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

(11) Publication number: **0 419 776 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **90112552.6**

(22) Date of filing: **02.07.90**

(51) Int. Cl.5: **H04H 1/00**, G08G 1/09, H04B 1/16

(30) Priority: **27.09.89 JP 249296/89**

(43) Date of publication of application: **03.04.91 Bulletin 91/14**

(84) Designated Contracting States: **DE FR GB**

(71) Applicant: **PIONEER ELECTRONIC CORPORATION**
No. 4-1, Meguro 1-chome
Meguro-ku Tokyo 153(JP)

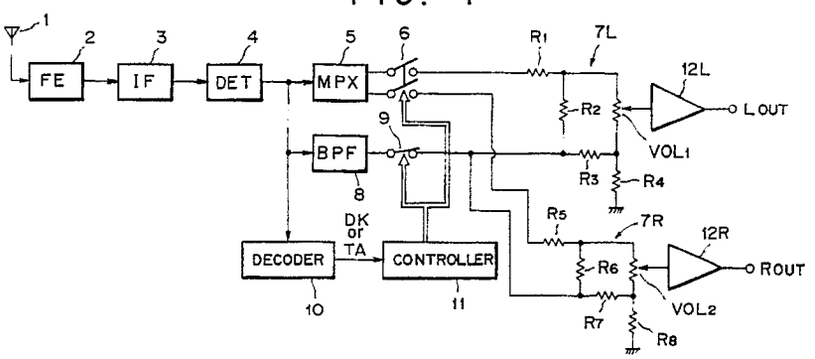
(72) Inventor: **Shishido, Osamu, Pioneer Electronic Corporation**
Kawagoe Kojo, 25-1 Aza Nishimachi
Oaza Yamada, Kawagoe-Shi, Saitama 350(JP)
Inventor: **Hatori, Tomoyasu, Pioneer Electronic Corporation**
Kawagoe Kojo, 25-1 Aza Nishimachi
Oaza Yamada, Kawagoe-Shi, Saitama 350(JP)
Inventor: **Miyano, Koichi, Pioneer Electronic Corporation**
Kawagoe Kojo, 25-1 Aza Nishimachi
Oaza Yamada, Kawagoe-Shi, Saitama 350(JP)
Inventor: **Kobayashi, Hideaki, Pioneer Electronic Corporation**
Kawagoe Kojo, 25-1 Aza Nishimachi
Oaza Yamada, Kawagoe-Shi, Saitama 350(JP)
Inventor: **Matsumoto, Isao, Pioneer Electronic Corporation**
Kawagoe Kojo, 25-1 Aza Nishimachi
Oaza Yamada, Kawagoe-Shi, Saitama 350(JP)

(74) Representative: **Reinhard, Skuhra, Weise**
Friedrichstrasse 31
W-8000 München 40(DE)

(54) On-Vehicle Receiver.

(57) An on-vehicle radio receiver comprises a tuning circuit for receiving a radio broadcast wave in which a data signal is multiplexed with a main signal including traffic information. The data signal indicates that the traffic information is on the air. A demodulating circuit demodulates the radio broadcast wave to extract the main signal from the radio broadcast wave received through the tuning means. A decoding circuit decodes the radio broadcast wave, received through said tuning means, to extract the data signal. A controlling circuit for outputting a control signal on the basis of the data signal. An audio signal processing circuit causes the output level and the frequency response of the main signal including the traffic information in response to the control signal.

FIG. 1



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ON-VEHICLE RECEIVER

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to an on-vehicle radio receiver which receives a broadcast signal in which a data signal indicative of the presence of traffic information is multiplexed with a main signal.

Prior Art

A traffic information system referred to ARI system (Autofahrer Rundfnk Information,) which is meant primarily for car radios, has been put in practical use in West Germany.

The ARI system employs a subcarrier having a frequency of 57 kHz, three times higher than the pilot tone (19 kHz) in an FM stereo broadcast wave. This subcarrier serves as a signal referred to an SK signal indicating that the station broadcasts traffic information. The SK signal is modulated by a message-identifying signal of 125 Hz called a DK signal only when traffic information is on the air.

In the mean time, RDS (Radio Data System) has been proposed and put in practical use in Europe, where a carrier frequency of 57 kHz is FSK-modulated by a bi-phase coded data to shift the phase of the carrier by 90 degrees.

This data includes a group consisting of four blocks, each of which including 26 bits, and the second block is assigned one bit of traffic information announcement identification code (referred to as TA code.) The RDS receiver demodulates the received signal to detect the TA code, thereby identifying that the traffic information is on the air.

With the prior art receivers for the ARI system or RDS system, when the speaker output is switched to the traffic information from the music having little or no background noise such as audio signal reproduced from an audio tape player, the traffic information with noticeable background noise causes uncomfortable listening conditions. This is particularly true if the speaker output level is adapted to be increased when the traffic information is present.

SUMMARY OF THE INVENTION

When the traffic information is on the air, the decoder reproduces the DK signal or TA signal from the broadcast wave received through the front end. The DK or TA signal thus extracted is then supplied to the controller which controls the audio circuit so as to output the audio signal at a level higher than when no traffic information is on the air and so as to cut as much background noise as possible.

BRIEF DESCRIPTION OF THE DRAWINGS

Features and other objects of the invention will be more apparent from the description of the preferred embodiments with reference to the accompanying drawings in which:

Fig. 1 is a block diagram showing a first embodiment of the present invention; and

Fig. 2 is a block diagram showing a second embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

First embodiment

Fig. 1 is a block diagram showing a first embodiment of the present invention. An RF signal received through an antenna 1 is applied to a front end 2 where the RF signal is converted into an IF (intermediate frequency) signal. The IF signal is amplified by an IF amplifier 3 and is then supplied to an FM detector 4 so as to reproduce an audio signal.

The output of the FM detector 4 is supplied to a stereo multiplex circuit 5 by which the signal is separated into a left and a right audio signal. The left and right audio signals are then fed to level control circuits 7L and 7R. In the mean time, part of the FM detected output is supplied to a bandpass filter 8 which rejects the high and low frequency components of the output of FM detector 4.s The output of the bandpass filter 8 is then supplied to the level control circuits 7L and 7R.

The output of the FM detector 4 is also supplied to a decoder (data demodulator) 10 which detects a signal indicating that the traffic. information is on the air at that time, i.e., the DK signal of the ARI system or the TA code for the RDS broadcast.

Upon detection of the DK signal or TA code, the decoder 10 outputs an output to the controller

11 which in turn causes a first muting circuit 6 to turn off and a second muting circuit 9 to turn on. As a result, the FM-detected output is rejected its low frequency and high frequency components by the bandpass filter 8 to subsequently feed the level controlling circuits 7L and 7R. The bandpass filter 8 has a high cut off frequency of about 10 kHz and a low cut off frequency of about 10Hz.

When the DK signal or TA code is not detected, the decoder 10 outputs no signal to the controller 11, which causes the first muting circuit 6 to turn on and a second muting circuits 9 to turn off. As a result, the output of the bandpass is not supplied to the level controlling circuit 7L and 7R but the L and R outputs of the stereo multiplex circuit 5 are supplied to the circuits 7L and 7R. The level controlling circuits 7l and 7R include potentiometers VOL1 and VOL2 and resistors R1-R4 and R5-R8 in bridge connection. The wipers of the potentiometers VOL1 and VOL2 are connected to a buffer amplifiers 12L and 12R, respectively.

The resistance R1 and R5 are selected relatively high as compared to the remaining resistors R2-R4 and R6-R8 such that the audio signals from the multiplex circuit 5 are attenuated considerably while the output from the second muting switch 9 is subjected to little or no attenuation.

Second embodiment

Fig. 2 shows a second embodiment of the invention, in which elements similar to those in Fig. 1 have been given the same reference numerals and the detailed description thereof is omitted.

The output of the multiplex circuit 5 are fed to a so-called electronic graphic equalizer 13 the output of which goes through an electronic volume control circuit 14 to the buffer amplifiers 12L and 12R. The microprocessor 15 is connected to an operating panel 16 accessible to the users. The graphic equalizer 13 is adapted to be programmed its output level such that each of several subdivided frequency ranges of the entire audio frequency range is increased or decreased in accordance with a control signal from the microprocessor 15. Likewise, the volume control circuit 14 is adapted to be controlled by a control signal from the microprocessor 15 such that the output level over the entire frequency range thereof is increased or decreased.

When the decoder 10 detects the DK signal in ARI system or the TA signal in the RDS broadcast, the decoder 10 outputs an output to the microprocessor 15, which in turn supplies to the equalizer 13 the control signal for setting a high frequency, e.g., 10 kHz above which the output of the equalizer is attenuated by several decibels and a low frequency level setting data for setting a low frequency, e.g., 100 Hz below which the output of the equalizer is attenuated by several decibels. At the same time, the microprocessor 15 outputs another control signal for increasing the left and right audio signals by several decibels. In this manner, when the incoming signal to the receiver is weak, signal level in the higher and lower frequency ranges are attenuated, so that the traffic information can be comfortably received without difficulties in listening in the background of noise. This is particularly useful where the traffic information with considerable radio noise comes in while the user is listening to, for example, the music from the tape player or tape deck the background noise of which is not detectable.

Claims

1. An on-vehicle radio receiver comprising:
tuning means (2,3,4) for tuning to a radio broadcast wave in which a data signal is multiplexed with a main signal including traffic information, said data signal indicating that the traffic information is on the air;
demodulating means (3,4,5) for demodulating the radio broadcast wave to extract the main signal from the radio broadcast wave received through said tuning means;
decoding means (3,4,10) for decoding the radio broadcast wave, received through said tuning means, to extract the data signal;
control means (11) for outputting a control signal on the basis of said data signal; and
audio signal processing means (13,8,7) for varying an output level and a frequency response of the main signal including said traffic information in response to said control signal.

2. An on-vehicle radio receiver according to Claim 1, wherein said tuner means is an FM receiver and said main signal is a left and right signals from a stereo multiplex demodulator.

3. An on-vehicle radio receiver according to Claim 1, wherein said tuner means is an FM receiver and said main signal is a monaural output.

4. An on-vehicle radio receiver according to Claim 2, wherein said audio signal processing means (13,8,7) is formed of an equalizer (13) and an electronic volume control circuit (14) placed after said stereo multiple) demodulator.

5. An on-vehicle radio receiver according to Claim 3, wherein said audio signal processing means (13,8,7) is formed of a bandpass filter (8) and a resistor network (7L, 7R) connected to a monaural output terminal.

FIG. 1

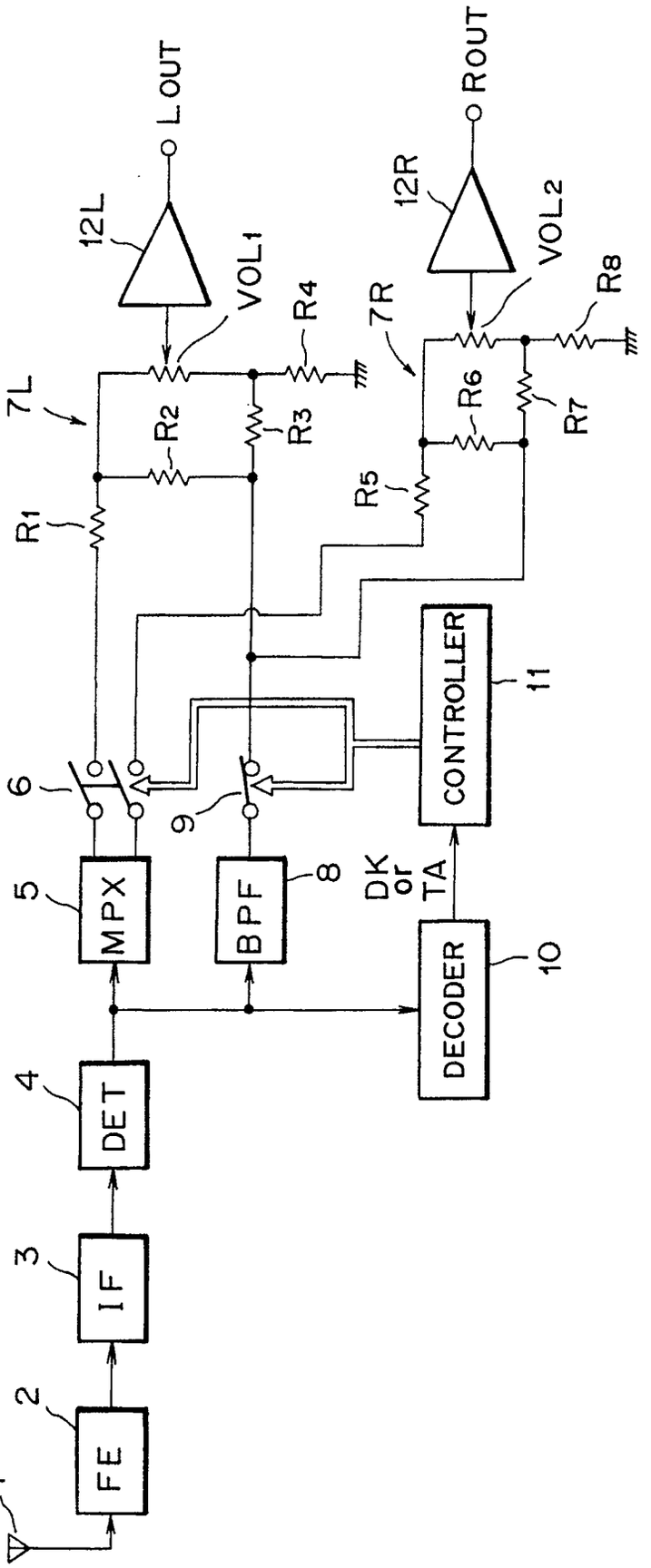
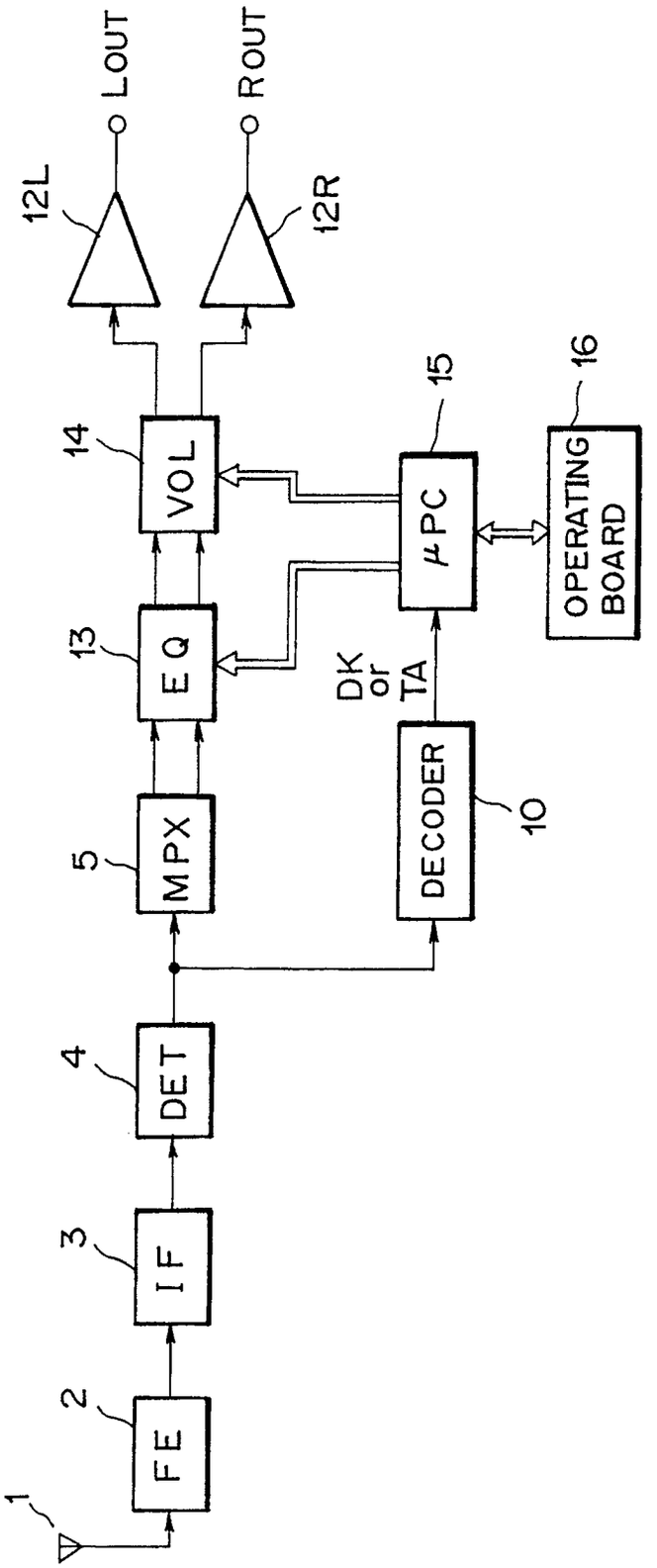

1
2
FE
3
IF
4
DET
5
MPX
6
9
BPF
8
DK
or
TA
DECODER
10
CONTROLLER
11
7L
R1
R2
R3
R4
VOL1
12L
LOUT
7R
R5
R6
R7
R8
VOL2
12R
ROUT

FIG. 2


1
FE
2
IF
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DET
4
MPX
5
EQ
13
VOL
14
LOUT
ROUT
12L
12R
DECODER
10
DK
or
TA
μPC
15
OPERATING
BOARD
16