(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 582 939 A1**

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **93112413.5**

(51) Int. Cl.5: **H04H 1/00**

(22) Date of filing: **03.08.93**

(30) Priority: **11.08.92 JP 213910/92**

(43) Date of publication of application:
16.02.94 Bulletin 94/07

(84) Designated Contracting States:
DE FR GB

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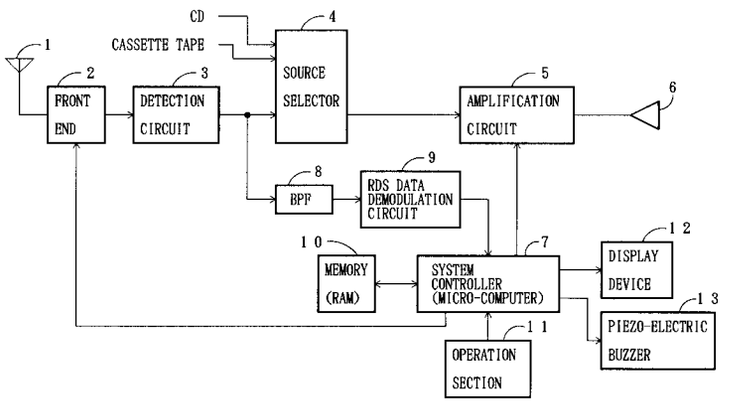
(54) **Method for selecting traffic information in an RDS radio receiver.**

(57) The present invention provides a method for receiving traffic information by an RDS receiver which is capable of receiving RDS broadcasting wave including EON information, wherein the method comprising the steps of: extracting frequency data of each of broadcasting stations of other networks from the EON information to store in a memory means; searching a broadcasting station from other networks broadcasting traffic information on the basis of the prestored frequency data on condition that the traffic announcement identification code becomes 1; and receiving the traffic information being broadcast from the thus selected station from other networks, interrupting a reproduction of a recorded source being operated at that time; and simultaneously informing the listener by a predetermined alarm method that the traffic information currently being received is not from the original station, but from a station of another network.

By use of the above receiving method, traffic information of a station of another network can be automatically received taking advantage of the newly settled EON information, interrupting the reproduction of a sound source being then operated, and furthermore, the driver is made aware that the traffic information currently being broadcast is whether from a station in the originally tuned network or a newly obtained one from another network.

F I G. 1



EP 0 582 939 A1

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a radio data system (RDS) receiver, and more particularly to a method for receiving traffic information by use of an RDS receiver, taking advantage of the EON (Enhanced Other Network) information recently included in the RDS data.

Description of the Prior Art

The radio data system, also referred to as RDS, is an FM multiplex transmission method recommended by the International Radio Consultative Committee (CCIR), which serves various functions such as indication of broadcasting stations, automatic selection of a broadcasting station, automatic reception of traffic information and so on.

The following is a detailed explanation about the RDS.

The radio data system is known which provides information associated with the broadcasting programs of ordinary radio stations. Information about the programs and program contents is transmitted as data through multiplex modulation, thereby permitting the radio listeners to select program contents of their preference based on information contained in the data demodulated at the receiver.

According to this radio data system, a subcarrier of 57KHz, which resides outside the band occupied by the FM modulation signal and which is the third harmonic of a 19 KHz stereo pilot signal, is amplitude modulated by a data signal which is filtered and biphase-coded, representative of the program contents to thereby provide radio data signals. A main carrier wave is frequency modulated by this amplitude modulated subcarrier, and then the main carrier is broadcast to the public.

As illustrated by Fig. 6, a base band coding structure of the radio data signal consists of 104 bits to form one group and is multiplex transmitted in a repeated manner. One group consists of four blocks, each including 26 bits, and each block consists of a 16 bit information word and a 10-bit checkword. In Fig. 6, block 1 is assigned a program identification code (PI), block 2 a traffic program identification code (TP) and a traffic announcement identification code (TA), block 3 an alternative station frequency (AF) of a station in the current network which is broadcasting the same program as the station currently being received and block 4 program service name information data (PS) such as station name or network name. Each group is distinguished by 4 bits into 16 types, i.e. type 0 to type 15 differing in contents. Further, two versions, version A and version B are defined with respect to respective types (0 to 15). These identification codes are located in block 2. The station frequency code of the stations in the current network (referred to as AF hereinafter) is arranged to be transmitted by type 0, group A (hereinafter referred to as group 0A). In this manner, the radio data of the group 0A contains AF data of the stations in the network which are broadcasting the same program as the station currently being received. When the broadcast wave is received, the AF data obtained by demodulating the broadcast wave is read and is then stored. When the receiving sensitivity of the station currently being received is weakened due to disturbances such as decreasing signal strength, an alternate station of another network can be selected based on the AF data of the alternate stations previously stored, thereby allowing radio listeners to listen to the same program with good reception free from disturbances continuously.

As explained above, hitherto, automatic reception of traffic information by the RDS receiver has been performed with reference to the TP code and the TA code in the RDS data of the group 0A, indicating whether there is any station broadcasting traffic information within the currently tuned network itself, and whether or not the traffic information is currently being received.

For example, in a situation where a stereo system in an automotive vehicle is playing a compact disk (hereinafter referred to as CD), a cassette tape or the like, and that the RDS receiver is preset for receiving a certain FM broadcasting station, monitoring the RDS data of the group 0A transmitted from the thus preset FM station, when it is detected in the RDS data that the TP code in the RDS data of the group 0A is set to 1, and the TA code is also set to 1, it is determined that the current FM station starts broadcasting traffic information, causing the CD, cassette tape or the like to stop playing and switching automatically to the RDS receiver side. Traffic information is emitted from the speaker even at an increased volume level so the listener will pay attention thereto.

However, in the above automatic traffic information reception method, only a broadcasting station preset by the RDS receiver and other stations within the current network can be received, and for this reason, when there is no station broadcasting traffic information within the current network, it is impossible to receive any kind of traffic information at all.

SUMMARY OF THE INVENTION

The present invention has been made to eliminate such problems as described, and it is an object of the present invention to provide a method

for receiving traffic information by use of an RDS receiver, whereby traffic information broadcast from a station of another broadcasting network can be received, and the listener is notified that the traffic information currently being received is being transmitted by a station on another network.

In order to achieve the above object, the method for receiving traffic information by an RDS receiver which is capable of receiving RDS broadcasting wave including EON information according to the present invention includes the steps of: extracting frequency data of each of broadcasting stations of other networks from the EON information to store in a memory means; searching a broadcasting station of another network broadcasting traffic information on the basis of the prestored frequency data on condition that the traffic announcement identification code TA becomes 1; receiving the traffic information being broadcast by the detected station of another network interrupting the reproduction of a recorded source being played at that time; and, simultaneously informing the listener by a predetermined alarm method that the traffic information currently being received is not from the preset station, but from a station belonging to another network.

The RDS data is distinguished by 4 bits of the program type code into 16 types, i.e. type 0 through type 15 including undefined types as mentioned above. Recently within the undefined types in the RDS data, groups 14A and 14B have been defined as the EON information, whereby not only information within the preset station, but a station of another network can be transmitted. The method for receiving traffic information according to the present invention allows automatic reception of traffic information broadcast in another network, taking advantage of the EON information composed of the newly defined groups 14A and 14B, and the driver can also be informed that the traffic information currently being received is from another network.

A detailed explanation according to the EON information is now given with reference to Fig. 4. The notation "TN" added after each code indicates a code regarding the current network (This Network) in which a station currently being received resides, while the notation "ON" indicates a code regarding another network (Other Network).

In the group 14A shown in Fig. 4A, a program identification code PI(TN) within the same network is given in the first block. This PI(TN) code is composed of a country identification code (4 bits), a broadcasting area code (4 bits) and a program reference number code (8 bits), wherein by searching the broadcasting stations with the same codes, the same program can be continuously received even while a vehicle is in motion.

A group type code composed of 4 bits, a version bit B0, a traffic program identification code TP(TN), a program type code PTY(TN), a traffic program identification code TP(ON) and an information classification code (usage code) are provided in the second block of group 14A.

The group type code is a 4-bit code for identifying what type of data transmission will follow thereafter. Sixteen different types of transmissions can be distinguished by these 4 bits with type 0 through type 15 differing in contents. A 1-bit code B0 for defining two versions A and B with respect to respective types (0 to 15) follows these 4 bits. The B0 bit set to 0 indicates the A version, while the B0 bit set to 1 indicates the B version. Thus, the group type code in group 14A is illustrated by "11100" as indicated in Fig. 4A, whereas that in group 14B is illustrated by "11101", as indicated in Fig. 4B.

The traffic program identification code TP(TN) is a 1-bit code for indicating whether or not there is any station broadcasting traffic program in the current network.

The program type code PTY(TN) is a 5-bit code for distinguishing 32 types, i.e. type 0 through type 31, of different programs (music, news, sports and so on), as assigned according to a predetermined rule.

The traffic program identification code TP(ON) is also a 1-bit code for indicating whether or not there is any station broadcasting traffic program in another network. Thus, by monitoring this TP(ON) code, one can know in real time as to whether there is any other station broadcasting traffic program on another network.

The usage code is a 4-bit code to indicate what the data indicated in the third block is, wherein 16 types of data i.e. from 0 to 15 can be indicated by these 4 bits.

In the first 4 codes (0) to (3) {"0000" to "0011"} of the third block, character codes 1 to 8 {char.1 to char.8} respectively indicating the name of each station are written. In the next code (4) "0100", frequency data of the stations in other networks AF(ON) are indicated by a method A format, and in the usage codes (5) to (9) {"0101" to "1001"}, frequency data of the preset network (tuning freq.(TN)) and frequency data in other networks (Mapped FM freq(ON)) are written in a Mapped-frequencies format. It is to be noted that by which method these frequency data represented by the code (4) or the codes (5) to (9) are to be written is predetermined in accordance with each station, and the frequency data are transmitted in accordance with the thus selected method.

An explanation concerning the remaining codes (10) through (15) of the usage code in the third block is omitted here since it bears no relation to

the present invention.

In the fourth block, a program identification code PI(ON) of another network is given for identifying country, broadcasting service area, broadcasting station and so on.

In the group 14B illustrated in Fig. 4B, a program identification code PI(TN) within the current network is indicated in the first block. In the second block, the group type code "11101" indicates that the data is of the group B, the traffic program identification code TP(ON), and the traffic announcement identification code TA(ON). Accordingly, by monitoring this TA(ON) code, it can be established that the traffic information is being broadcast in one of the stations in another network.

In the third and fourth blocks of the group 14B, a program identification code PI(TN) within the current network and that PI(ON) in another network are respectively given.

The method for receiving traffic information by an RDS receiver which is capable of receiving RDS broadcasting wave including EON information according to the present invention includes the steps of: extracting frequency data from each of broadcasting stations of other networks to store in a memory means; searching station of other networks to locate a station broadcasting traffic information on the basis of the prestored frequency data; receiving the traffic information broadcast from a thus detected station of another network, interrupting the reproduction of a recorded source being played at that time; and informing the listener by a predetermined alarm sound through a speaker that the receiving station has been changed, that is, the traffic information currently being received is not from the original station, but from a newly tuned station belonging to another network.

Other objects and features of the invention will be more fully understood from the following detailed description and appended claims when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram showing one embodiment of an RDS receiver to which a method of receiving traffic information according to the present invention is applied;

Fig. 2 is a flow chart illustrating the traffic information receiving operation within a receiver according to the embodiment as shown in Fig. 1;

Fig. 3 is a diagram showing a method according to the present invention of informing the listener that the traffic information currently being received is not from the original station, but from a newly tuned station belonging to another network by varying the volume of the sound;

Figs. 4A and 4B are diagrams, respectively showing formats of the group 14a and of the group 14B of RDS data;

Fig. 5 is a diagram showing a method according to the present invention of informing the listener that the traffic information currently being received is not from the original station, but from a newly tuned station belonging to another network by varying the volume of sound as adopted in a conventional receiver, and

Fig. 6 is a diagram showing the format of the RDS data of the group 0A.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the following, one embodiment of the present invention will now be described with reference to the accompanying drawings.

Fig. 1 is a block diagram showing an embodiment of the RDS receiver to which a traffic information receiving method of the present invention is applied, wherein reference numerals 1 through 6 refer to a super-heterodine receiver for receiving FM or FM/AM frequency. In the figure, reference numeral 1 denotes an antenna, numeral 2 a front end; 3 a detection circuit, 4 a source selector, 5 an amplification circuit and numeral 6 denotes a speaker. The front end 2 can be tuned to a desired station by adjusting the oscillation frequency in a built-in PLL circuit (not shown) by a system controller 7. Further, a band pass filter (BPF) 8 with a center frequency of 57 KHz extracts only RDS signals from the output of the detection circuit 3, and an RDS demodulation circuit 9 demodulates the RDS signal fed from the band pass filter 7. Reference numeral 10 denotes a memory 10 in a form such as Random Access Memory (RAM) for storing the demodulated RDS data, 11 an operation section, 12 a display device such as a Liquid Crystal Display (LCD) to provide information about the station tuning to the user, and finally numeral 13 denotes an alarm device such as a piezoelectric buzzer for informing when the radio station is switched in order to receive a traffic information report.

The traffic information receiving procedure carried out by the above construction will now be described with reference to a flow chart shown in Fig. 2. It is to be noted that in the following explanation the usage code of the second block in the group 14A (Fig. 4A) is set to "0100", and in the third block, the station frequency data AF(0N) from other networks are written in the third block in accordance with the method A corresponding to the "0100" of the usage code.

Power to the car stereo with an RDS receiver according to the present invention as shown in Fig. 1 is turned on during step S1. The source selector 4 is used to select a source to be reproduced, such as a CD or a radio station during step S2, and the reproduced source is played through speakers 5 during step S3. In this state, the front end 2 of the RDS receiver is tuned to the preset FM station or to the FM station last tuned by the receiver prior to the selection of an alternate source to be reproduced, such as a CD or tape, and a broadcast wave from the present FM station is continuously received at step S4.

During step 5, the received FM wave is detected by the detection circuit 3, and only the RDS signal composed of 57 KHz is extracted at the band pass filter (BPF) 8, where it is demodulated to the original data at the RDS data demodulation circuit 9. The system controller 7 continuously monitors the traffic program identification code TP-(TN) and the traffic announcement identification code TA(TN) in the group 0A of the thus demodulated RDS at step S6.

When the traffic program identification code TP(TN) is set to 0 and the traffic announcement code (TA(TN)) is set to 1, the system controller 7 determines that there is a station broadcasting traffic information in another network at step S7, and it begins to continuously monitor data from the group 14A as illustrated in Fig. 4A during step S8, and when it is detected that the traffic program identification code TP(ON) of the group 14A is set to 1 during step S9, the frequency data AF(ON) of another network written in the third block of the group 14A are then stored in the memory 10 at step S10.

Thereafter, the system controller 7 monitors the data of the group 14B as illustrated in Fig. 4B during step S11 until the traffic announcement identification code TA(ON) is detected with group 14B set to 1 at step S12, and the reception frequency of the receiver is tuned to a station from another network which is broadcasting traffic information based on the frequency data AF previously stored in the memory 10. During step S14, the reception signal level of the new is checked to verify that quality of reception is acceptable so that this station continues to be received. If the quality of the reception is good, another station is tuned according to the station frequency data AF. The searching operation in steps S13 and S14 is repeated until the receiver is tuned to a station with good reception quality.

Once the system controller receives a station with good reception quality, the RDS data transmitted from the station is monitored during step S15. The traffic program identification code TP(TN) and the traffic announcement identification code TA(TN) in the RDS data of the group 0A transmitted from the station are also monitored during step S16.

If neither the TP(TN) code nor TA(TN) code is set to 1, then the system controller determines that the selected station is not broadcasting traffic information, and returns to step 13 to repeat the same searching operation. However, if, on the other hand, both of the TP(TN) and TA(TN) codes in the group 0A of the selected station are set to 1, the system controller 7 determines that the selected station is currently broadcasting traffic information, and begins to receive the traffic information from the station at step S17. In other words, the source selector 4 is switched from the original sound source such as a CD to the detection circuit 3, and simultaneously makes a beep sound from a piezo-electric buzzer 13 to inform the driver that the station currently being received has been changed from the original station to a station from another network during step S18, so that in place of the original sound source such as a CD, traffic information is received from the station of another network and emitted by the speakers 6 by way of the amplifier 5 during step S19.

The alarm sound made by the piezo-electric buzzer 13 informs the driver as to whether the broadcast of the traffic information which interrupted the reception of the original sound source is from the originally tuned station or from a broadcasting station of another network selected on the basis of the EON information. For example, if the received information is from the originally tuned station, the piezo-electric buzzer makes a beep sound only once, whereas if a newly obtained station from another network was tuned on the basis of EON information, the buzzer makes the sound twice and so on.

It should be noted that the alarm method is not limited to the above two types of different alarm sounds, and the volume of the sound when the traffic information emitted from the speakers 6 can be changed in two steps. Further, if the display 12 is able to vary the color of the display, the color of the display 12 can be changed depending on the station currently being received. Even if the display device has only one color, the display 12 itself can be turned on and off or the like. Furthermore, it can be arranged such that a sound reproduced by the speakers 6 can be caused to include a special tone by changing the frequency characteristic of the amplifier 5. In fact, what is important is that the driver is made assured that the traffic information currently being received is from the originally tuned station or from a newly tuned station of another network tuned on the basis of EON information.

After a predetermined period of time, when the broadcast of traffic information is finished, the traffic announcement identification code TA(TN) in the RDS data of the group 0A transmitted from the

thus obtained station of another network currently being received is set to 0 at step S20, and the fact that the broadcast of traffic information is finished is confirmed by the system controller 7 during step S21.

Thereafter, during step 22, the source selector 4 is switched back to its original state prior to the reception of the traffic information and the reception frequency of the front end 2 is switched to the originally tuned station before the interruption by the traffic information. At step S3, the original sound source, such as CD, begins to supply sound signals to the speakers 6, and the system controller 7 again monitors the RDS data received from the present FM station.

In the embodiment as described above, although the situation is described such that an interruption of traffic information occurs while CD is being played, the receiver can also be dormant so that while no sound source including CD, cassette tape, radio etc. supplies sound signals to the speakers 6, the RDS receiver is set to only receive traffic information, wherein the traffic information is automatically emitted from the speaker when received. The interruptive reception as defined in the present invention includes dormant interruption as well.

{Effect of the Invention]

As explained heretofore, by use of a traffic information receiving method of the present invention, traffic information from a station of another network can be automatically received by taking advantage of the recently established EON information standards. The reproduction of a sound source being operated at that time is interrupted, and the driver is assured whether the traffic information currently being broadcast is from the originally tuned station or a newly obtained station in another network.

Having now fully described the invention, it will be apparent to one of ordinary skill in the art that many changes and modifications can be made thereto without departing from the spirit and scope of the invention as set forth herein.

Claims

1. A method for receiving traffic information by an RDS receiver which is capable of receiving RDS broadcasting wave including EON information, said method comprising the steps of:

   extracting frequency data of each of broadcasting stations of other networks from the EON information to store in a memory means;

   searching broadcasting stations of other networks broadcasting traffic information on the basis of the prestored frequency data on condition that the traffic announcement identification code becomes 1; and

   receiving the traffic information being broadcast from the thus selected station from other networks, interrupting a reproduction of a recorded source being operated at that time; and simultaneously informing the listener by a predetermined alarm method that the traffic information currently being received is not from the original station, but from a newly tuned station belonging to another network.

2. A method for receiving traffic information as claimed in claim 1, wherein said method for extracting frequency data is composed of the steps of;

   detecting the RDS data of the group 0A for investigating the value of a traffic program identification code regarding the current network TP(TN) and that of a traffic program announcement bode regarding the current network TA(TN),

   detecting the RDS data of the group 14A, when the TP(TN) code and the TA(TN) code of the group 0A are respectively 0 and 1, in order to investigate the value of a traffic program identification code regarding other networks TP(ON), and

   storing broadcasting stations of other networks broadcasting traffic information into said memory means, when the TP(ON) code of the group 14A is 1.

3. A method for receiving traffic information as claimed in claim 2, wherein said method for searching broadcasting station is composed of the steps of;

   detecting the RDS data of the group 14B for investigating the value of a traffic announcement identification code regarding other networks TA(ON), and

   selecting a broadcasting station on the basis of said prestored frequency data, when the value of said TA(ON) code is 1.

4. A method for receiving traffic information as claimed in claim 3, wherein said method for receiving traffic information from other networks is composed of the steps of;

   checking the reception quality of the selected station,

   wherein said method further comprises the steps of;

   receiving said station selected from said prestored frequency data, when the reception quality thereof is good, and,

setting another station on the basis of said station frequency data, when the reception quality thereof is bad.

FIG. 1

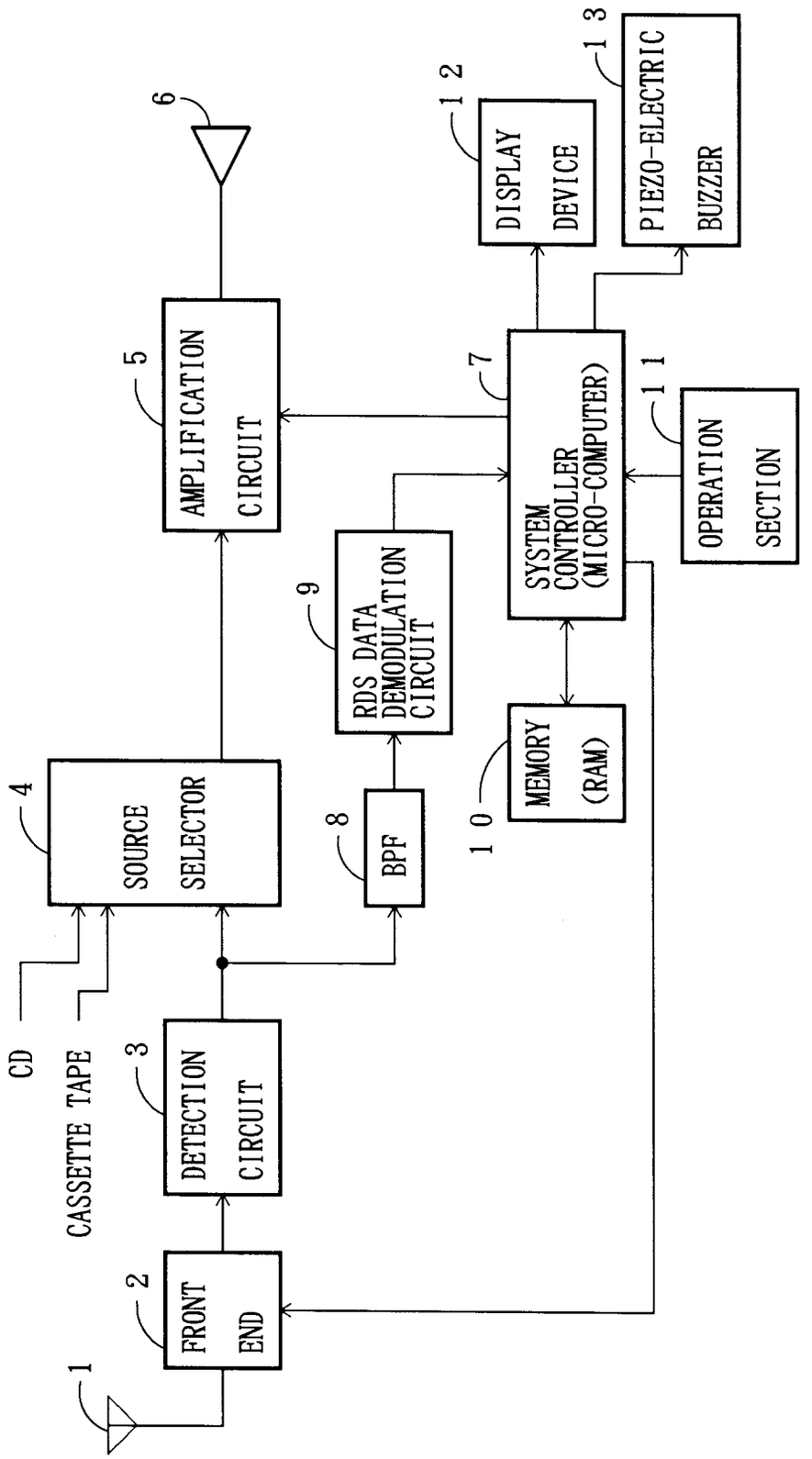

1
2
FRONT END
3
DETECTION CIRCUIT
CD
CASSETTE TAPE
4
SOURCE SELECTOR
5
AMPLIFICATION CIRCUIT
6
7
SYSTEM CONTROLLER (MICRO-COMPUTER)
8
BPF
9
RDS DATA DEMODULATION CIRCUIT
10
MEMORY (RAM)
11
OPERATION SECTION
12
DISPLAY DEVICE
13
PIEZO-ELECTRIC BUZZER

FIG. 2

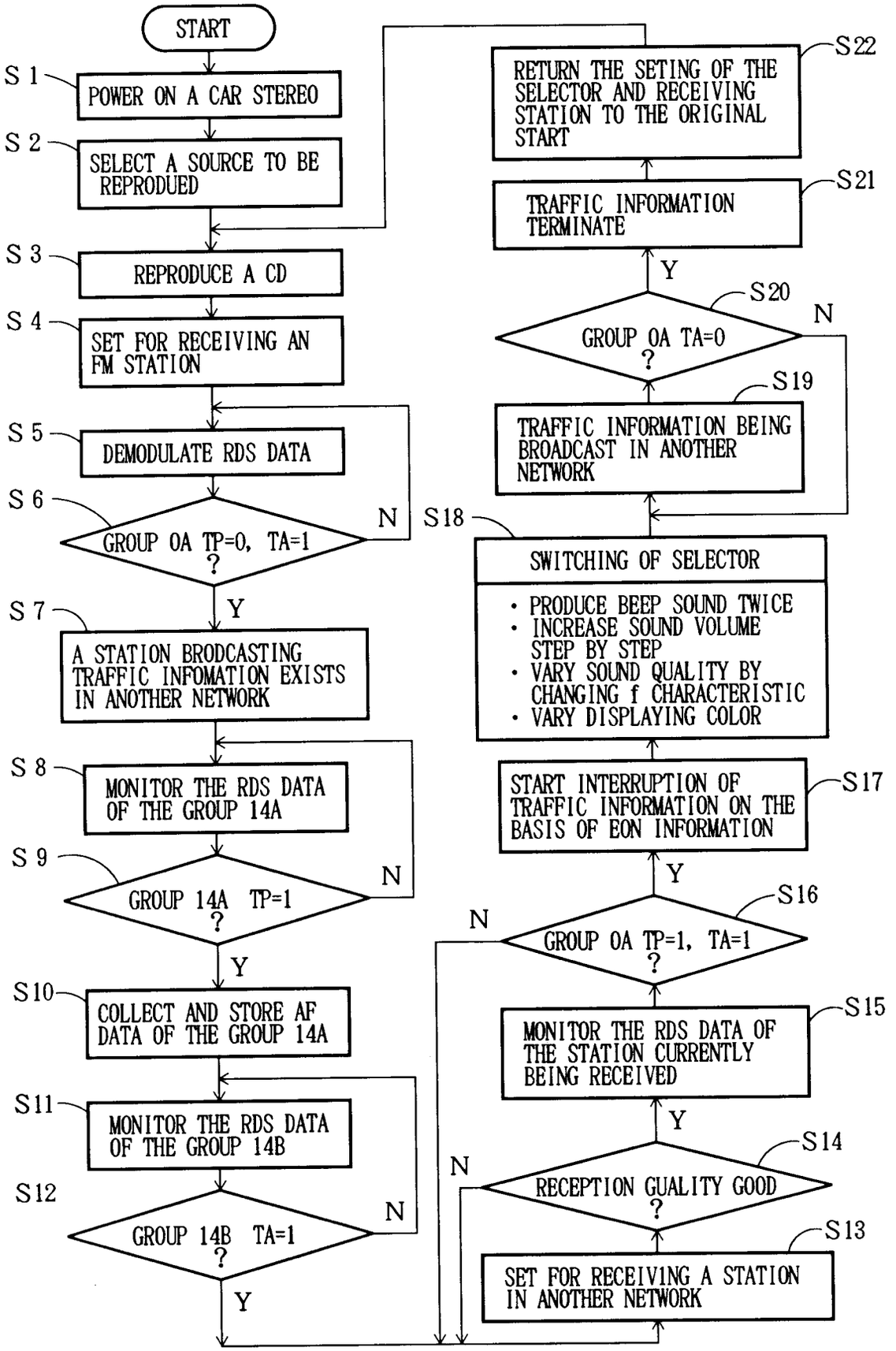

START
S1
POWER ON A CAR STEREO
S2
SELECT A SOURCE TO BE REPRODUED
S3
REPRODUCE A CD
S4
SET FOR RECEIVING AN FM STATION
S5
DEMODULATE RDS DATA
S6
GROUP 0A TP=0, TA=1 ?
N
Y
S7
A STATION BRODCASTING TRAFFIC INFOMATION EXISTS IN ANOTHER NETWORK
S8
MONITOR THE RDS DATA OF THE GROUP 14A
S9
GROUP 14A TP=1 ?
N
Y
S10
COLLECT AND STORE AF DATA OF THE GROUP 14A
S11
MONITOR THE RDS DATA OF THE GROUP 14B
S12
GROUP 14B TA=1 ?
N
Y
S22
RETURN THE SETING OF THE SELECTOR AND RECEIVING STATION TO THE ORIGINAL START
S21
TRAFFIC INFORMATION TERMINATE
Y
S20
GROUP 0A TA=0 ?
N
S19
TRAFFIC INFORMATION BEING BROADCAST IN ANOTHER NETWORK
S18
SWITCHING OF SELECTOR
• PRODUCE BEEP SOUND TWICE
• INCREASE SOUND VOLUME STEP BY STEP
• VARY SOUND QUALITY BY CHANGING f CHARACTERISTIC
• VARY DISPLAYING COLOR
S17
START INTERRUPTION OF TRAFFIC INFORMATION ON THE BASIS OF EON INFORMATION
Y
S16
N
GROUP 0A TP=1, TA=1 ?
S15
MONITOR THE RDS DATA OF THE STATION CURRENTLY BEING RECEIVED
Y
S14
N
RECEPTION GUALITY GOOD ?
S13
SET FOR RECEIVING A STATION IN ANOTHER NETWORK

FIG. 3

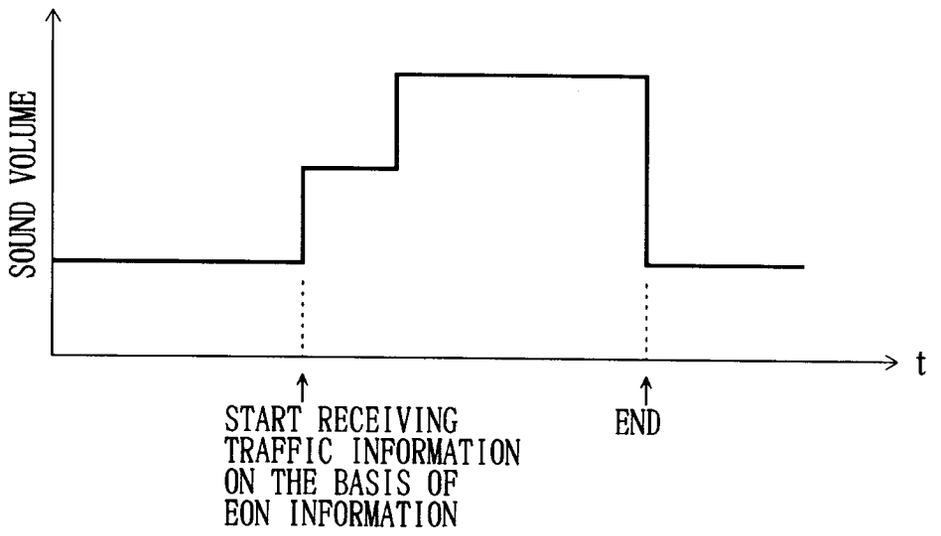

SOUND VOLUME
t
START RECEIVING TRAFFIC INFORMATION ON THE BASIS OF EON INFORMATION
END

FIG. 5

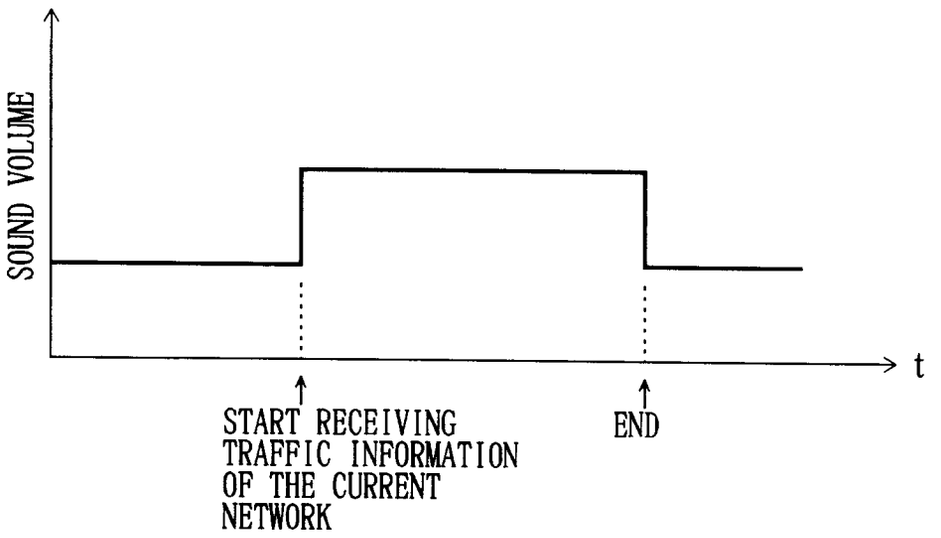

SOUND VOLUME
t
START RECEIVING TRAFFIC INFORMATION OF THE CURRENT NETWORK
END

FIG. 4A (GROUP 14A)

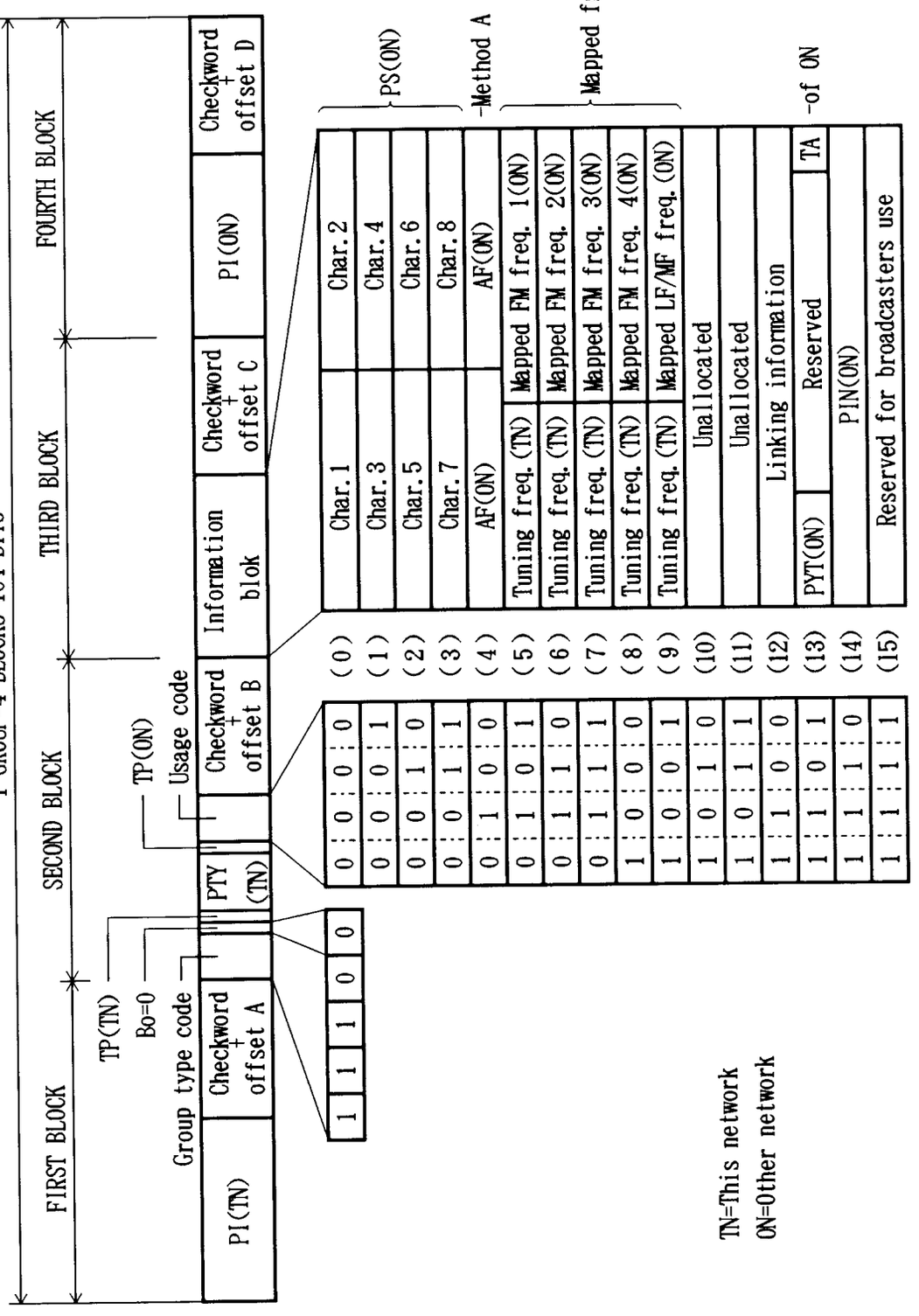


FIG. 4B (GROUP 14B)

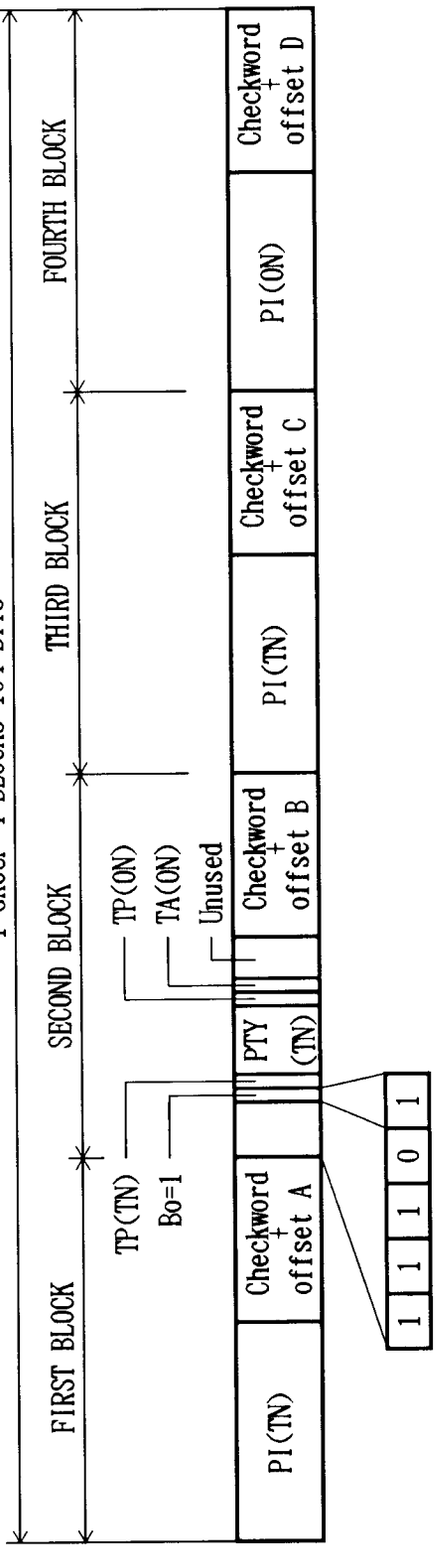
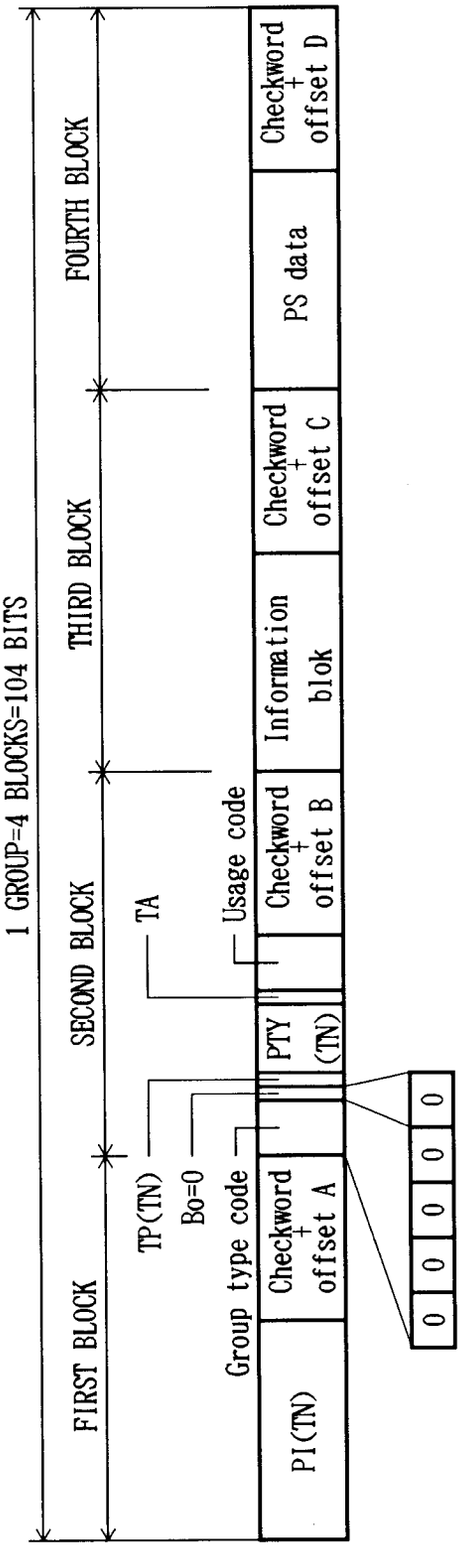


FIG. 6



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 11 2413

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.5)
Y	EBU REVIEW- TECHNICAL no. 245 , February 1991 , BRUSSELS BE pages 4 - 10 S. PARNALL 'Functional objectives of the Enhanced Other Networks (EON) feature' * paragraph 3.5. -paragraph 3.6. *	1	H04H1/00
Y	DE-A-40 31 431 (PIONEER ELECTRONIC CORP.) * column 2, line 66 - column 4, line 3; figure 1 *	1	
A	EP-A-0 446 985 (N.V. PHILIPS GLOEILAMPENFABRIEKEN) * page 2, line 1 - page 3, line 13; claims 1,4 *	1	
A	DE-A-38 32 454 (PIONEER ELECTRONIC CORP.) * column 1, line 1 - column 2, line 35; claim 1 *	1	
A	EP-A-0 386 835 (N.V. PHILIPS GLOEILAMPENFABRIEKEN) * column 1, line 1 - column 3, line 13; claim 1 *	1	TECHNICAL FIELDS SEARCHED (Int.Cl.5) H04H G08G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	3 November 1993	DE HAAN, A

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

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