



(11) Publication number : **0 688 112 A1**

(12) **EUROPEAN PATENT APPLICATION**

(21) Application number : **95109101.6**

(51) Int. Cl.⁶ : **H04H 1/00**

(22) Date of filing : **13.06.95**

(30) Priority : **15.06.94 JP 132938/94**

(43) Date of publication of application :
20.12.95 Bulletin 95/51

(84) Designated Contracting States :
DE FR GB

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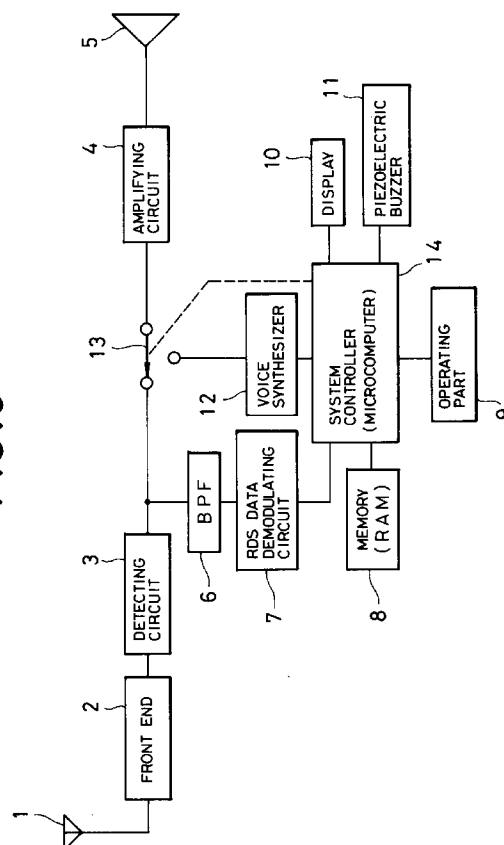
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(54) **Method of selecting other networks carrying traffic information using a radio data system receiver**

(57) A reception control method whereby when an interruption reception is performed to an arbitrary information program of other network, a reception situation of the information program of the other network of which the broadcasting was started is correctly notified to the user and a proper correspondence can be used in accordance with the reception situation. When a PTY burst signal such that same EON information of the group type 14A and comprising an information classification code (Usage Code = 13) of the second block is transmitted a plurality of number of times in a short time is received, whether a preset information program of which the interruption reception is desired coincides with an information program shown by a program type code (PTY(ON)) in the received PTY burst signal or not is detected. When they coincide, whether broadcasting station frequency data of the other network which broadcasts the relevant information program has already been read in a memory in the receiver or not is detected. When the broadcasting station frequency data is not read yet, such a fact is notified by a desired method.

FIG. 3



BACKGROUND OF THE INVENTION

Field of the Invention

The invention relates to an interruption reception control method of an RDS receiver for performing an interruption reception of an arbitrary information program of another network by using EON information (Enhanced Other Networks Information).

Description of Background Information

An RDS (Radio Data System) is an FM multiplex broadcasting system recommended by CCIR (International Radio Consultative Committee) used mainly for car radios and devised to provide various services such as display of a station name of a broadcasting station, an automatic station selection, an automatic reception of traffic information, and the like.

Hitherto, in the automatic reception of traffic information in an RDS receiver, a reception station which has been preset in the receiver and its associated stations, namely, only the traffic information of a station of the self network (this network) can be received. In the case where a traffic information program is not broadcasted by this network, therefore, there is a problem such that the traffic information cannot be listened at all times.

To solve such a problem, the applicant of the present invention has already filed a patent application on a traffic information receiving method which can automatically interruption receive a traffic information program of another network station (Japanese Patent Application No. Hei 4-213910). According to the traffic information receiving method disclosed in the above application, by using EON information which comprises group types 14A and 14B newly enacted, it is detected that the broadcasting of a traffic information program has been started by another network station, a reception station of the RDS receiver is automatically switched from this network which has been preset, to the other network station, so that the traffic information being broadcasted by the other network is received by interruption.

In case of the above prior art invention, however, the traffic information of the other network station is received by interruption and it was not possible to perform an interruption to an arbitrary information program other than the traffic information. In case of interruption receiving an arbitrary information program, it is desired that the interruption can be performed from the broadcasting start time point of the information program as accurately as possible. Such an interruption reception, however, cannot be executed in the conventional RDS receiver as well as in the above-mentioned prior art invention.

SUMMARY OF THE INVENTION

The present invention has been made to solve the above subject and it is an object of the invention to provide an interruption reception control method of an RDS receiver in which an arbitrary information program of another network can be automatically received by interruption from its broadcasting start time point, and upon such an interruption reception a reception state of an information program of another network of which the broadcasting has been started is precisely notified to the user, and a proper countermeasure can be taken in accordance with a reception situation.

To accomplish the above object, according to the first aspect of the invention, there is provided an interruption reception control method for an RDS receiver in an RDS system in which same EON information of the group type 14A which is constructed by an information classification code (usage code = 13) of the second block is transmitted a plurality of number of times in a short time, thereby specifying as a PTY burst signal indicative of the switching of the broadcasting of an information program of another network, wherein when the PTY burst signal is received, a check is made to see if a preset information program of which the interruption reception is desired coincides with an information program shown by a program type code "PTY(ON)" in the received PTY burst signal, and when they coincide, whether or not broadcasting station frequency data of the other network which broadcasts the information program has already been read to a memory in the receiver is detected, and when the broadcasting frequency data is not read, such a fact is informed by a desired method.

The RDS data is constituted by sixteen kinds of groups from 0 to 15 groups including undefined groups. In recent years, among the undefined groups of the RDS data, the groups 14A and 14B were newly enacted for the EON information as shown in Figs. 1A and 1B. Not only the information of the self network that is at present being received, therefore, but also the information of the other networks which are not received can be transmitted. The invention has been made by using the EON information which is specified by an information classification code (Usage code = 13) of the newly enacted group 14A.

According to the second aspect of the invention, there is provided an interruption reception control method for an RDS receiver in an RDS system in which same EON information of the group type 14A which is constituted by the information classification code (Usage code = 13) of the second block is transmitted a plurality of number of times in a short time, thereby specifying as a PTY burst signal indicative of the switching of a broadcasting of an information program of another network, wherein when the PTY burst signal is received, a check is made to see if a

preset information program of which the interruption reception is desired coincides with an information program shown by a program type code "PTY(ON)" in the received PTY burst signal, and when they don't coincide, the kind of information program of which the broadcasting was started is notified by a predetermined method.

According to the third aspect of the invention, in the interruption reception control method of the RDS receiver mentioned above, when a station selection instruction about the notified information program is given, the station which is at present broadcasting the information program is searched for and is received by interruption.

BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1A and 1B are diagrams showing data formats of EON information;
Figs. 2A and 2B are diagrams showing transmission forms of a PTY burst signal;
Fig. 3 is a block diagram of an embodiment of an RDS receiver constructed by applying a method of the invention; and
Fig. 4 is a flowchart showing the operation of the embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Prior to describing an embodiment of the invention, data formats of EON information of Figs. 1A and 1B as a condition of the invention will be first described. In Figs. 1A and 1B, (TN) added after each code indicates data regarding a self network (This Network) and (ON) denotes data regarding another network (Other Network), respectively.

In a 14A group of Fig. 1A, a program ID code PI(TN) of this network is allocated to the first block. The PI(TN) code comprises 16 bits of a code per country (4 bits), a broadcasting area code (4 bits), and a program reference number code (8 bits). The PI(TN) code is a code for enabling the same program to be continuously listened even during the movement of a car by searching for a station of the same code.

A group type code, a version bit B0, a traffic program etation code TP(TN), a program type code PTY(TN), a traffic program station code TP(ON), and a usage code are allocated to the second block of the 14A group.

The group type code is a code of four bits for identifying what data is transmitted as data which is sent after that. Sixteen groups from 0 to 15 are designated by using four bits and a version A or B is designated by the subsequent version bit B0 (one bit). B0 = 0 indicates the A version and B0 = 1 shows the B version. The group type code of the 14A group, therefore, is given by "11100" as shown in Fig. 1A. The group type

code of the 14B group is given by "11101" as shown in Fig. 1B.

The traffic program station code TP(TN) is a code of one bit indicating whether a traffic program station exists in this network at present or not. The program type code PTY(TN) is a code of five bits to identify 32 kinds of program types from 0 to 31 (music program, news program, sports program, etc.) and program kinds are allocated on the basis of predetermined rules.

The traffic program station code TP(ON) is a code of one bit indicating whether a traffic program station exists in the other network at present or not. By always monitoring the TP(ON) code, therefore, whether the traffic program station exists in the other network or not can be known in a real-time manner.

The usage code is a code of four bits indicative of the kind of information which is sent by the next third block. As shown in Fig. 1A, sixteen kinds of information from (0) to (15) are specified by using codes "0000" to "1111" of four bits.

Character codes (char.1 - char.8) of the broadcasting names are described in (0) to (3) of the third block. Broadcasting station frequency data AF(ON) of the other network by a method A format is described in (4). Broadcasting station frequency data (Tuning freq. (TN)) of this network by a mapped frequencies format and broadcasting station frequency data (Mapped FM freq. (ON)) of the other network are described in (5) to (9), respectively. As for the broadcasting station frequency data of (4) and (5) to (9), any one of the formats is previously selected by each broadcasting station and the broadcasting station frequency data is transmitted by the selected format.

Information items of (10) and (11) are not defined. Linking information is allocated to (12). The program type code PTY(ON) of the other network and a traffic announcement code TA are allocated to (13). A broadcasting start reservation code PIN(ON) of the other network is allocated to (14). The item (15) relates to a data area only for use in the broadcasting station. A program ID code PI(ON) of the other network is allocated to the fourth block. By monitoring the program type code PTY(ON) of the other network of (13), an arbitrary information program of the other network can be received by interruption.

In the 14B group of Fig. 1B, the program ID code PI(TN) of this network is allocated to the first block. A group ID code "11101" indicative of the 14B group, traffic program station code TP(TN), program type code PTY(TN), traffic program station code TP(ON), and traffic announcement code TA(ON) are allocated to the second block. By monitoring the traffic announcement code TA(ON) of the other network, therefore, it is possible to know that the traffic information is being broadcasted by any one of the stations in the other network.

The program ID code PI(TN) of this network is al-

located to the third block of the 14B group. The program ID code PI(ON) of the other network is given to the fourth block.

As mentioned above, by transmitting the data of the information classification code (Usage code = 13) of the 14A group, if the program type code PTY(ON) in the relevant data is monitored, an interruption reception can be performed to arbitrary information program of the other network.

In case of interruption receiving to an arbitrary information program, it is desired that the interruption reception can be performed from the broadcasting start time point of such an information program. To interruption receive from the broadcasting start time point of the arbitrary information program, therefore, it is necessary to transmit the broadcasting start time point by some method.

In the invention, therefore, as a transmission format to notify a switching time point of the information program, as shown in examples in Figs. 2A and 2B, there is presumed a case of specifying such that the same RDS data by the group type 14A comprising the information classification code (Usage code = 13) of the second block is transmitted a plurality of number of times and is continuously transmitted a predetermined number of times in a short time.

Fig. 2A shows an example of a case where the 14A group comprising the information classification code (Usage code = 13) is continuously transmitted eight times. Fig. 2B shows an example of a case where data of another different group type is inserted in the halfway and the resultant data is continuously transmitted eight times. In the invention, a unit of the 14A group which continues a predetermined number of times is referred to as a "PTY burst signal". Since a length of one group is equal to 87.6 msec. (refer to Fig. 1A), a length of PTY burst signal in case of Fig. 2A is equal to 700.8 msec. and a length of PTY burst signal in case of Fig. 2B is equal to about 788.4 msec.

The present invention has been made for the RDS system which transmits the above-mentioned PTY burst signal as a prerequisite. In the invention according to claim 1, when the PTY burst signal is received, a check is made to see if a preset information program of which the interruption reception is desired coincides with an information program shown by the program type code PTY(ON) in the received PTY burst signal or not, and when they coincide, whether broadcasting station frequency data of the other network which broadcasts the information program has already been read in a memory in the receiver or not is detected, and when the broadcasting station frequency data is not read, such a fact is notified by a desired method.

By using such a method, in the case such that although an information program of which the interruption reception is desired has been started by the other network, the broadcasting station frequency data of

the other network necessary to receive it is not stored in the memory, such a fact can be recognized by the above notification. In such a case, accordingly, the desired information program is selected by the manual operation and can be received. If such a notification is not performed, since even a fact that the information program of which the interruption reception is desired has already been started cannot be known, such an operation cannot be performed.

According to the second aspect of the invention, when the PTY burst signal is received, a check is made to see if a preset information program of which the interruption reception is desired coincides with an information program which is shown by the program type code "PTY(ON)" in the PTY burst signal received or not, and when they don't coincide, the kind of information program which is shown by the program type code "PTY(ON)" is notified by a predetermined method.

According to the third aspect of the invention, when a station selection instruction is given with respect to the notified information program, the station which is broadcasting the information program is searched and is received by interruption.

By using such a method, in the case where although the information program of which the broadcasting was started by the other network is not the preset information program of which the interruption reception is desired, the user wants to listen to it because it seems to be interesting, the user can freely select and listen to it.

An embodiment of the invention will now be described hereinbelow with reference to the drawings.

Fig. 3 is a block diagram of an embodiment of an RDS receiver constructed by applying a method of the invention. In Fig. 3, a portion shown by reference numerals 1 to 5 denotes what is called a superheterodyne receiver for FM or FM/AM reception. Reference numeral 1 denotes an antenna; 2 a front end; 3 a detecting circuit; 4 an amplifying circuit; and 5 a speaker. The front end 2 is tuned to a desired broadcasting station by variably controlling an oscillating frequency of a built-in PLL circuit (not shown) by a system controller 14.

Reference numeral 6 denotes a band pass filter (BPF) having a center frequency 57 kHz for extracting only an RDS signal from an output of the detecting circuit 3. Reference numeral 7 denotes an RDS data demodulating circuit for demodulating the RDS signal which is sent from the BPF 6 to the original data; 8 a memory (RAM) for storing the demodulated RDS data; 9 an operating part having keys, switches, and the like; 10 a display comprising a liquid crystal display or the like; 11 an alarm comprising a piezoelectric buzzer or the like; 12 a voice synthesizer for synthesizing a necessary voice message; 13 a change-over switch for transmitting the voice message; and 14 the system controller comprising a microcomputer

or the like for controlling the operation of the whole system.

The operation will now be described with reference to a flowchart of Fig. 4.

In the following operation example, for simplicity of explanation, the RDS receiver of Fig. 3 receives a music program of the present existing FM station (this station and its affiliated station become this network (TN)) and generates the corresponding sound from the speaker 5. It is assumed that "news program" has been preset by the operating part 9 as an information program of the other network (ON) of which the interruption reception is desired.

A detection signal which is generated from the detecting circuit 3 is transmitted to the amplifying circuit 4 and to the BPF 6. An RDS signal component of a band of 57 kHz is extracted from the detection signal by the BPF 6. The extracted RDS data signal is demodulated to the original RDS data by the RDS demodulating circuit 7 and, after that, it is transmitted to the system controller 14. The system controller 14 monitors the RDS data and stores the necessary data into the memory 8.

It is now assumed that in such a receiving state as mentioned above, the broadcasting of some information program of the other network is started and the PTY burst signal of Fig. 2A or 2B mentioned above is transmitted in association with it (Y side in step S1). The system controller 14 detects the PTY burst signal, thereby detecting that the broadcasting of some information program was started in the other network.

When the start of the broadcasting of the information program of the other network is detected from the reception of the PTY burst signal, the system controller reads out the program type code PTY(ON) of the third block in the received PTY burst signal and knows the kind of information program of which the broadcasting was started by the other network from the program type code PTY(ON).

A check is made to see if the information program of the other network of which the broadcasting was started coincides with a preset "news program" of which the interruption reception is desired or not (step S2). When they coincide, step S3 follows. When they don't coincide, step S8 follows.

It is now assumed that the program type code PTY(ON) in the PTY burst signal indicates "news program", since the information program of which the broadcasting was started coincides with the information program of which the interruption reception is desired, the processing routine advances to step S3. A check is made to see if the broadcasting station frequency data AF(ON) with respect to the relevant other network which is necessary to select the station of "news program" has already been collected and stored in the memory 8 or not.

The EON information in Figs. 1A and 1B is, generally, not only transmitted by the PTY burst signal in

Figs. 2A and 2B mentioned above but also transmitted at every predetermined time. In the case, therefore, where the RDS receiver has already received the EON information comprising the information classification code (Usage code = 4) of the second block of the 14A group in Fig. 1A, for example, and has already received the broadcasting station frequency data AF(ON) of the other network corresponding to the information classification code (Usage code = 4), the broadcasting station frequency data AF(ON) of the other network is collected and stored in the memory 8. When the data AF(ON) is not received yet, the broadcasting station frequency data AF(ON) doesn't exist.

In the case where the broadcasting station frequency data AF(ON) of the other network has already been collected and stored in the memory 8, the processing routine advances to step S4. On the basis of the broadcasting station frequency data AF(ON), the broadcasting station of the other network which started the broadcasting of the "news program" is automatically searched and the receiving station is switched to the relevant broadcasting station. The desired information program, therefore, is automatically received by interruption.

When the broadcasting station frequency data AF(ON) of the other network is not collected and stored in the memory 8, the processing routine advances to step S5. The absence of the broadcasting station frequency data of the other network is notified for only a predetermined time by a predetermined method (steps S5, S6, S7). In spite of the fact that the broadcasting of the "news program" was started by the other network, therefore, the user can know that the interruption reception cannot be executed. The user, consequently, can take a proper procedure such as to select the "news program" by a manual operation as necessary.

As a notifying method in step S5, for example, it is possible to use any one of the following various kinds of methods such that it is notified by a sound by the piezoelectric buzzer 11, it is visually notified by the display 10, a desired voice message is synthesized by the voice synthesizer 12 and is generated as a sound from the speaker 5 by switching the change-over switch 13, two or more of the above methods are combined and a notification is performed, or the like.

In the above step S2, when the information program of the other network of which the broadcasting was started doesn't coincide with the preset "news program" of which the interruption reception is desired, the processing routine advances to step S8. Whether the broadcasting station frequency data AF(ON) regarding the other network has been collected and stored in the memory or not is detected. If the broadcasting station frequency data AF(ON) of the other network is not collected and stored in the memory 8, the processing routine is finished (N side in

step S8).

On the contrary, when the broadcasting station frequency data AF(ON) of the other network is collected and stored in the memory 8, the processing routine advances to step S9. A message indicating that the broadcasting start program is not the desired "news program" and a message indicating that the kind of the relevant broadcasting start program is, for example, "sports program" are notified by the display 10, voice synthesizer 12, or the like for a predetermined time (steps S10, S11). The user, thus, can know a fact that although the broadcasting of the information program was started, it differs from the desired information program and that the kind of information program of which the broadcasting was started is, for instance, the "sports program". In this case as well, in a manner similar to the case in step S5, the user can also use any one of various kinds of notifying methods.

In the case where the user operates a key, button, or the like of the operating part 9 and instructs the interruption reception to the information program of which the broadcasting was started for a period of time until the end of the notification (step S12), the processing routine advances to step S13. On the basis of the broadcasting station frequency data AF(ON) of the other network stored in the memory 8, the broadcasting station of the other network which started the broadcasting of the "sports program" is automatically searched and the receiving station is switched to the relevant broadcasting station.

In the case, therefore, where although the information program of which the broadcasting was started differs from the preset information program of which the interruption reception is desired, the user wants to listen to such a program due to the notification, an interruption reception of the relevant information program can be performed by a simple operation. In case of an RDS receiver such that only one information program of which the interruption reception is desired can be set or the like, the information program of which the interruption is desired at the first time is set and the information program of which the interruption is desired at the second time is confirmed by the notification, so that a degree of freedom of the station selection can be widened by interruption receiving by a manual operation or the like.

According to the invention as described above, when an arbitrary information program of the other network is received by interruption by using the EON information, the user can accurately know by which reception situation the relevant information program cannot be received by interruption. The kind of information program of the other network which started the broadcasting can be known. By executing a desired operation in the well-known procedure, even for the other information program of which the interruption reception is not preset yet, the interruption reception can be freely performed from the broadcasting

start time point. A degree of freedom of the station selecting operation in such a kind of RDS receiver can be further increased.

Claims

1. An interruption reception control method for an RDS receiver in an RDS system in which same enhancement other networks (EON) information of a group type 14A and comprising an information classification code (Usage Code = 13) of a second block is transmitted a plurality of number of times in a short time, thereby specifying as a PTY burst signal indicative of a switching of a broadcasting of an information program of the other network, wherein
 - when said PTY burst signal is received, whether a preset information program of which an interruption reception is desired coincides with an information program which is shown by a program type code (PTY(ON)) in said received PTY burst signal or not is detected,
 - when they coincide, whether broadcasting station frequency data of the other network which broadcasts said information program has already been read in a memory in the receiver or not is detected, and
 - when the broadcasting station frequency data is not read yet, such a fact is notified by a desired method.
2. An interruption reception control method for an RDS receiver in an RDS system in which same enhancement other networks (EON) information of a group type 14A and comprising an information classification code (Usage Code = 13) of a second block is transmitted a plurality of number of times in a short time, thereby specifying as a PTY burst signal indicative of a switching of a broadcasting of an information program of the other network, wherein
 - when said PTY burst signal is received, whether a preset information program of which an interruption reception is desired coincides with an information program which is shown by a program type code (PTY(ON)) in said received PTY burst signal or not is detected, and
 - when they don't coincide, a kind of said information program of which the broadcasting was started is notified by a predetermined method.
3. A method according to claim 2, wherein in the case where a station selecting instruction is given with respect to the notified information program, a station which is broadcasting said information program is automatically searched and said information program is received by interruption.

FIG.1A

14A GROUP

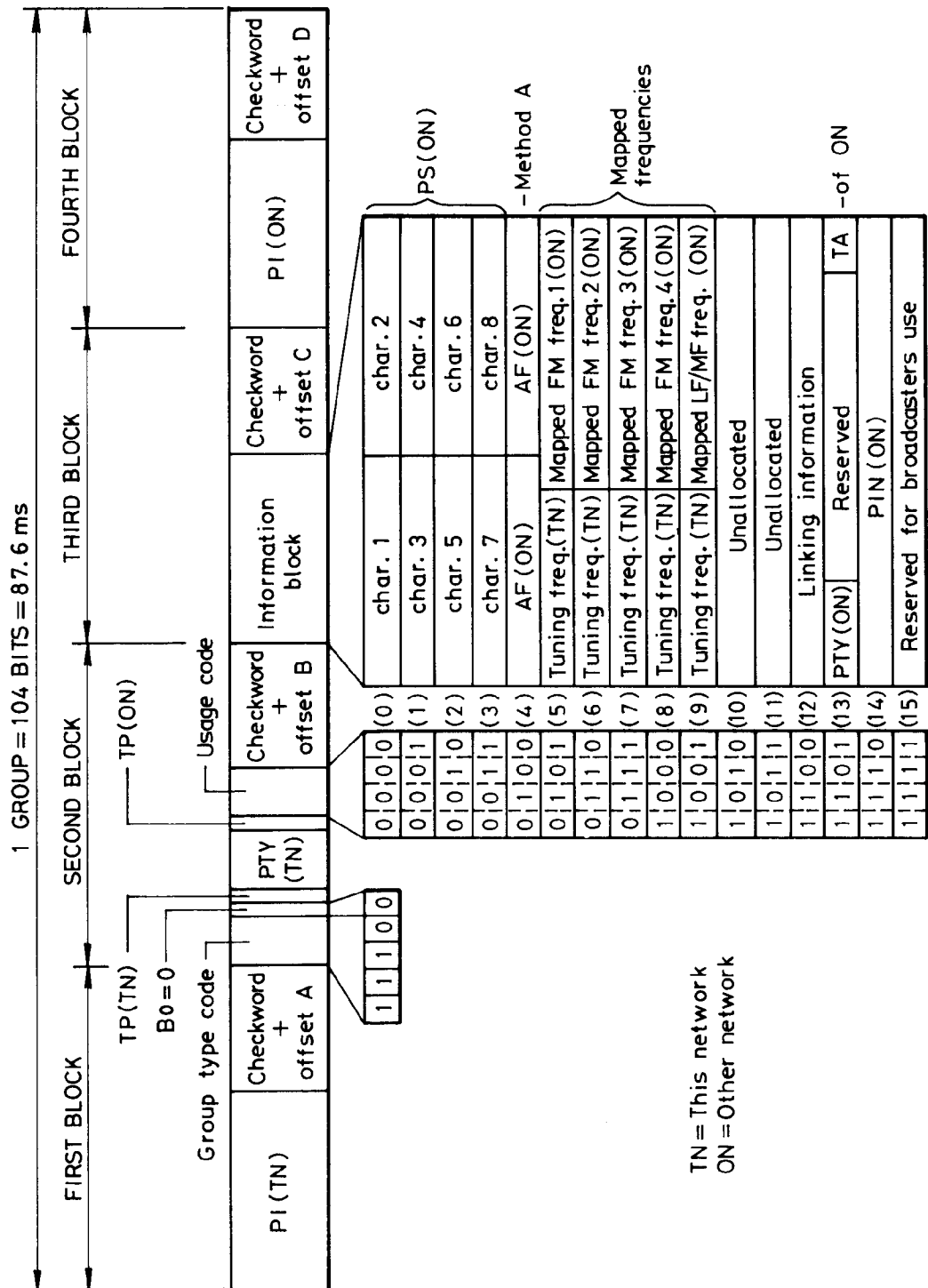


FIG.1B

14B GROUP

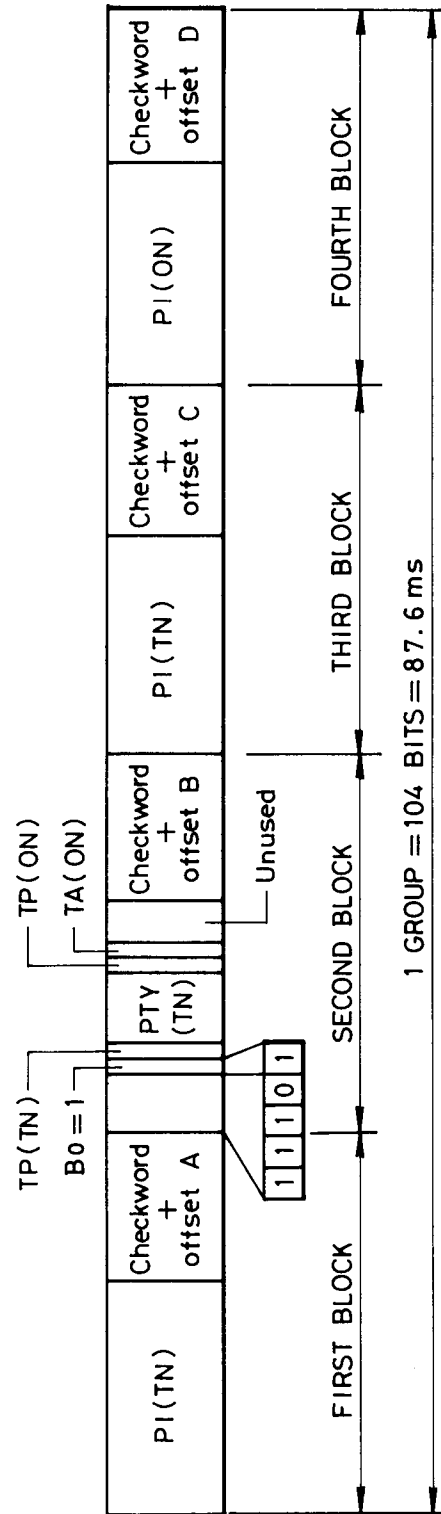


FIG. 2A

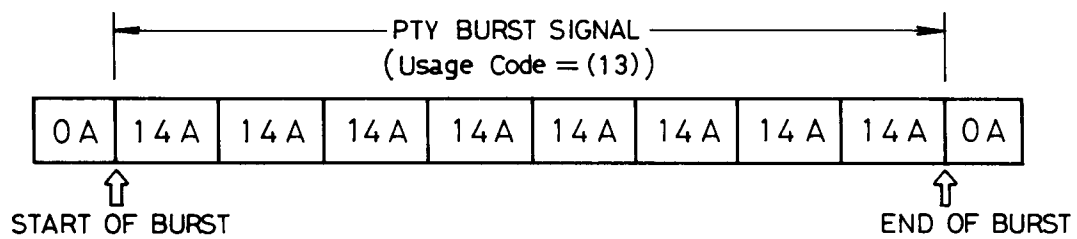


FIG. 2B

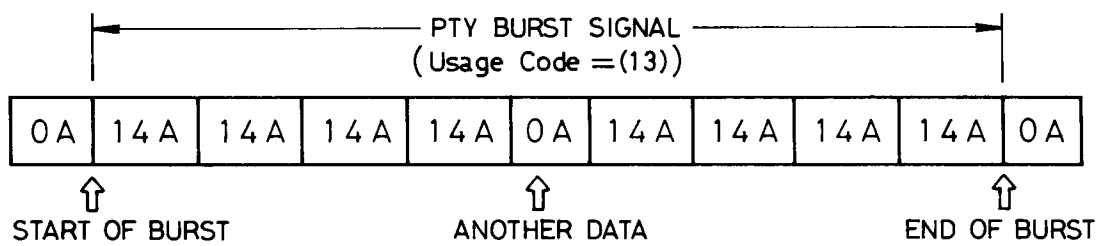


FIG. 3

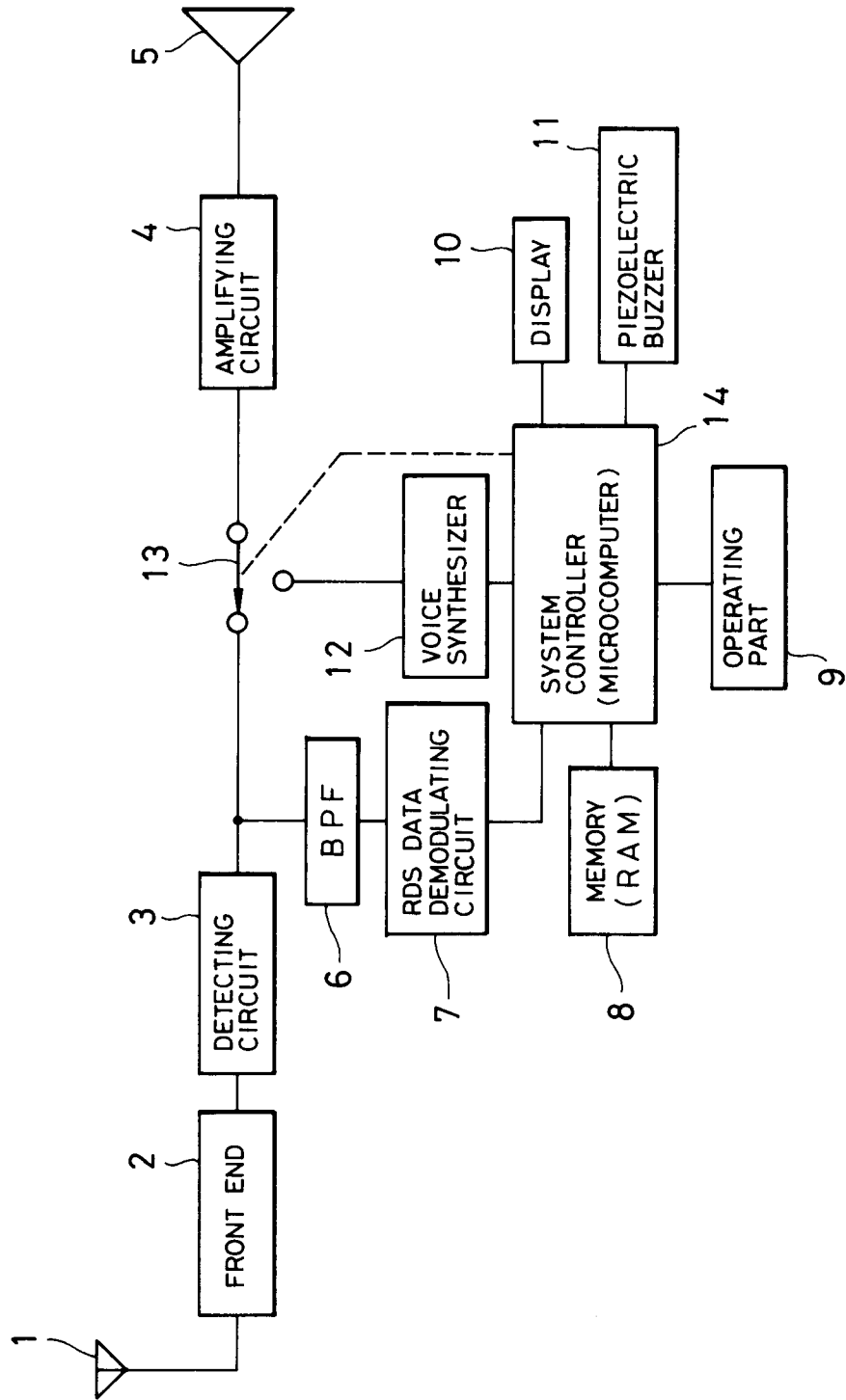
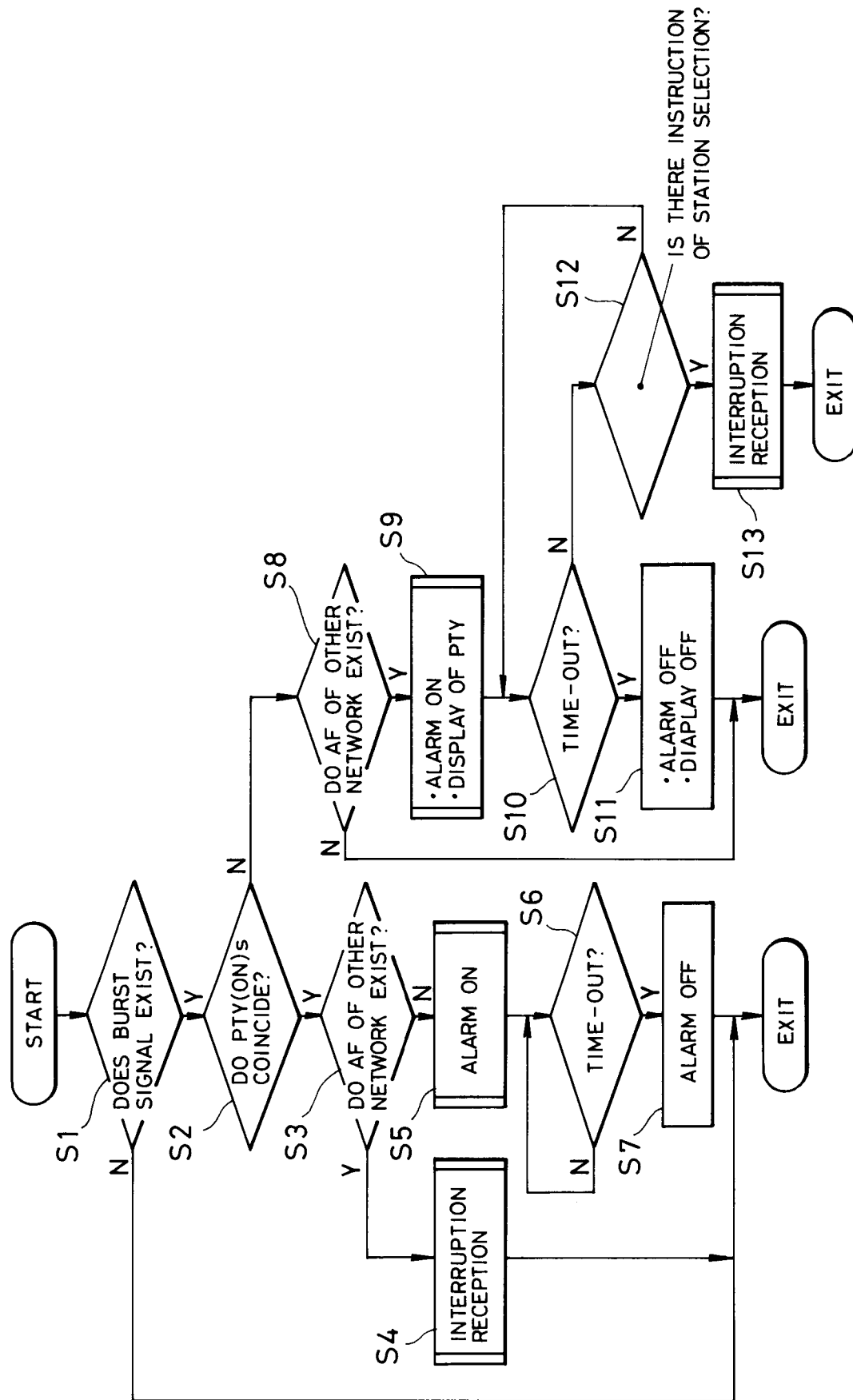


FIG. 4





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 10 9101

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	RUNDFUNKTECHNISCHE MITTEILUNGEN, vol.35, no.1, January 1991, NORDERSTEDT DE pages 17 - 22 S. PARNALL 'Erweiterte Informationen über andere Programmketten.' * page 21, column 1, line 14 - page 22, column 1, line 40; figures 3,5 *	1,2	H04H1/00
A	EP-A-0 446 985 (N.V. PHILIPS GLOEILAMPENFABRIEKEN) * page 2, line 1 - page 3, line 13; claims 1,4 *	1,2	
A	EP-A-0 582 939 (PIONEER ELECTRONIC CORP.) * column 1, line 1 - column 3, line 26; claim 1; figure 1 *	1,2	
A	EP-A-0 386 835 (N.V. PHILIPS GLOEILAMPENFABRIEKEN) * column 1, line 1 - column 3, line 13; claim 1 *	1,2	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			H04H
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 15 September 1995	Examiner De Haan, A.J.
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