for the channels having the Fukushima code, as illustrated in Fig. 2C. Finally, as illustrated in Fig. 2D, the preset update unit 13 stores, in the preset memory 10, only channels having the most frequently extracted Ibaraki code among receivable channels extracted by the scan processing unit 12.

**[0038]** Fig. 3 is a flowchart illustrating an example of operations performed by the digital broadcast receiving apparatus according to the embodiment configured as described above. The flowchart illustrated in Fig. 3 starts when a power supply of the digital broadcast receiving apparatus is turned on.

**[0039]** First, the reception strength determination unit 11 detects a reception strength of a channel currently being received (step S1), and determines whether or not the detected reception strength has become a predetermined value or lower (step S2). If the reception strength has not become the predetermined value or lower, the process returns to step S1.

**[0040]** On the other hand, if the reception strength has become the predetermined value or lower, the reception strength determination unit 11 subsequently selects, among channels currently stored in the preset memory 10, one channel whose area code coincides with an area code of the channel currently being received. Then, the reception strength determination unit 11 detects a reception strength of the selected channel (step S3), and determines whether or not the detected reception strength has become the predetermined value or lower (step S4).

**[0041]** Here, if the reception strength of the selected channel has not become the predetermined value or lower, the process returns to step S1. On the other hand, if the reception strength of the selected channel has become the predetermined value or lower, the reception strength determination unit 11 selects all channels whose area codes coincide with the area code of the channel currently being received and determines whether or not determinations of reception strengths of all the channels have been completed (step S5). If determinations of the reception strengths of all the channels have not been completed, the process returns to step S3.

**[0042]** On the other hand, among the channels currently stored in the preset memory 10, if determinations of the reception strengths of all the channels whose area codes coincide with the area code of the channel currently being received have been completed, that is, if it is determined that all the reception strengths have become the predetermined value or lower, the scan processing unit 12 scans receivable channels whose reception strengths exceed the predetermined value, except for the channels whose area codes coincide with the area code of the channel currently being received (step S6).

**[0043]** Then, the preset update unit 13 performs updating and stores the receivable channels extracted by the scan processing unit 12 in the preset memory 10 (step S7). Subsequently, the digital broadcast receiving apparatus determines whether or not the power supply

has been turned off (step S8), and if the power supply has not been turned off, the process returns to step S1. If the power supply has been turned off, the process of the flowchart illustrated in Fig. 3 ends.

**[0044]** As described in detail above, in the embodiment, if a reception strength of a channel currently being received has become a predetermined value or lower, receivable channels are scanned, except for channels whose area codes coincide with an area code of the channel currently being received, and updating is performed and the receivable channels extracted by performing the scan are stored in the preset memory 10.

**[0045]** According to the embodiment configured in this way, while a vehicle is moving and crossing into a different broadcast area, when automatic updating in the preset memory 10 is performed because a reception strength of a channel being received in a broadcast area of an origin of movement has decreased, channels involved in the broadcast area (Fukushima code) of the origin of movement are not preset, and only channels involved in a broadcast area (Ibaraki code or Tochigi code) which is likely to be a destination of movement are preset. This may prevent unnecessary channels (channels involved in the broadcast area of the origin of movement) which are more likely not to be able to be received immediately with movement of the vehicle from being preset.

**[0046]** Furthermore, according to the embodiment, a scan process is performed on channels, except for channels whose area codes coincide with an area code of a channel currently being received, thereby offering an advantage in that a scan time period may be reduced.

**[0047]** In addition, in the embodiment, an example has been described in which the scan processing unit 12 performs a scan process on channels, except for channels whose area codes coincide with an area code of a channel currently being received, and the preset update unit 13 stores, in the preset memory 10, the receivable channels extracted by performing the scan process; however, the present invention is not limited to this.

**[0048]** For example, as in a typical scan process, the scan processing unit 12 performs a scan process on all frequencies (all channels). Then, the preset update unit 13 may select, among the receivable channels extracted by the scan processing unit 12, only channels whose area codes differ from an area code of a channel currently being received, and store them in the preset memory 10. However, the embodiment is desirable in that it has an advantage in that a scan time period may be reduced.

**[0049]** Furthermore, in the embodiment, as for a plurality of receivable channels to be stored in the preset memory 10, there have been described two cases, that is, the case where channels associated with a plurality of area codes are stored in a mixed state, and the case where only channels having an area code most frequently extracted by the scan processing unit 12 are stored; however, either of the two cases may be automatically selected in accordance with circumstances. For exam-

ple, a navigation device is connected to the digital broadcast receiving apparatus, and thus either of the two cases may be automatically selected in accordance with a state of a guidance route setting.

**[0050]** For example, a notification of broadcast areas respectively represented by area codes second and subsequent most frequently extracted by the scan processing unit 12 among area codes of receivable channels is provided to the navigation device, and an inquiry is made as to whether or not a guidance route set in the navigation device exists within the broadcast areas. Then, if the guidance route does not exist within the broadcast areas respectively represented by the second and subsequent most frequently extracted area codes, only channels having an area code most frequently extracted by the scan processing unit 12 are stored in the preset memory 10. On the other hand, if the guidance route exists within the broadcast areas respectively represented by the second and subsequent most frequently extracted area codes, a plurality of area codes are allowed to exist in a mixed state, and receivable channels are stored in the preset memory 10. This enables useful channels involved in a broadcast area through which a vehicle is more likely to move along the guidance route to be stored in the preset memory 10.

**[0051]** In addition, regardless of whether or not a broadcast area in which the guidance route exists is any of the broadcast areas respectively represented by the second and subsequent most frequently extracted area codes, the preset update unit 13 may select, among receivable channels extracted by the scan processing unit 12, channels in the broadcast area in which the guidance route exists, and store them in the preset memory 10.

**[0052]** Furthermore, in the embodiment, the digital broadcast receiving apparatus that receives a digital broadcast complying with the ISDB standard or DAB standard is used; however, the digital broadcast receiving apparatus is applicable to a digital broadcast as long as it complies with a digital broadcasting standard having area codes.

**[0053]** In addition, the above embodiment is merely an example of an embodiment for implementing the present invention, and the technical scope of the present invention should not be construed in a limited manner due to the above embodiment.

## Claims

1. A digital broadcast receiving apparatus comprising:
  - a tuner (2) configured to receive a digital broadcast wave signal of a reception frequency matching an intended channel, the digital broadcast wave signal comprising an area code representing an area in which the broadcast wave of the intended channel can be received: reception strength determination means (11)

configured to determine whether or not a reception strength of the received digital broadcast wave signal has become a predetermined value or lower;

scan processing means (12) configured to change the reception frequency of the tuner (2) and to generate a receivable channel list from the channels matching receivable digital broadcast wave signals whose reception strengths exceed the predetermined value, except for channels matching digital broadcast wave signals whose area codes coincide with the area code of the digital broadcast wave signal currently being received, if the reception strength determination means (11) determines that the reception strength has become the predetermined value or lower; and  
 preset update means (13) configured to perform updating and store the receivable channel list generated by the scan processing means (12) in a preset memory (10).

2. The digital broadcast receiving apparatus according to Claim 1, wherein the digital broadcast wave signal is a digital broadcast wave signal modulated using a digital modulation method complying with at least an ISDB standard or DAB standard.
3. The digital broadcast receiving apparatus according to Claim 1 or 2, wherein the reception strength determination means (11) is configured to determine whether or not a reception strength of the digital broadcast wave signal currently being received has become the predetermined value or lower, and if the reception strength determination means (11) determines that the reception strength has become the predetermined value or lower, the reception strength determination means (11) is configured to further determine whether or not, among channels currently stored in the preset memory (10), reception strengths of digital broadcast wave signals matching channels whose area codes coincide with the area code of the digital broadcast wave signal matching the channel currently being received have become the predetermined value or lower, and  
 wherein if the reception strength determination means (11) determines that the reception strength of the digital broadcast wave signal matching the channel currently being received and reception strengths of a predetermined proportion or more of the digital broadcast wave signals matching the channels whose area codes coincide with the area code of the digital broadcast wave signal matching the channel currently being received have become the predetermined value or lower, the scan processing means (12) is configured for changing the reception frequency of the tuner (2) and generating a re-

ceivable channel list from the receivable digital broadcast wave signals whose reception strengths exceed the predetermined value.

4. The digital broadcast receiving apparatus according to one of Claims 1-3, wherein the preset update means (13) is configured to store, in the preset memory (10), only channels matching digital broadcast wave signals having a most frequently extracted area code among the receivable channels extracted by the scan processing means (12).
5. A method for receiving a digital broadcast wave signal comprising:
  - a first step of determining whether or not a reception strength of a digital broadcast wave signal matching a channel currently being received by a tuner (2) has become a predetermined value or lower, the digital broadcast wave signal comprising an area code representing an area in which the broadcast wave can be received;
  - a second step of changing the reception frequency of the tuner (2) and generating a receivable channel list from the receivable digital broadcast wave signals whose reception strengths exceed the predetermined value, except for channels matching digital broadcast wave signals whose area codes coincide with an area code of the digital broadcast wave signal currently being received, if it is determined that the reception strength has become the predetermined value or lower; and
  - a third step of performing updating and storing the generated receivable channel list in a preset memory (10).
6. The method according to Claim 5, wherein the digital broadcast wave signal is a digital broadcast wave signal modulated using a digital modulation method complying with at least an ISDB standard or DAB standard.
7. The method according to Claim 5 or 6, wherein the first step further includes a step of, if it is determined that the reception strength of the digital broadcast wave signal matching the channel currently being received has become the predetermined value or lower, further determining whether or not, among the channels currently stored in the preset memory (10), the reception strengths of the digital broadcast wave signals matching the channels whose area codes coincide with the area code of the channel currently being received have become the predetermined value or lower, and  
 wherein the second step further includes a step of, if it is determined that the reception strength of the digital broadcast wave signal matching the channel

currently being received and the reception strengths of a predetermined proportion or more of the digital broadcast wave signals matching the channels whose area codes coincide with the area code of the digital broadcast wave signal matching the channel currently being received have become the predetermined value or lower, changing the reception frequency of the tuner (2) and generating a receivable channel list from the receivable digital broadcast wave signals whose reception strengths exceed the predetermined value.

8. The method according to one of Claims 5-7, wherein the third step further includes a step of storing, in the preset memory (10), only channels matching digital broadcast wave signals having a most frequently extracted area code among the receivable channels extracted by the scanning.

### Patentansprüche

1. Digitale Rundfunkempfangsvorrichtung, die umfasst:

einen Tuner (2), der dazu ausgelegt ist, ein digitales Rundfunkwellensignal einer Empfangsfrequenz, die einem beabsichtigten Kanal entspricht, zu empfangen, wobei das digitale Rundfunkwellensignal einen Gebietscode umfasst, der ein Gebiet darstellt, in dem die Rundfunkwelle des beabsichtigten Kanals empfangen werden kann:

eine Empfangsstärkenbestimmungseinrichtung (11), die dazu ausgelegt ist, zu bestimmen, ob eine Empfangsstärke des empfangenen digitalen Rundfunkwellensignals ein vorbestimmter Wert oder niedriger geworden ist;

eine Abtastverarbeitungseinrichtung (12), die dazu ausgelegt ist, die Empfangsfrequenz des Tuners (2) zu ändern und eine Liste empfangbarer Kanäle von den Kanälen zu erzeugen, die empfangbaren digitalen Rundfunkwellensignalen entsprechen, deren Empfangsstärken den vorbestimmten Wert überschreiten, mit Ausnahme von Kanälen, die digitalen Rundfunkwellensignalen entsprechen, deren Gebietscodes mit dem Gebietscode des momentan empfangenen digitalen Rundfunkwellensignals zusammenfallen, wenn die Empfangsstärkenbestimmungseinrichtung (11) bestimmt, dass die Empfangsstärke der vorbestimmte Wert oder niedriger geworden ist; und

eine Voreinstellaktualisierungseinrichtung (13), die dazu ausgelegt ist, Aktualisierungen durchzuführen und die von der Abtastverarbeitungseinrichtung (12) erzeugte Liste empfangbarer Kanäle in einem Voreinstellspeicher (10) zu speichern.

2. Digitale Rundfunkempfangsvorrichtung nach Anspruch 1, wobei das digitale Rundfunkwellensignal ein digitales Rundfunkwellensignal ist, das durch Verwendung eines digitalen Modulationsverfahrens, das mindestens einer ISDB-Norm oder DAB-Norm entspricht, moduliert wird.

3. Digitale Rundfunkempfangsvorrichtung nach Anspruch 1 oder 2,

wobei die Empfangsstärkenbestimmungseinrichtung (11) dazu ausgelegt ist, zu bestimmen, ob eine Empfangsstärke des momentan empfangenen digitalen Rundfunkwellensignals der vorbestimmte Wert oder niedriger geworden ist, und wenn die Empfangsstärkenbestimmungseinrichtung (11) bestimmt, dass die Empfangsstärke der vorbestimmte Wert oder niedriger geworden ist, die Empfangsstärkenbestimmungseinrichtung (11) dazu ausgelegt ist, ferner zu bestimmen, ob von momentan in dem Voreinstellspeicher (10) gespeicherten Kanälen Empfangsstärken von digitalen Rundfunkwellensignalen, die Kanälen entsprechen, deren Gebietscodes mit dem Gebietscode des digitalen Rundfunkwellensignals zusammenfallen, das dem momentan empfangenen Kanal entspricht, der vorbestimmte Wert oder niedriger geworden sind, und

wobei, wenn die Empfangsstärkenbestimmungseinrichtung (11) bestimmt, dass die Empfangsstärke des digitalen Rundfunkwellensignals, das dem momentan empfangenen Kanal entspricht, und Empfangsstärken eines vorbestimmten Anteils oder mehr der digitalen Rundfunkwellensignale, die den Kanälen entsprechen, deren Gebietscodes mit dem Gebietscode des digitalen Rundfunkwellensignals, das dem momentan empfangenen Kanal entspricht, zusammenfallen, der vorbestimmte Wert oder niedriger geworden sind, die Abtastverarbeitungseinrichtung (12) dazu ausgelegt ist, die Empfangsfrequenz des Tuners (2) zu ändern und eine Liste empfangbarer Kanäle von den empfangbaren digitalen Rundfunkwellensignalen, deren Empfangsstärken den vorbestimmten Wert übersteigen, zu erzeugen.

4. Digitale Rundfunkempfangsvorrichtung nach einem der Ansprüche 1-3, wobei die Voreinstellaktualisierungseinrichtung (13) dazu ausgelegt ist, in dem Voreinstellspeicher (10) von den von der Abtastverarbeitungseinrichtung (12) extrahierten empfangbaren Kanälen nur Kanäle zu speichern, die digitalen Rundfunkwellensignalen mit einem am häufigsten extrahierten Gebietscode entsprechen.

5. Verfahren zum Empfangen eines digitalen Rundfunkwellensignals, das umfasst:

einen ersten Schritt des Bestimmens, ob eine Empfangsstärke eines digitalen Rundfunkwellensignals, das einem momentan von einem Tu-



- ner (2) empfangenen Kanal entspricht, ein vorbestimmter Wert oder niedriger geworden ist, wobei das digitale Rundfunkwellensignal einen Gebietscode umfasst, der ein Gebiet darstellt, in dem die Rundfunkwelle empfangen werden kann;
- einen zweiten Schritt des Änderns der Empfangsfrequenz des Tuners (2) und des Erzeugens einer Liste empfangbarer Kanäle von den empfangbaren digitalen Rundfunkwellensignalen, deren Empfangsstärken den vorbestimmten Wert überschreiten, mit Ausnahme von Kanälen, die digitalen Rundfunkwellensignalen entsprechen, deren Gebietscodes mit einem Gebietscode des momentan empfangenen digitalen Rundfunkwellensignals zusammenfallen, wenn bestimmt wird, dass die Empfangsstärke der vorbestimmte Wert oder niedriger geworden ist; und
- einen dritten Schritt des Durchführens von Aktualisieren und Speichern der erzeugten Liste empfangbarer Kanäle in einem Voreinstellspeicher (10).
6. Verfahren nach Anspruch 5, wobei das digitale Rundfunkwellensignal ein digitales Rundfunkwellensignal ist, das durch Verwendung eines digitalen Modulationsverfahrens, das mindestens einer ISDB-Norm oder DAB-Norm entspricht, moduliert wird.
7. Verfahren nach Anspruch 5 oder 6, wobei der erste Schritt ferner einen Schritt umfasst, in dem, wenn bestimmt wird, dass die Empfangsstärke des digitalen Rundfunkwellensignals, das dem momentan empfangenen Kanal entspricht, der vorbestimmte Wert oder niedriger geworden ist, ferner bestimmt wird, ob von den momentan in dem Voreinstellspeicher (10) gespeicherten Kanälen die Empfangsstärken der digitalen Rundfunkwellensignale, die den Kanälen entsprechen, deren Gebietscodes mit dem Gebietscode des momentan empfangenen Kanals zusammenfallen, der vorbestimmte Wert oder niedriger geworden sind, und wobei der zweite Schritt ferner einen Schritt umfasst, in dem, wenn bestimmt wird, dass die Empfangsstärke des digitalen Rundfunkwellensignals, das dem momentan empfangenen Kanal entspricht, und die Empfangsstärken eines vorbestimmten Anteils oder mehr der digitalen Rundfunkwellensignale, die den Kanälen entsprechen, deren Gebietscodes mit dem Gebietscode des digitalen Rundfunkwellensignals, das dem momentan empfangenen Kanal entspricht, zusammenfallen, der vorbestimmte Wert oder niedriger geworden sind, die Empfangsfrequenz des Tuners (2) geändert wird und eine Liste empfangbarer Kanäle von den empfangbaren digitalen Rundfunkwellensignalen, deren Empfangs-

stärken den vorbestimmten Wert übersteigen, erzeugt wird.

8. Verfahren nach einem der Ansprüche 5-7, wobei der dritte Schritt ferner einen Schritt des Speicherns, in dem Voreinstellspeicher (10), nur von Kanälen, die digitalen Rundfunkwellensignalen mit einem am häufigsten extrahierten Gebietscode entsprechen, von den durch das Abtasten extrahierten empfangbaren Kanälen umfasst.

### Revendications

1. Appareil de réception de diffusion numérique, comprenant :
- un syntoniseur (2) configuré pour recevoir un signal d'onde de diffusion numérique dont la fréquence de réception correspond à celle d'un canal recherché, le signal d'onde de diffusion numérique comprenant un indicatif de zone représentant une zone dans laquelle l'onde de diffusion du canal recherché peut être reçue ;
- un moyen de détermination (11) de la puissance de réception configuré pour déterminer le fait de savoir si oui ou non une puissance de réception du signal reçu d'onde de diffusion numérique a pris une valeur prédéterminée ou une valeur inférieure ;
- un moyen de traitement par balayage (12) configuré pour modifier la fréquence de réception du syntoniseur (2) et pour générer une liste de canaux qui peuvent être reçus à partir des canaux correspondant à des signaux d'ondes de diffusion numérique aptes à être reçus, dont les puissances de réception dépassent la valeur prédéterminée, à l'exception de canaux correspondant à des signaux d'ondes de diffusion numérique dont les indicatifs de zones coïncident avec l'indicatif de zone du signal d'onde de diffusion numérique en train d'être reçu, lorsque le moyen de détermination (11) de la puissance de réception détermine que la puissance de réception a pris la valeur prédéterminée ou une valeur inférieure ; et
- un moyen de mise à jour préétabli (13) configuré pour procéder à une mise à jour et pour mémoriser la liste de canaux qui peuvent être reçus, générée par le moyen de traitement par balayage (12), dans une mémoire préétablie (10).
2. Appareil de réception de diffusion numérique selon la revendication 1, dans lequel le signal d'onde de diffusion numérique est un signal d'onde de diffusion numérique modulé en utilisant un procédé de modulation numérique conforme à au moins une norme choisie parmi une norme ISDB ou une norme DAB.

3. Appareil de réception de diffusion numérique selon la revendication 1 ou 2, dans lequel le moyen de détermination (11) de la puissance de réception est configuré pour déterminer le fait de savoir si oui ou non une puissance de réception du signal d'onde de diffusion numérique en train d'être reçu a pris la valeur prédéterminée ou une valeur inférieure, et lorsque le moyen de détermination (11) de la puissance de réception détermine que la puissance de réception a pris la valeur prédéterminée ou une valeur inférieure, le moyen de détermination (11) de la puissance de réception est en outre configuré pour déterminer le fait de savoir si oui ou non, parmi les canaux présentement mis en mémoire dans la mémoire préétablie (10), des puissances de réception de signaux d'ondes de diffusion numérique correspondant à des canaux dont les indicatifs de zones coïncident avec l'indicatif de zone du signal d'onde de diffusion numérique correspondant au canal en train d'être reçu ont pris la valeur prédéterminée ou une valeur inférieure ; et dans lequel, lorsque le moyen de détermination (11) de la puissance de réception détermine que la puissance de réception du signal d'onde de diffusion numérique correspondant au canal en train d'être reçu et que des puissances de réception d'une proportion prédéterminée ou plus des signaux d'ondes de diffusion numérique correspondant aux canaux dont les indicatifs de zones coïncident avec l'indicatif de zone du signal d'onde de diffusion numérique correspondant au canal en train d'être reçu ont pris la valeur prédéterminée ou une valeur inférieure, le moyen de traitement par balayage (12) est configuré pour modifier la fréquence de réception du syntoniseur (2) et pour générer une liste de canaux qui peuvent être reçus à partir des signaux d'ondes de diffusion numérique aptes à être reçus, dont les puissances de réception dépassent la valeur prédéterminée.
4. Appareil de réception de diffusion numérique selon l'une quelconque des revendications 1 à 3, dans lequel le moyen de mise à jour préétabli (13) est configuré pour mettre en mémoire, dans la mémoire préétablie (10), uniquement des canaux qui correspondent à des signaux d'ondes de diffusion numérique qui possèdent un indicatif de zone extrait le plus fréquemment parmi les canaux qui peuvent être reçus extraits par le moyen de traitement par balayage (12).
5. Procédé destiné à la réception d'un signal d'onde de diffusion numérique, comprenant :
- une première étape consistant à déterminer le fait de savoir si oui ou non une puissance de réception d'un signal d'onde de diffusion numérique correspondant à un canal en train d'être
- reçu par un syntoniseur (2) a pris une valeur prédéterminée ou une valeur inférieure, le signal d'onde de diffusion numérique comprenant un indicatif de zone représentant une zone dans laquelle l'onde de diffusion peut être reçue ; une deuxième étape consistant à modifier la fréquence de réception du syntoniseur (2) et à générer une liste de canaux qui peuvent être reçus à partir des signaux d'ondes de diffusion numérique aptes à être reçus, dont les puissances de réception dépassent la valeur prédéterminée, à l'exception de canaux correspondant à des signaux d'ondes de diffusion numérique dont les indicatifs de zones coïncident avec un indicatif de zone du signal d'onde de diffusion numérique en train d'être reçu, lorsqu'il est déterminé que la puissance de réception a pris la valeur prédéterminée ou une valeur inférieure ; et une troisième étape consistant à procéder à une mise à jour et à une mise en mémoire de la liste générée de canaux qui peuvent être reçus, dans une mémoire préétablie (10).
6. Procédé selon la revendication 5, dans lequel le signal d'onde de diffusion numérique est un signal d'onde de diffusion numérique modulé en utilisant un procédé de modulation numérique conforme à au moins une norme choisie parmi une norme ISDB ou une norme DAB.
7. Procédé selon la revendication 5 ou 6, dans lequel la première étape englobe en outre une étape consistant à, lorsqu'il est déterminé que la puissance de réception du signal d'onde de diffusion numérique correspondant au canal en train d'être reçu a pris la valeur prédéterminée ou une valeur inférieure, déterminer en outre le fait de savoir si oui ou non, parmi les canaux présentement mis en mémoire dans la mémoire préétablie (10), les puissances de réception des signaux d'ondes de diffusion numérique correspondant aux canaux dont les indicatifs de zones coïncident avec l'indicatif de zone du canal en train d'être reçu ont pris la valeur prédéterminée ou une valeur inférieure ; et dans lequel la deuxième étape englobe en outre une étape consistant à, lorsqu'il est déterminé que la puissance de réception du signal d'onde de diffusion numérique correspondant au canal en train d'être reçu et que les puissances de réception d'une proportion prédéterminée ou plus des signaux d'ondes de diffusion numérique correspondant aux canaux dont les indicatifs de zones coïncident avec l'indicatif de zone du signal d'onde de diffusion numérique correspondant au canal en train d'être reçu ont pris la valeur prédéterminée ou une valeur inférieure, modifier la fréquence de réception du syntoniseur (2) et générer une liste de canaux qui peuvent être reçus à partir des signaux d'ondes de diffusion numérique

apte à être reçus, dont les puissances de réception dépassent la valeur prédéterminée.

8. Procédé selon l'une quelconque des revendications 5 à 7, dans lequel la troisième étape englobe en outre une étape consistant à mettre en mémoire, dans la mémoire préétablie (10), uniquement des canaux qui correspondent aux signaux d'ondes de diffusion numérique qui possèdent un indicatif de zone extrait le plus fréquemment parmi les canaux qui peuvent être reçus, extraits par le balayage.

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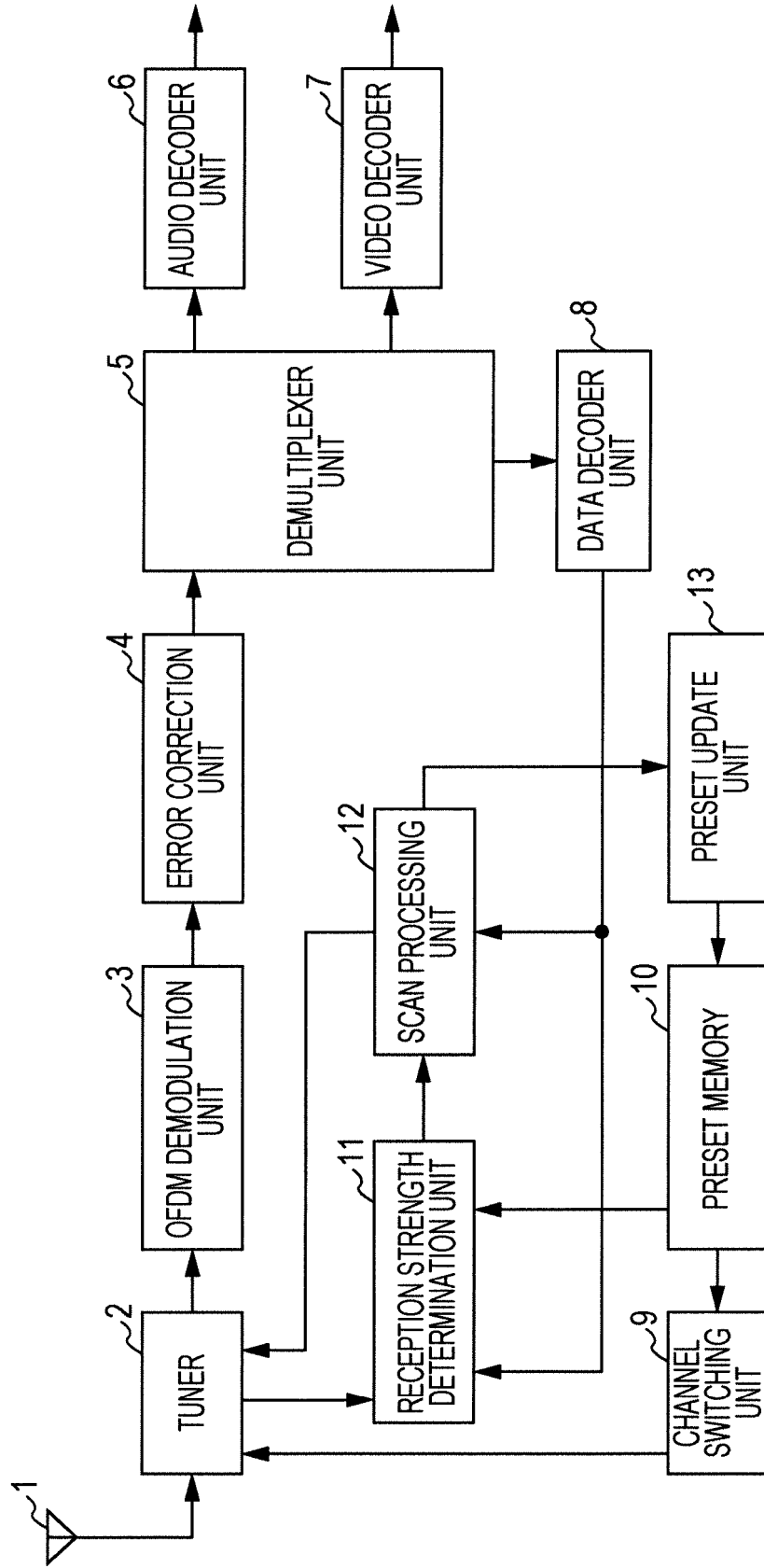
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FIG. 1



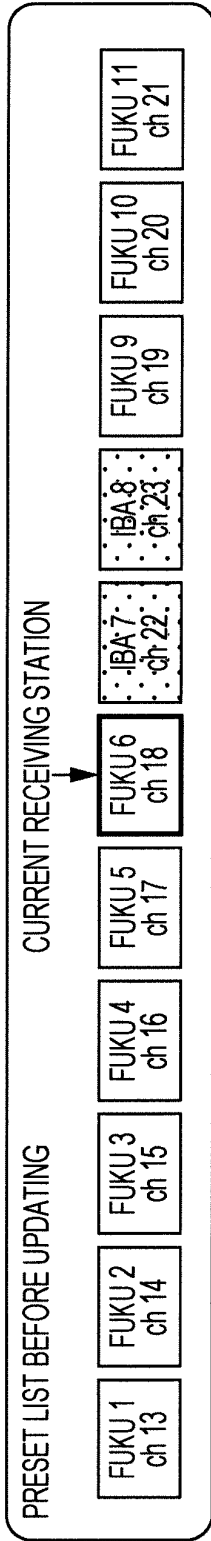


FIG. 2A

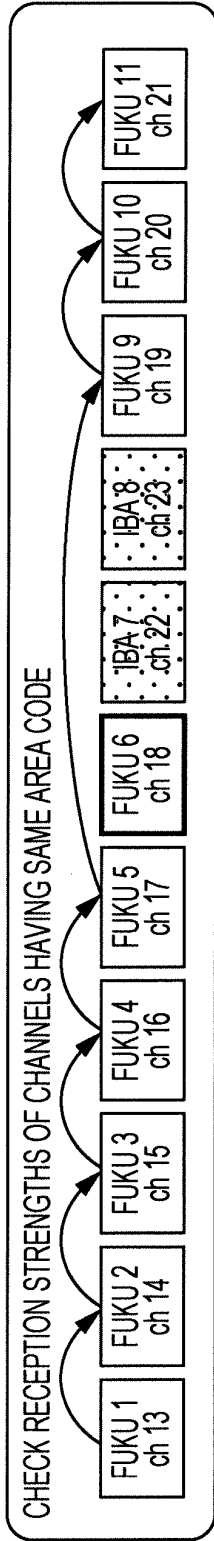


FIG. 2B

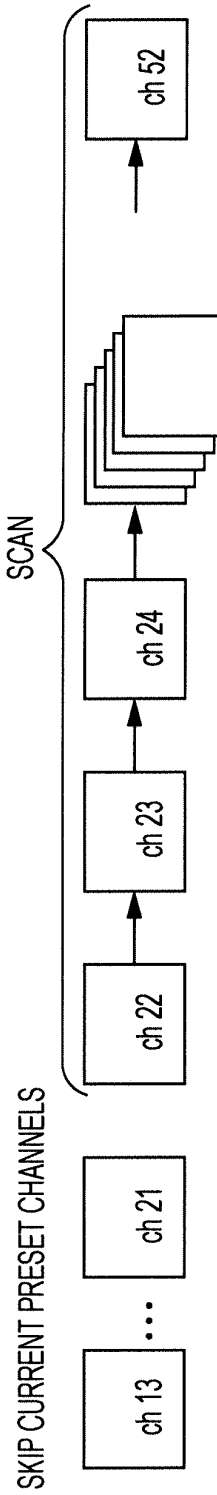


FIG. 2C

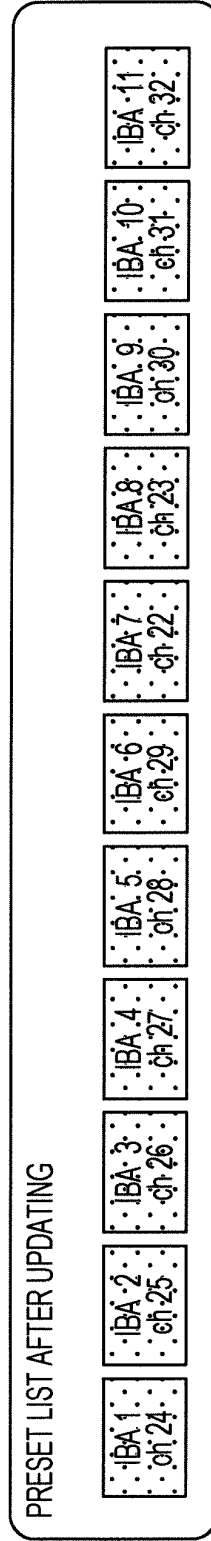


FIG. 2D

( FUKU: FUKUSHIMA  
IBA: IBARAKI

FIG. 3

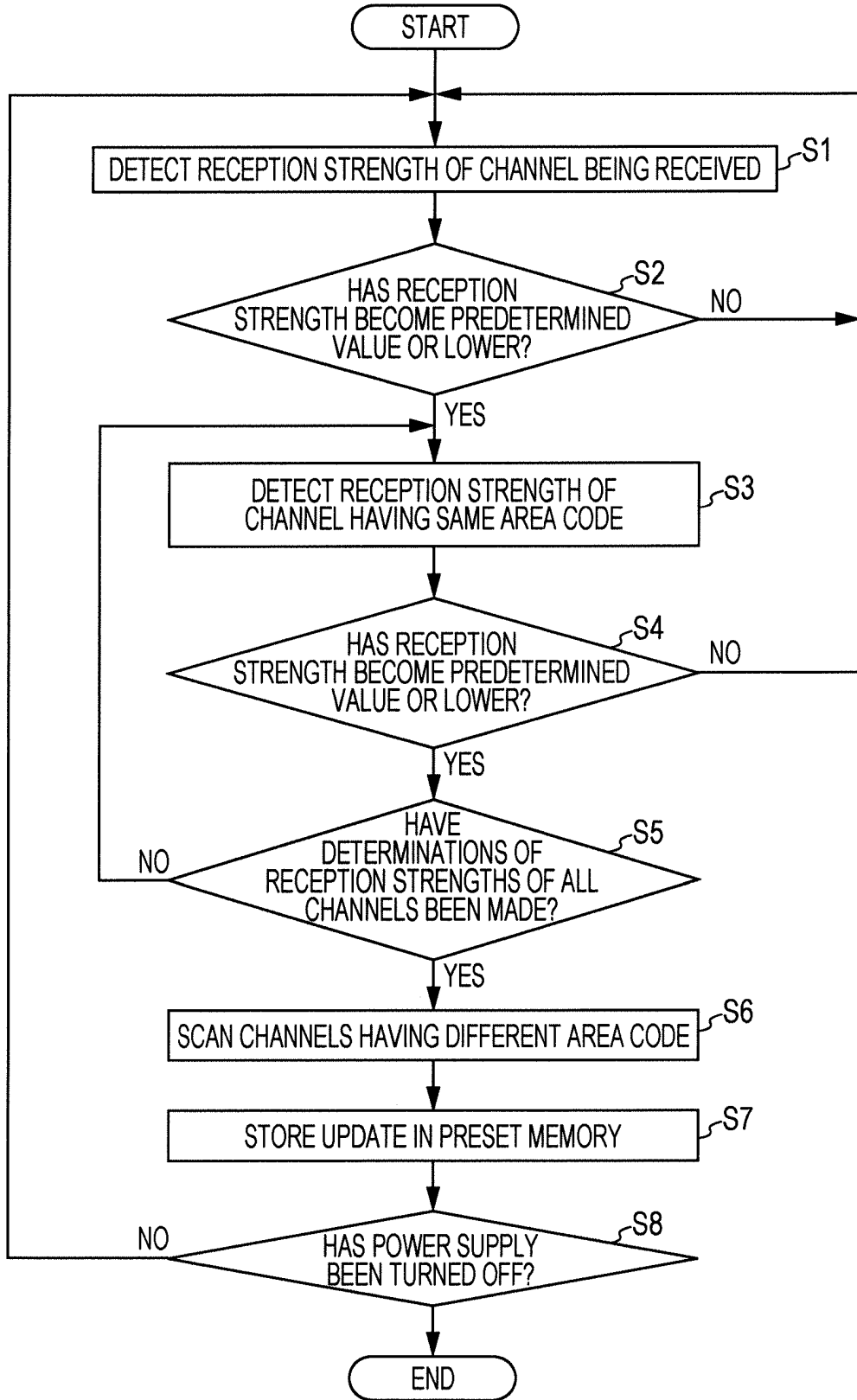
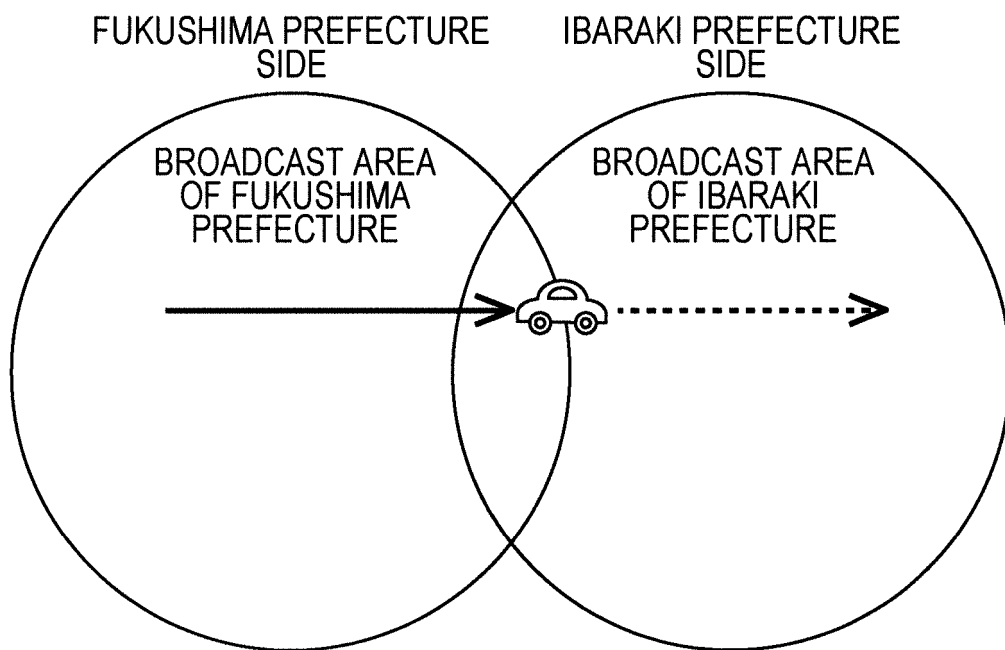


FIG. 4



**REFERENCES CITED IN THE DESCRIPTION**

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