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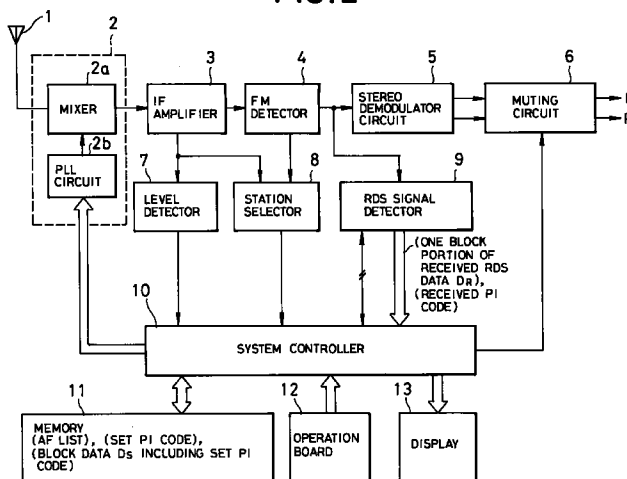
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(54) Network follow processing method and RDS receiver executing same

(57) A network follow processing method for reducing a time spent for a network follow, and an RDS receiver for implementing the method. The network follow processing method reads alternative frequency data corresponding to a set network from a memory, and executes station selection processing based on the read alternative frequency data. The method has a station selecting control step S12 for controlling a station selection at a received frequency in accordance with the alternative frequency data read from the memory, a received data fetch step S15 for fetching one block portion of RDS data from a received broadcast wave transmitted from a broadcasting station selected at the station selecting control step, and a block comparison step S17 for comparing the one block portion of RDS data fetched at the received data fetch step with block data including network identifying data which identifies the set network. The reception of a broadcast wave from a broadcasting station belonging to the set network is confirmed when both the data are determined to be coincident with each other at the block comparison step.

FIG. 2



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a radio data system (hereinafter abbreviated as "RDS"), and more particularly to a method for network follow processing which is initiated when a receiving condition of a broadcast wave from a broadcasting station is deteriorated in a receiver, for controlling the switching of received frequencies so as to automatically receive a broadcast wave from another broadcasting station which belongs to the same broadcasting network as the broadcasting station transmitting the so far received broadcast wave and presents a favorable receiving condition, based on a PI (Program Identification) code in RDS data which is multiplexed on the received broadcast wave. The present invention is also directed to an RDS receiver adapted to execute such the network follow processing.

2. Description of Background Information

There is an RDS system in which an RDS signal including information on the contents of a broadcast program transmitted from a particular broadcasting station, identification information from a traffic information broadcasting station, and data such as frequency information on broadcast waves transmitted from broadcasting stations belonging to a broadcast network which are broadcasting the program of the same contents as the particular broadcasting station, is frequency multiplexed on an FM stereo audio signal as a principle information signal (broadcast signal) to produce an RDS broadcast wave for emission, and the RDS signal is demodulated on the reception side in order to provide a variety of functions in addition to the reproduction of the principle information based on the respective information included in the demodulated RDS signal.

The RDS signal is a two-phase DPSK (Differentially Encoded PSK) signal having a bit rate of 1187.5 bps, and is frequency multiplexed out of the frequency band for audio FM modulated waves by subjecting a subcarrier at 57 KHz, which is a third harmonic of a stereo pilot signal having a frequency of 19KHz, to quiescent-carrier amplitude modulation.

The data structure of the base band of the RDS signal, as shown in Fig. 1, is formed of four blocks which constitute a group of 104 bits. Each block consists of a total of 26 bits which include a 16-bit information word and a 10-bit check word and offset word. The contents of each information word is defined by a group type code.

The information word in a block 1 within a group is always assigned to a program identification code (hereinafter called the PI code) which includes information such as a country, region, network, and so on. The information word in a block 2 includes a four-bit group type code, a one-bit traffic program identification (TP) code,

a five-bit program type (PTY) code, and other information. The information words in blocks 3 and 4 are defined by a group type determined by the group type code in the block 2. When the group type code is set to "0A", an alternative frequency to a currently received frequency, i.e., a frequency of a broadcast wave transmitted from another broadcasting station belonging to the same network as a currently received station, is defined as eight-bit AF (Alternative Frequencies) data in the block 3, and broadcasting station name data for displaying the name of the received station is defined as 16-bit PS (Program Service Name) data in the block 4.

One of applications for which the above-mentioned RDS signal can be utilized is a network follow function. More specifically, this function previously demodulates and fetches the PI code and AF data multiplexed on a currently received broadcast wave, and stores the AF data for every PI code, i.e., every broadcasting network, as an AF list in a predetermined area of a memory. Then, if a receiving condition of a receiver for receiving a broadcast wave from a currently receiving broadcasting station is deteriorating, for example, during transfer by a car equipped with the receiver, respective AF data corresponding to a PI code identical to the PI code associated with the so far received broadcast wave (set PI code) are sequentially read out from the AF list, such that an alternative broadcasting station belonging to the same broadcasting network, which provides a favorably receivable broadcast wave, is automatically selected to keep listeners listening to the same broadcast program constantly with clear sound.

In the network follow as described above, for knowing a received frequency of the same network, basically, the PI code is detected from an RDS signal received at a newly set received frequency, the detected PI code is compared with a desired PI code (PI code which identifies a network to be selected) such that the newly set received frequency is fixed if they are coincident with each other, and a broadcast wave is subsequently received at this fixed received frequency for reproducing sound output from the received broadcast wave.

As pre-processing for detecting the PI code, a group synchronization is established for an RDS signal after confirming the existence of a broadcast wave which is tuned at a set received frequency and determined by a received electric field strength and a detected output. In the group synchronization, the offset words are calculated for the received RDS signal to confirm that calculated offset words are arranged in the order of A, B, C, and D at regular intervals of 26 bits. The offset word may be calculated by dividing 26-bit data by a generator polynomial during a period of one bit rate clock (840μsec).

A condition for determining whether or not the synchronization is established should be defined in consideration of the possibility of erroneously determined synchronization due to a data error caused by noise, multi-path distortion, or the like, and due to a false offset word accidentally included in an RDS signal itself. Processing performed until the synchronization is estab-

lished, i.e., synchronization introduction may be performed in the following manner.

First, each bit of a received RDS signal is divided by a generator polynomial, and the division is repeated until the result matches either of the offset words A - F. When an offset word is detected, the results of the divisions at every 26th bit from the point at which the offset word is detected are extracted to confirm whether they are correct offset words and arranged in an appropriate order. For example, if correct results have been detected five times before erroneous results are detected eight times, it is determined that the synchronization is detected. If the detection of erroneous results are made eight times before the detection of correct results have not been made five times, the introduction processing is repeated from the beginning.

Once the group synchronization is established, the receiver performs error detection/correction for each block data while predicting an offset word which may be next received thereby. If predicted offset words cannot be identified over five consecutive blocks or more, the synchronization introduction mode is again entered, determining that the synchronization is failed.

After the completion of the group synchronization and the error detection/correction, a PI code is fetched from data in the first block of received RDS data, which has undergone the error detection/correction. Thus, the detection of the PI code from the RDS signal received at the newly set received frequency is achieved.

In the conventional network follow function, as described above, each time the existence of a broadcast wave tuned at one of sequentially set received frequencies is confirmed, the PI code for comparison is detected from RDS data, which has undergone error detection/correction, after the group synchronization has been established.

Thus, since the network follow is delayed as the group synchronization and error detection/correction take longer time, a receiver which executes the network follow based on the PI code, if suffering from a deteriorated receiving condition, will require an excessively long time to complete a selection of an alternative broadcasting station for providing the user with clear sound reproduced from a received broadcast wave transmitted from the selected alternative broadcasting station.

OBJECTS AND SUMMARY OF THE INVENTION

The present invention has been made in view of the problem mentioned above, and its object is to provide a method of reducing a time required for the network follow and an RDS receiver which is adapted to execute the method.

The network follow processing method according to the present invention, for use with an RDS receiver which receives RDS broadcast waves having multiplexed thereon a broadcast signal, network identifying data for identifying a network to which a broadcasting station transmitting the broadcast signal belongs, and alterna-

tive frequency data representing frequencies of broadcast signals transmitted from broadcasting stations belonging to the network, the RDS receiver having the network identifying data previously stored in a memory, is executed when a network follow initiating command is issued with a network being set for selecting a broadcasting station therefrom, for reading the alternative frequency data corresponding to the set network from the memory, and selecting a broadcasting station based on the alternative frequency data read from the memory, the network follow processing method comprising: a station selecting control step for controlling a station selection at a received frequency in accordance with the alternative frequency data read from the memory; a received data fetch step for fetching a predetermined bit amount of the RDS data from a received broadcast wave transmitted from a station selected by the station selecting control step; and a block comparison step for comparing the predetermined bit amount of the RDS data fetched by the received data fetch step with block data including the network identifying data stored in the memory, wherein the reception of a broadcast wave transmitted from a broadcasting station belonging to the set network is confirmed when both the data are determined to be coincident with each other at the block comparison step.

According to the network follow processing method of the present invention, one block portion of RDS data is fetched from a broadcast wave received from a selected broadcasting station, and this fetched RDS data is compared with block data including network identifying data identifying a set network to which a broadcasting station to be selected belongs, such that the reception of a broadcast wave from a broadcasting station belonging to the set network is confirmed if both data are coincident with each other.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a data structure for the RDS data of the baseband;

Fig. 2 is a block diagram showing the basic configuration of an embodiment of an RDS receiver according to the present invention;

Fig. 3 is a block diagram showing a specific configuration of an RDS signal detector in the RDS receiver illustrated in Fig. 2;

Fig. 4 is a flow chart showing an exemplary processing procedure for the network follow executed by a system controller in the RDS receiver illustrated in Fig. 2;

Fig. 5 is a flow chart showing another exemplary processing procedure for the network follow executed by the system controller in the RDS receiver illustrated in Fig. 2;

Fig. 6 is a diagram conceptually showing an exemplary feature of a broadcasting network when the processing based on the flow chart of Fig. 5 is effectively performed;

Fig. 7A is a diagram representing in a time-sequential manner RDS data obtained from a received broadcast wave radiated from a transmitting antenna 2 in the feature shown in Fig. 5;

Fig. 7B is a diagram representing in a time-sequential manner RDS data obtained from a received broadcast wave radiated from a transmitting antenna 3;

Fig. 8 is a flow chart showing a first part of a further exemplary processing procedure for the network follow executed by the system controller in the RDS receiver illustrated in Fig. 2 (a flow up to sound mute cancel processing); and

Fig. 9 is a flow chart showing a second part of the further exemplary processing procedure for the network follow executed by the system controller in the RDS receiver illustrated in Fig. 2 (synchronization introduction processing flow).

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will hereinafter be described in detail with reference to the accompanying drawings.

Fig. 2 is a schematic block diagram showing the basic configuration of an embodiment of an RDS receiver according to the present invention.

Referring specifically to Fig. 2, from FM broadcast waves each having an RDS signal multiplexed thereon, which have been received by an antenna 1, a broadcast wave from a desired broadcasting station is selected by a front end 2. The selected wave is converted to an intermediate frequency (IF) signal at a frequency of 10.7 MHz and then amplified by an IF amplifier 3. The front end 2 has a mixer 2a and a PLL circuit 2b, and generates a local oscillating signal to the mixer 2a by a PLL synthesizer method employing the PLL circuit 2b including a programmable frequency divider (not shown). The front end 2 is configured to perform a station selecting operation with a dividing ratio of the programmable divider controlled by a controller 10, later described.

The FM signal at 10.7MHz, which has been amplified and sufficiently limited by the IF amplifier 3, is reconverted to an audio signal by an FM detector 4, separated into L-channel (left-channel) and R-channel (right-channel) audio signals by a stereo demodulator circuit 5 when the signal is reproduced from a stereo broadcast wave, and output as reproduced audio signals through a muting circuit 6.

The RDS receiver further comprises a level detector 7 for detecting a received signal level (electric field strength) based on the level of an IF signal in the IF amplifier 3, and a station detector 8 for outputting a station detecting signal indicating that a received station has been detected when the received signal level is equal to or higher than a predetermined level and when a detected output having an S-shaped curve characteristic in the FM detector 4 is within a predetermined level range.

An RDS signal detector 9 is further provided for detecting an RDS signal (data) from the detected output of the FM detector 4. The RDS data output from the RDS signal detector 9, the received signal level output from the level detector 7, and the station detecting signal output from the station detector 8 are all supplied to the microcomputer-based system controller 10.

The system controller 10 fetches information words in respective blocks of an RDS signal which is input in group units, i.e., PI code, AF data, PS data, and so on, and stores them into a memory 11. The memory 11 serves as a storage means for storing alternative frequency data (AF data) representative of frequencies of broadcast signals transmitted from broadcasting stations belonging to the same network in the form of an AF list. The AF data is listed for each of networks. A desired broadcasting station or another broadcasting station belonging to the same network as a currently received broadcasting station is selected by controlling the dividing ratio of the programmable frequency divider constituting the front end 2, based on a station selecting command with a received frequency specified, from an operation board 12, or based on AF data read from the AF list when the network follow is performed. The system controller 10 also outputs a switching signal for turning the muting circuit 6 on when selecting a station. The operation board 12 and a display 13 are arranged on a front panel of the RDS receiver. The display 13 serves as a notifying means for notifying that a broadcast from a network corresponding to a specified channel cannot be received when network identifying data for identifying the network corresponding to the specified channel (i.e., a network including a broadcasting station to be selected), i.e., the PI code was not detected as a result of automatic station selecting processing such as the network follow. The display 13 displays in accordance with a display control signal from the system controller 10.

A specific configuration of the RDS signal detector 9 is shown in Fig. 3.

Referring specifically to Fig. 3, by passing a detected output of the FM detector 4 through a filter 14, a subcarrier at 57KHz amplitude-modulated by a bi-phase-coded data signal, i.e., RDS signal components are extracted, and demodulated by a PLL circuit 15. The demodulated output is supplied to a digital PLL (D-PLL) circuit 16 and a decoder 17. The D-PLL circuit 16 generates a clock for demodulating data based on the demodulated output of the PLL circuit 15. The generated clock is supplied to a gate circuit 18. A lock detector circuit 19 generates a lock detecting signal when it detects that the D-PLL circuit 16 is locked, and supplies the lock detecting signal to the gate circuit 18 to control the same to be brought into an open state. The decoder 17 decodes the bi-phase-coded data signal, which is the demodulated output of the PLL circuit 15, in synchronism with the clock generated by the D-PLL circuit 16.

Output data of the decoder 17, as shown in Fig. 1, has a 104-bit group unit sequence formed of four 26-bit

blocks, and is sequentially supplied to a block/group synchronization and error detecting circuit 20. In the block/group synchronization and error detecting circuit 20, the data blocks are subjected to block synchronization and group synchronization based on 10-bit offset words assigned to 10-bit check words in the respective blocks, and 16-bit information words in the respective blocks undergo error detection based on the check words. The error detected data are then subjected to error correction in an error correcting circuit 21 at the next stage, and then the error free data are supplied to the system controller 10.

It should be noted that the circuits 20 and 21 are respectively supplied with control signals from the system controller 10, such that output data of the decoder 17 may be output as it is, i.e., as the received RDS data without subjected to synchronization or error detection/correction, if so required, under the control of the system controller 10, detail of which will be described later.

In the RDS receiver configured as described above, the system controller 10 performs a station selecting operation by controlling a received frequency data value for determining the dividing ratio of the programmable frequency divider in the PLL circuit 2b, in accordance with a station selecting manipulation on the operation board 12 by the user (or with a channel recall).

Assuming that a station selection has been made to receive a broadcast wave from a broadcasting station A belonging to a certain network, and the broadcast wave is being received, a signal indicating the signal level of the received radio wave is generated from the level detector 7, and the station detector 8 generates a station detecting signal. These signals are supplied to the system controller 10. From the RDS signal, data such as the PI code, AF data, PS data, and so on are fetched into the system controller 10 through the RDS signal detector 9 and written into the memory 11. By thus writing the data into the memory 11, frequencies f_1 , f_2 , ..., f_n of respective broadcast waves transmitted from n broadcasting stations, belonging to the same network as the broadcasting station A which is transmitting the currently received broadcast wave, are stored as an AF list.

Next, an exemplary processing procedure for the network follow executed by the system controller 10 in the RDS receiver will be described with reference to a flow chart of Fig. 4.

In Fig. 4, when a receiving condition of a broadcast wave is deteriorating or when the system controller 10 receives a command to select one of broadcasting stations belonging to a network corresponding to a preset channel, the system controller 10 initiates the network follow processing. First, the system controller 10 supplies the muting circuit 6 with a mute command signal for muting, i.e., interrupting audio signal outputs reproduced from the received broadcast wave (step S11). Next, the system controller 10 controls the station selection based on the AF list which has previously established in the memory 11 (step S12). This is a control dedicated to a

station selecting control process. Specifically, one of AF data corresponding to a PI code previously set before the initiation of the network follow (set PI code) is read from the memory 11, and a received frequency is set to the PLL circuit 2b in accordance with the read AF data. This control forces the front end 2 to tune at the set received frequency. Then, the system controller 10 waits for a first predetermined time period as a lag time until the receiver system including the PLL circuit 2b is stabilized (step S13).

After the lag time has elapsed, the system controller 10 determines whether or not the receiver system has received the broadcast wave (step S14). In this event, the reception of the broadcast wave (the existence of a broadcasting station which is transmitting a broadcast wave receivable at a current receiving location or in a current receiving environment) is determined only when a received signal level detected by the level detector 7 exceeds a predetermined level and when the station detector 8 has detected the associated broadcasting station. Alternatively, the determination may be made only with the received signal level detected by the level detector 7.

The system controller 10, when determining at step S14 that a broadcast wave has been received, fetches one block portion of RDS data D_R output from the decoder 17 in the RDS signal detector 9 based on a signal generated from the received broadcast wave (FM detecting output) (step S15). This step is dedicated to a received data fetch process. The data D_R is data before being subjected to the block and group synchronization as well as the error detection/correction (differentially decoded data or data detected in the form of a block). Data without such processing is made available by supplying the respective associated circuits with control signals from the system controller 10 for disabling the synchronization and error detecting circuit 20 and the error correcting circuit 21 to execute their respective processing.

The system controller 10 next reads block data DS including a PI code corresponding to a station belonging to the network to be selected (set PI code) from the memory 11. This PI code has already been held in the memory 11 before the initiation of the network follow. More specifically, this PI code may be a PI code specified by the user from the operation board 12 or a PI code included in a broadcast wave received before the initiation of the network follow. The block data DS held in the memory 11 is to include block data having the set PI code, i.e., all 26-bit data in the first block of a group, or includes only a portion necessary for a later comparison executed at step S17. In other words, data having one block portion or more includes the group type data in the second block, and cannot be used for the comparison. Therefore, the block data to be compared should have one block portion (26 bits) at maximum. Since the PI code is formed of 16 bits, the shortest block data DS has 16 bits.

When the block data DS is read from the memory 11, the system controller 10 compares the one block portion of the data D_R fetched at step S15 with the block data DS read at step S16 to see whether they are coincident (step S17). The system controller 10, when determining as a result of the comparison that the data D_R is not coincident with the data D_S , shifts the RDS data D_R output from the decoder 17 in the RDS signal detector 9 by one bit, based on the signal generated from the received broadcast wave (FM detecting output) and fetches one block portion of the RDS data D_R from the shifted position (step S18). Then, the comparison of the data D_R with the data DS and the one-bit shift of the data D_R are repeated until a second predetermined time period elapses by a time limiting operation at step S19. The system controller 10, when determining as a result of the comparison at step S17 that the contents of the data D_R and DS are coincident, disables the mute command signal to force the muting circuit 6 to cancel the muting operation, as a received sound output process, determining that the received broadcast wave has the PI code, i.e., the received broadcast wave is transmitted from a broadcasting station belonging to the desired network (step S20). Thus, the broadcast sound is output after confirming that the broadcast wave is received and has the set PI code.

If it is determined at step S14 that no broadcast wave can be received, the system controller 10 proceeds to step S12 without performing the comparison of D_R with D_S , where the system controller 10 performs the station selecting control based on a new AF list. Also, if the second predetermined time period has elapsed, more specifically, if the system controller 10 fails to determine the coincidence of the data D_R with the data D_S even after the second predetermined time period has elapsed, the system controller 10 jumps to step S12, determining that although a broadcast wave has been received, the received broadcast wave does not have the set PI code and therefore is transmitted from a broadcasting station belonging to a different network. At step S12, the system controller 10 sets to the PLL circuit 2b a received frequency corresponding to another AF data different from the AF data previously read from the memory 11 each time the processing (the tuning control at a received frequency in accordance with one of the AF data) is executed.

Thus, only when the system controller 10 sets to the PLL circuit 2b a received frequency, at which a broadcast wave having the set PI code can be received, from among received frequencies corresponding to the AD data included in the AF list, sound reproduced from the received broadcast wave is output through step S20.

In addition, the confirmation as to the presence or absence of the set PI code in a broadcast wave upon receiving the same is realized by the comparison of one block portion of received RDS data D_R obtained by block detection before error detection/correction with block (first block) data including a set PI code previously held in the memory, without establishing group synchroniza-

tion. Thus, in comparison with the prior art which confirms the presence or absence of a PI code after establishing the group synchronization, the present invention can eliminate a time required for detecting the synchronization, as well as reduce a time required until the PI code is detected by a time otherwise required for the error detection/correction of the RDS data. It is therefore appreciated that the present invention can significantly reduce a time spent for the network follow as well as a time from the reception of a broadcast wave having the set PI code to the output of sound reproduced from the received broadcast wave.

Fig. 5 shows another exemplary processing procedure for the network follow executed by the system controller 10 in the RDS receiver.

In Fig. 5, steps equivalent to those in Fig. 4 are designated the same reference numerals. The flow chart of Fig. 5 differs from that of Fig. 4 in that step S31 is added immediately after the initiation of the network follow procedure for determining the arrival of a predetermined station selecting timing.

The step S31 is dedicated to a timing detection process, and determines a timing appropriate to proceed to the processing at step S11 and subsequent steps after the system controller 10 has jumped back from step S19 to step S31 due to the answer at step S19 being YES, in order to perform the station selecting operation with new AF data. Specific operations executed at step S31 will be explained below with reference to Figs. 6, 7A, and 7B.

Fig. 6 is a diagram conceptually showing a feature of a broadcast network which is built using the same RDS encoder (RDS data generator circuit), wherein an output of the encoder 1 is supplied at least to a transmission antenna 2 for transmitting broadcast waves to a region A and a transmission antenna 3 for transmitting the broadcast waves to a region B through cables. Broadcast signals including RDS data supplied to the respective transmission antennas are respectively radiated therefrom and captured by RDS receivers, for example, equipped in cars.

In the situation represented in Fig. 6, the RDS data received by a RDS receiver may be structured as shown in Figs. 7A and 7B.

Fig. 7A shows RDS data obtained from a received broadcast wave radiated from the transmission antenna 2 in a time-sequential manner, and Fig. 7B shows RDS data obtained from a received broadcast wave radiated from the transmission antenna 3 also in a time-sequential manner. As shown in these figures, a propagation delay exists between the RDS data of Fig. 7A and the RDS data of Fig. 7B due to the difference in the propagation paths from the respective transmission antennas (strictly speaking, from the encoder 1) to the RDS receiver. In practice, however, such delay may be regarded substantially negligible, so that the determination of a station selecting timing, as presently explained, is considerably effective.

More specifically, before proceeding to step S11 (Fig. 5), the system controller 10 detects the arrival of a

predetermined station selecting timing as shown in Figs. 7A and 7B. This detection may be made using the timing of the block synchronization which has been accomplished before the initiation of the network follow. In this block synchronization, it can be predicted, in the recognition of the system controller 10, that a first block (A) having a PI code, and second, third, and fourth blocks (B, C, D) are received in this order. Further, processing for synchronizing respective bits in the block data is simultaneously performed based on the block synchronization.

A predetermined station selecting timing is determined at step S31 on the assumption that the synchronization processing as mentioned above is performed. Consequently, it is determined at step S31 as to the arrival of a time point (predetermined station selecting timing) preceding, by a time required for the station selecting operations at steps S11 - S14, from the time at which the first bit of the block A has been received.

In this way, since the first bit of the block A is received when the system controller 10 proceeds to step S15, all data in the block A is fetched at step S15 without failure. Thus, the data in the first block can be fetched immediately after the completion of the station selecting operation, the confirmation of the presence or absence of a set PI code in the received data can be promptly carried out, and the muting of sound at step S11 is performed in the shortest time, thus contributing to a reduction in muting time.

Figs. 8 and 9 show in combination a further exemplary processing procedure for the network follow executed by the system controller 10 in the RDS receiver, wherein steps equivalent to those in Fig. 5 are designated the same reference numerals.

In this embodiment, when a broadcast wave having a set PI code is received and the sound muting is canceled at step S20, the synchronization and error detecting circuit 20 is controlled such that a portion corresponding to three subsequent blocks of received RDS data is fetched (step S52) and determination is made as to whether the synchronization has been established (step S53). This determination is an example of possible determinations made in the synchronization circuit 20 based on a detecting rule of the group synchronization as previously described in connection with the related prior art. The established synchronization is determined if whichever two offset words in the blocks A - D are confirmed within the three block portions of the received RDS data fetched at step S51. If the synchronization circuit 20 determines at step S53 that the synchronization is not established, the system controller 10 responsively proceeds to step S54 to wait for the lapse of a predetermined time period, and then jumps back to step S52 to again fetch three block portions of the received RDS data by shifting the data one bit by one bit.

Upon determining at step S53 that the synchronization is established in the synchronization introduction processing as described above, the system controller 10 generates a control signal to the error correcting circuit

21 to force the same to execute the error correction processing (step S55). Then, the PI code included in the first block is fetched from the error corrected RDS data (step S56), the fetched PI code (received PI code) is compared with the set PI code to determine whether or not both are coincident (step S57). The system controller 10, when determining the coincidence of these PI codes as a result of the comparison in the final comparison process, determines that a broadcast wave having the set PI code has been formally received with the synchronization being detected, exits the network follow, and proceeds to a normal reception mode indicated in a main flow, not shown.

If the predetermined time period has elapsed, i.e., if the synchronization is not established even after the predetermined time period has elapsed at step S54, or if the received PI code obtained after the error correction is not coincident with the set PI code at step S57, the system controller 10 proceeds to step S31 which is the time detecting process. These failures are due to the fact that the synchronization is not established even after the set PI code is confirmed at step S17, and that the error corrected version of the received PI code is not coincident with the set PI code, but they are rather rare cases.

Thus, in this embodiment, after the reception of a broadcast wave having a set PI code is confirmed based on received RDS data before error correction and the sound muting is canceled, the synchronization introduction processing is performed to confirm the set PI code based on the error corrected version of the received RDS data, and finally the normal reception mode is entered. Therefore, the PI code can be confirmed as exactly as before in a shorter mute time.

While in the foregoing embodiments, the received sound output is muted during the network follow procedure, the present invention is not limited to this particular configuration, but may be applicable to a network follow without such sound muting and can also produce considerable effects in such applications.

According to the network follow processing method of the present invention as described above in detail, one block portion of RDS data is fetched from a received broadcast wave from a selected broadcasting station, and the fetched RDS data is compared with block data including network identifying data for identifying a set network to which a broadcasting station to be selected belongs, to confirm that a broadcast wave from a broadcasting station belonging to the set network has been received if both are coincident, thus making it possible to reduce a time spent for the network follow.

Claims

1. In an RDS receiver which receives RDS broadcast waves having multiplexed thereon a broadcast signal, network identifying data for identifying a network to which a broadcasting station transmitting the broadcast signal belongs, and alternative frequency data representing frequencies of broadcast signals

transmitted from broadcasting stations belonging to the network, said RDS receiver having said network identifying data previously stored in a memory, a network follow processing method, which is executed when a network follow initiating command is issued with a network being set for selecting a broadcasting station therefrom, for reading said alternative frequency data corresponding to said set network from said memory, and selecting a broadcasting station based on said alternative frequency data read from said memory, said network follow processing method comprising:

a station selecting control step for controlling a station selection at a received frequency in accordance with said alternative frequency data read from said memory;

a received data fetch step for fetching a predetermined bit amount of said RDS data from a received broadcast wave transmitted from a station selected by said station selecting control step; and

a block comparison step for comparing the predetermined bit amount of said RDS data fetched by said received data fetch step with block data including said network identifying data stored in said memory,

wherein the reception of a broadcast wave transmitted from a broadcasting station belonging to said set network is confirmed when both said data are determined to be coincident with each other at said block comparison step.

2. A network follow processing method according to claim 1, further comprising a received sound output step for canceling interruption of a received sound output when both said data are determined to be coincident with each other at said block comparison step.

3. A network follow processing method according to claim 1 or 2, further comprising a timing detection step, executed prior to said station selecting control step, for detecting a predetermined station selecting timing after the network follow processing has been initiated, said station selecting control step being executed in response to the detection of said predetermined station selecting timing.

4. A network follow processing method according to claim 3, further comprising:

a synchronization introduction step for introducing synchronization after said received sound output step;

an error correction step for correcting errors in said received RDS data after synchronization has been established at said synchronization introduction step; and

a final comparison step for fetching network identifying data from said received RDS data corrected at said error correcting step and comparing

the fetched network identifying data with said network identifying data identifying said set network,

wherein said timing detection step is entered when it is determined at said final comparison step that both said data are different from each other.

5. A network follow processing method according to claim 3 or 4, wherein said predetermined station selecting timing is a time point preceding, by a time required for a station selecting operation at said station selecting control step, from the time at which the first bit of a first block of said received RDS data has been received.

FIG.1

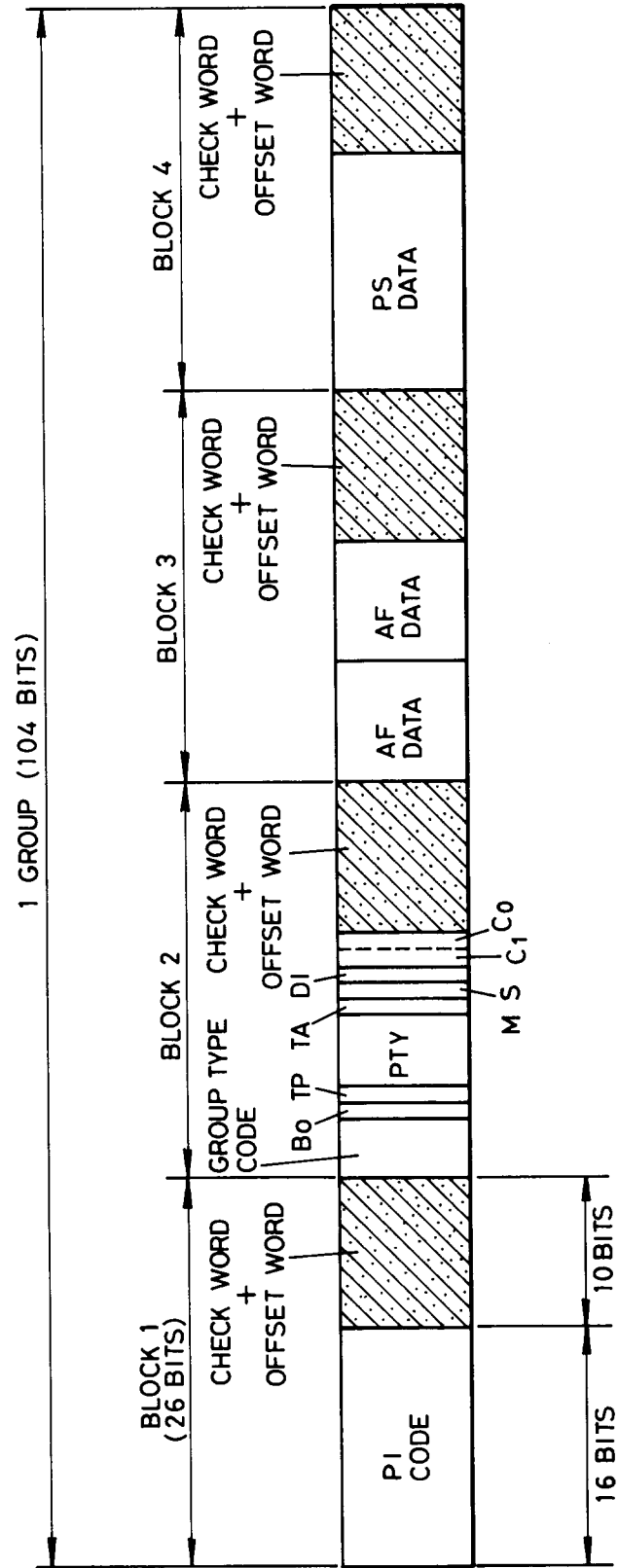


FIG. 2

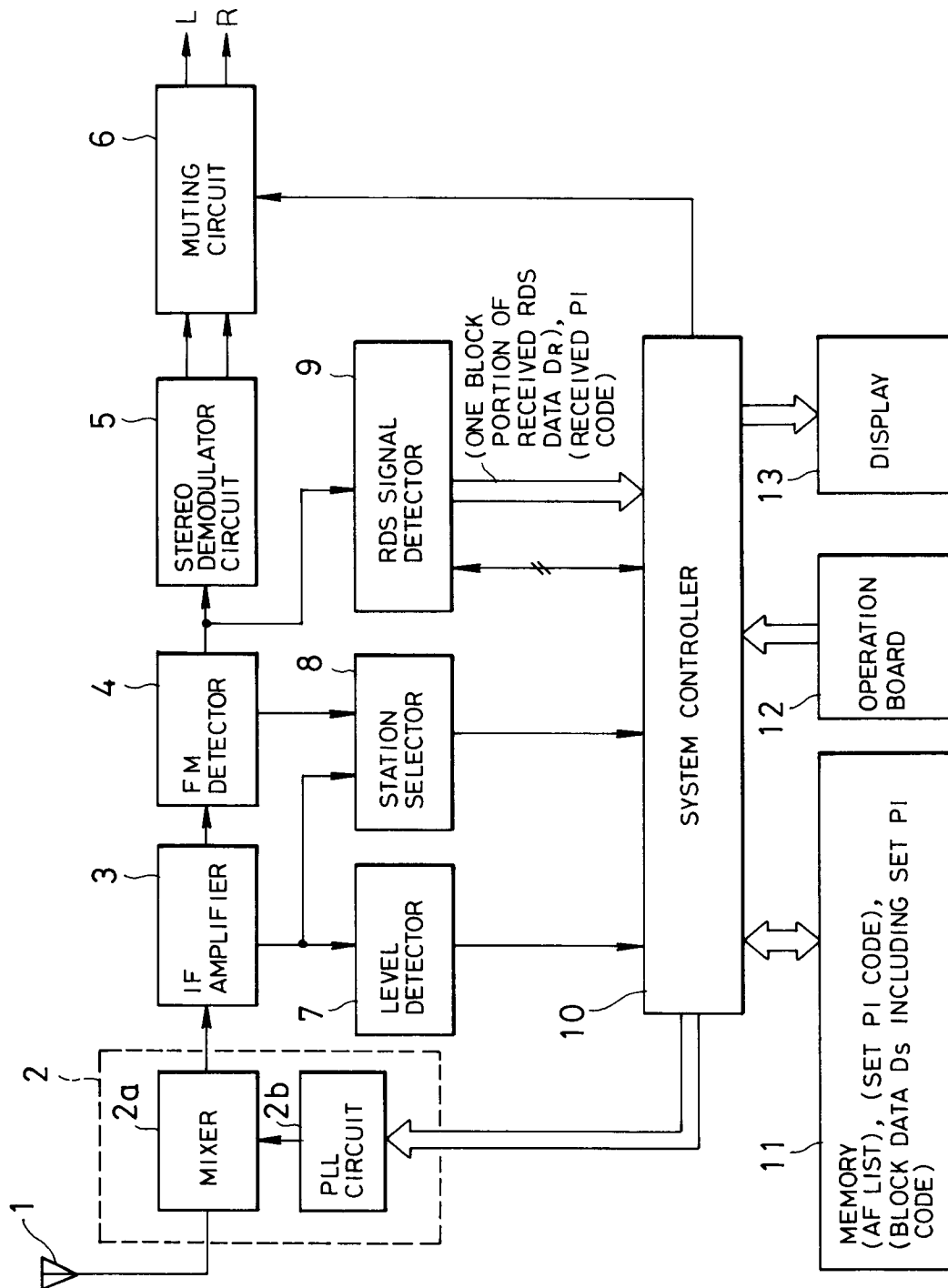


FIG. 3

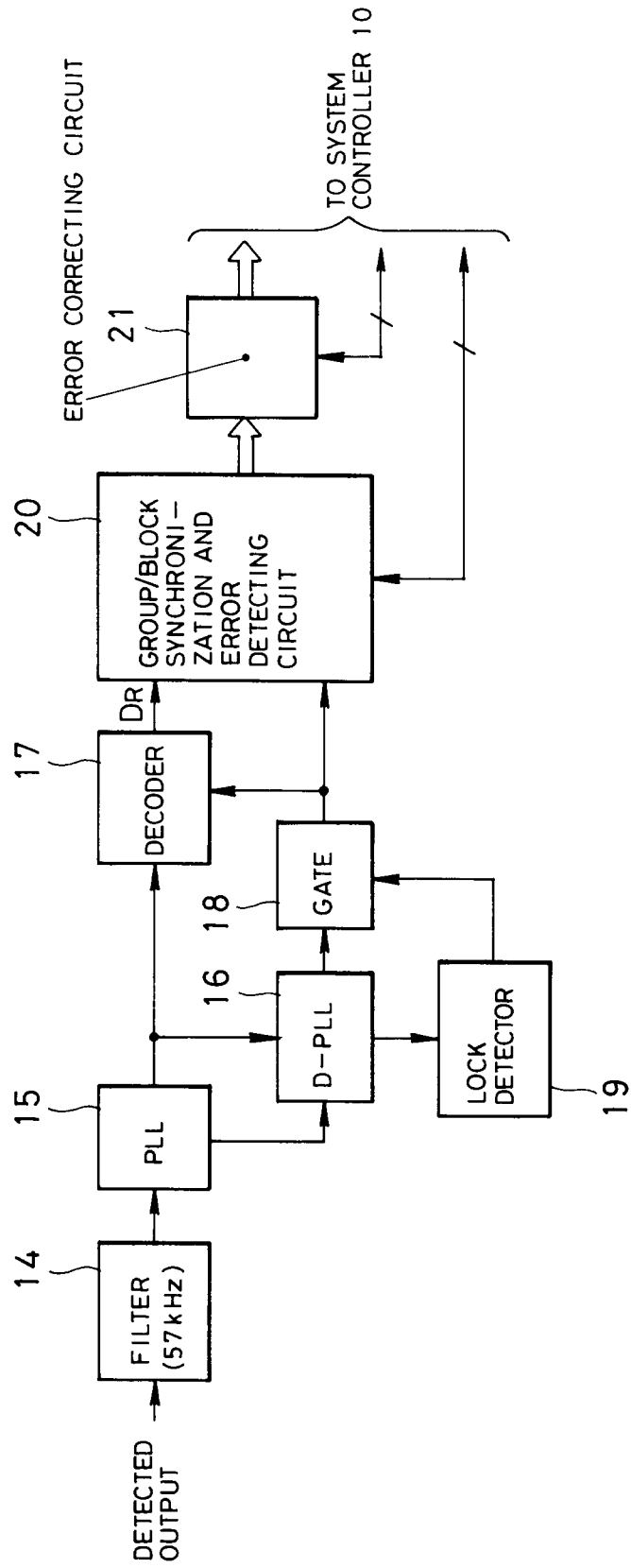


FIG. 4

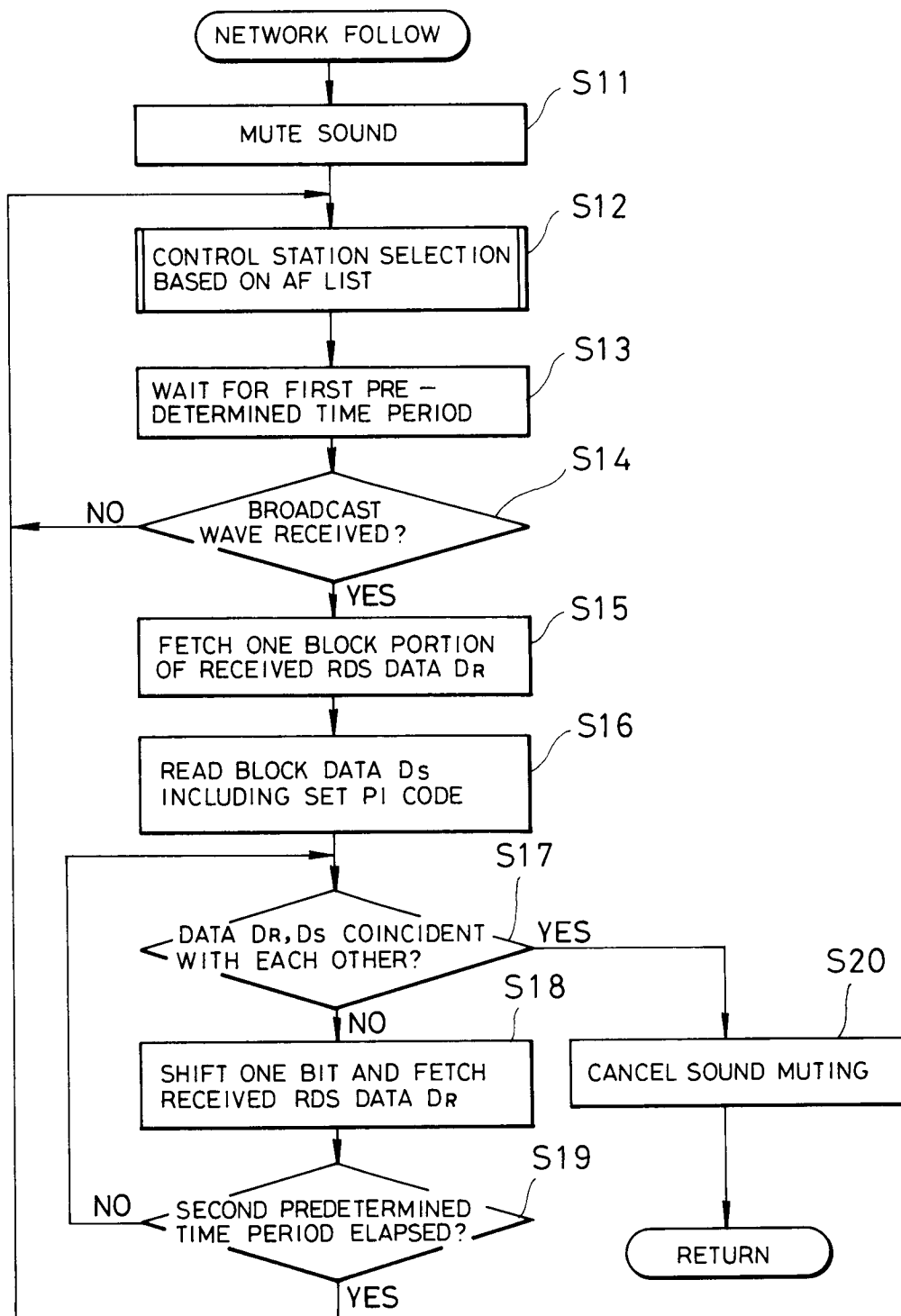


FIG. 5

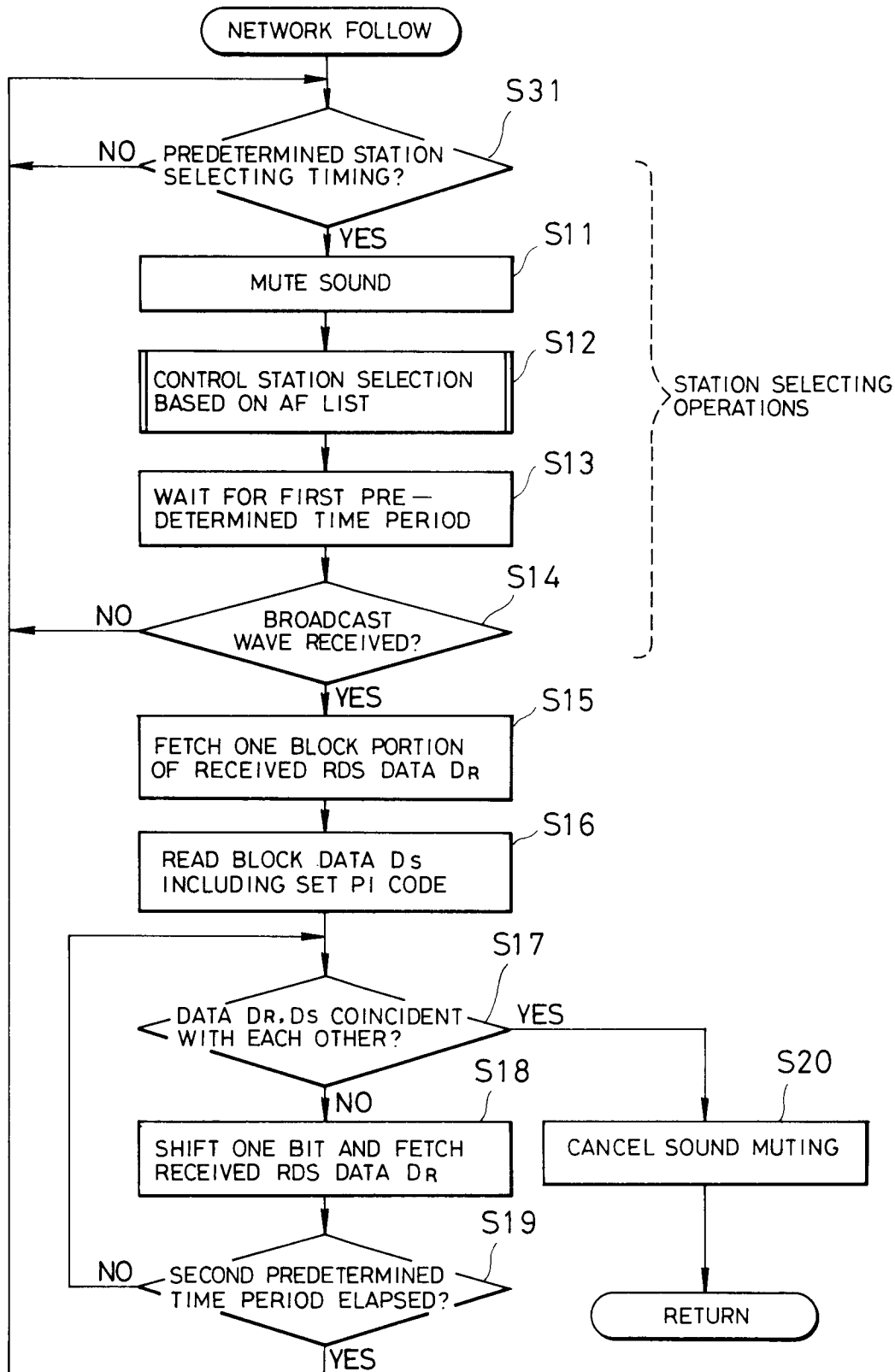


FIG. 6

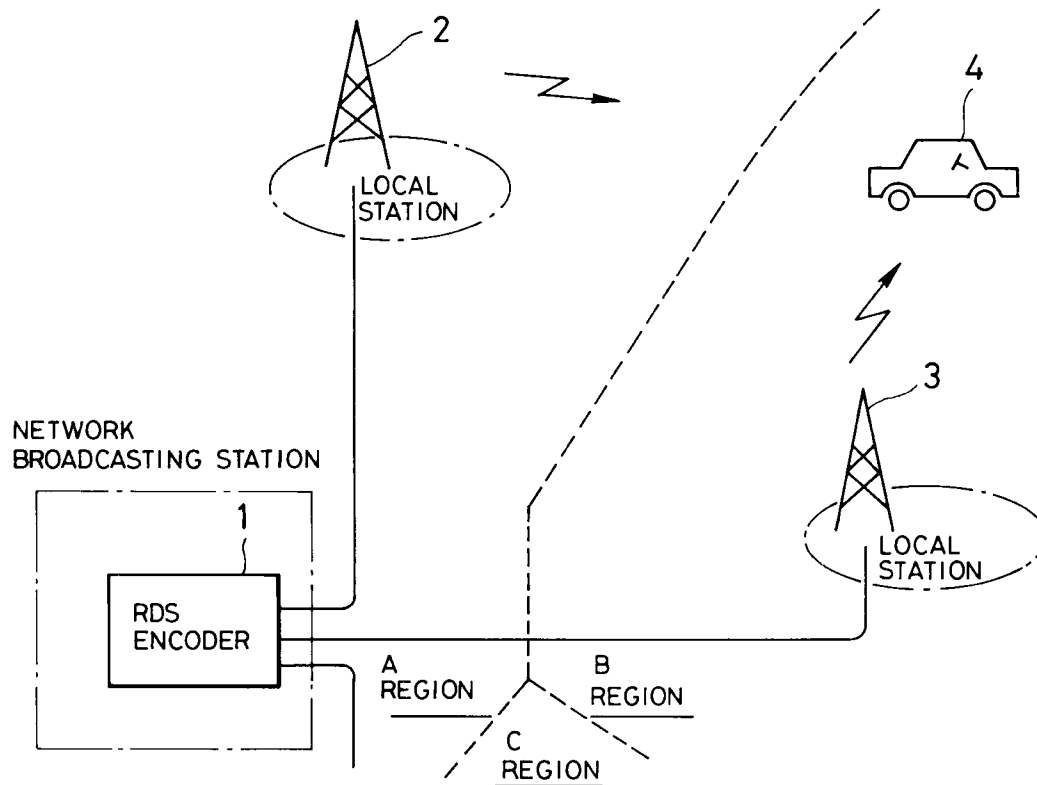


FIG. 7A

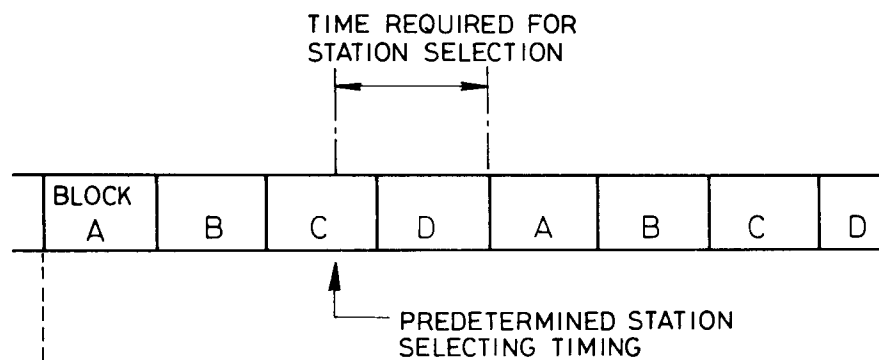


FIG. 7B

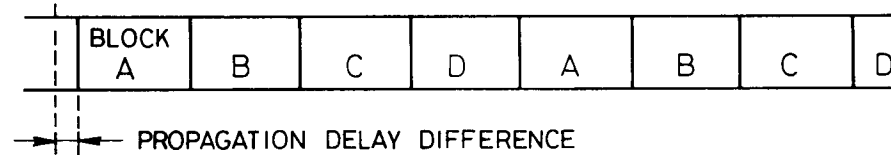


FIG. 8

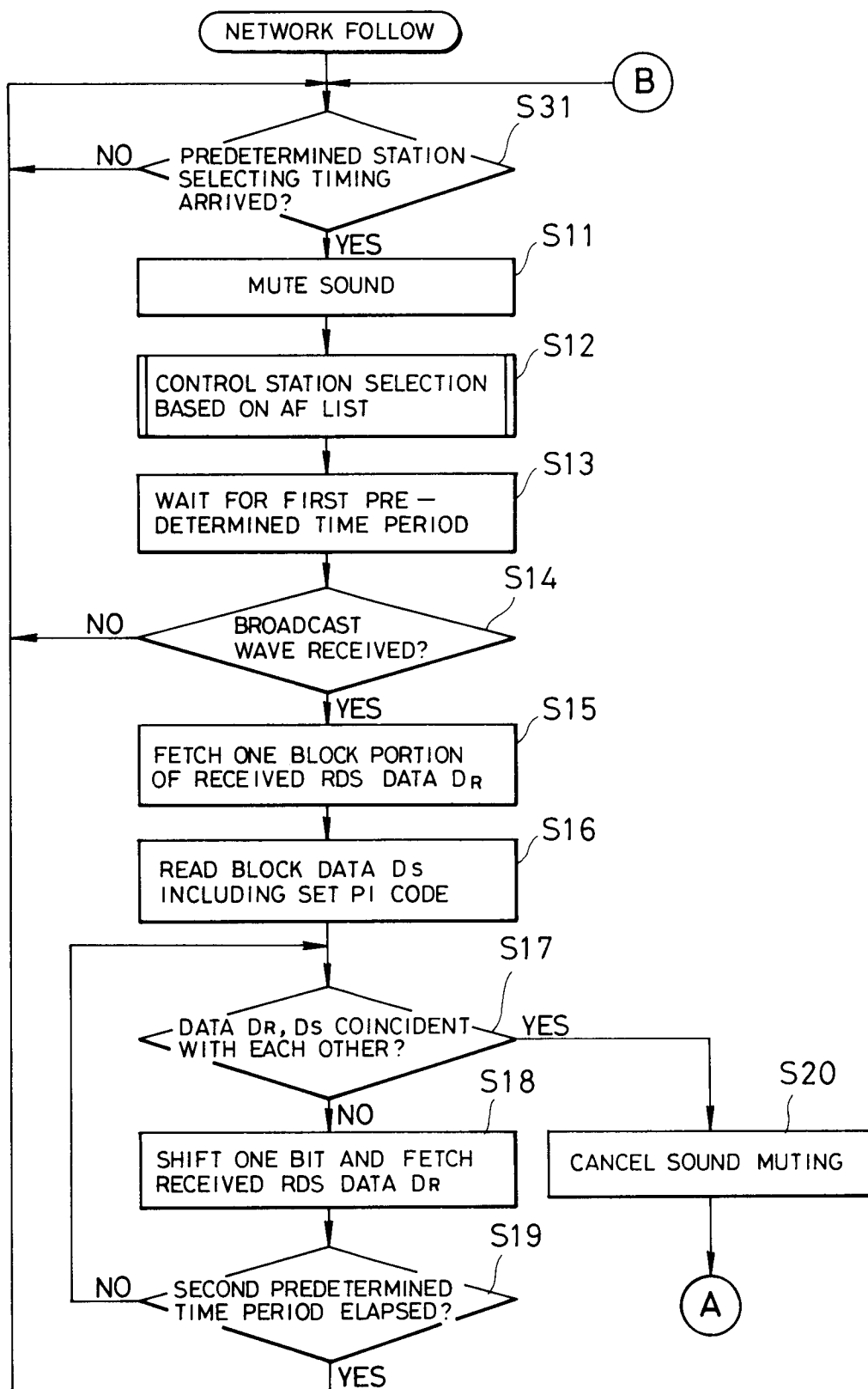


FIG. 9

