

HEADPHONES

This invention relates to headphones suitable for use with audio equipment.

Portable radio receivers and sound reproducers such as tape recorders are often used by persons who are running or walking while listening to music. At times, the person using such apparatus wishes to hear other sounds such as another person speaking, and, with previously proposed devices, in order to hear the headphones have to be taken off. Alternatively, the user may have to move to the audio equipment to which the headphones are connected and then operate a muting switch.

According to the present invention there is provided a headphone comprising a signal input terminal, left and right headphone units of open air type, an input cord with a Y branch point connected between said signal input terminal and said left and right headphone units respectively, and a muting switch means mounted at a predetermined position between said terminal and said Y branch point or at said Y branch point of said input cord.

According to the present invention there is also provided a headphone comprising left and right headphone units of open air type, an input plug, a left signal cord connected between said input plug and said left headphone unit, a right signal cord connected between said input plug and said right headphone unit, and a muting switch means attached to said left and right signal cords between said input plug and said right and left headphone units and electrically connected to said cords for selectively muting said headphones.

According to the present invention there is also provided a stereo headphone comprising left and right headphone units, left and right signal input terminals, and a common terminal, an input cord with a Y branch point having a left signal transmitting line connected between said left signal input terminal and said left headphone unit, and a right signal transmitting line connected between said right signal input terminal and said right headphone unit, and a muting switch mounted at a predetermined position between said terminal and said Y branch point or at said Y branch point of said input cord and including a pair of switching devices normally conducting the left and

right signal from said input terminals to said left and right headphone units and a switching actuating member for operating said pair of switching devices together so as to mute the left and right signals from said left and right signal transmitting lines respectively.

5 According to the present invention there is also provided a stereo headphone comprising left and right headphone units, an input plug having left, right and common terminals, a left signal cord connected between said left terminal of said input plug and said left headphone unit, a right signal cord connected between said right terminal of said input plug and said right
10 headphone unit, and muting switch means comprising first and second switches attached to said left and right signal cords between said input plug and said right and left headphone units and electrically connected to said cords and a switch actuating member for operating said first and second switches together so as to mute said headphones.

15 The invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a first embodiment of headphone according to the invention;

20 Figure 2 is a circuit diagram showing a muting circuit employed in the headphone of Figure 1;

Figure 3 comprises a circuit diagram of an example of an audio equipment for use with a headphone according to the invention; and

Figure 4 is a circuit diagram illustrating a second embodiment of headphone according to the invention.

25 Figure 1 illustrates a headphone set comprising a left headphone unit

1L and a right headphone unit 1R which are connected together by a suitable headband. Left and right input cords 3L and 3R extend from the right and left headphone units 1L and 1R and to a binaural input plug 4. The plug 4 has a left audio signal input terminal 4a, a right audio signal input terminal 4b and a common terminal 4c. The headphone units 1L and 1R may, for example, be open air type.

As illustrated in Figure 2, a voice coil 2L is connected between the left terminal 4a and the common terminal 4c of the plug 4 and a voice coil 2R is connected between the right terminal 4b and the common terminal 4c.

The headphone has a muting switch 5 mounted at the separation point of the input cords 3L and 3R. As illustrated in Figure 2, the muting switch 5 includes a resistor 6L of relatively low resistance as, for example, 0.5 ohms which has one side connected to one end of the voice coil 2L and the other end connected to a muting switch 7L which has its other side connected to the common junction point between the voice coils 2L and 2R. A muting switch 7R is connected from the common point to a resistor 6R which has its other side connected to the second side of the voice coil 2R. Thus, the resistors 6L and 6R and the muting switches 7L and 7R are connected respectively in parallel with the voice coils 2L and 2R. The muting switches 7L and 7R are normally open to allow the audio signal to pass to the voice coils 2L and 2R, and a switch actuating button 7 is mechanically connected to both the switches 7L and 7R so as to close the switches 7L and 7R for muting operation. When the button 7 is released, the muting switches 7L and 7R open.

Figure 3 illustrates how the headphone is connected to audio equipment, for example, a tape recorder. The input plug 4 is connected to a headphone jack 8 which has a left audio signal output terminal 8a, a right audio signal output terminal 8b and a common terminal 8c which respectively correspond to the left terminal 4a, the right terminal 4b and the common terminal 4c of the plug 4. The left output terminal 8a is connected to a left reproducing magnetic head 9L through a left channel amplifier 10L and the right output terminal 8b is connected to a right reproducing magnetic head 9R through a right channel amplifier 10R.

With this circuit, when the muting switches 7L and 7R are open, the voice coils 2L and 2R of the headphone units 1L and 1R will be supplied with left and right channel audio signals from the left and right channel amplifiers

10L and 10R at predetermined levels respectively. Thus, left and right channel sound will be reproduced from the left and right headphone units 1L and 1R.

5 On the other hand, when the muting switches 7L and 7R are closed by depressing the button 7, most of the left and right audio signals will be fed to the resistors 6L and 6R due to their low resistances, and the left and right voice coils 7L and 7R will receive very little of the audio signals. Thus, the headphone units 1L and 1R will not reproduce the left and right channel signals under these conditions. Thus, depressing the button 7 to close the
10 muting switches 7L and 7R will cause the audio to disappear from the headphone units 1L and 1R and muting will be accomplished.

Thus, when a listener is aware that someone is speaking to him as he listens to music or other audio from the headphones, he can provide muting of the music in the headphones simply by immediately depressing the button 7 so
15 that he can hear the person speaking to him and can immediately respond. In the same manner, if a telephone rings or someone knocks at the door, it is not necessary for the user to take off the headphones or to move to an audio equipment to operate a muting switch since he can merely turn off the audio in the headphones by depressing the button 7 which is closely adjacent the
20 headphones.

Figure 4 illustrates a modified embodiment wherein a resistor 6'L is connected in series between the left terminal 4a and one end of the voice coil 2L and a muting switch 7'L is connected in parallel across the resistor 6'L. A resistor 6'R is connected between the right terminal 4b and one end of the voice coil 2R and a muting switch 7'R is connected in parallel with the
25 resistor 6'R. The resistance value of the resistors 6'L and 6'R is selected to be relatively high, for example, 680 ohms, and the muting switches 7'L and 7'R are normally closed. Thus, in normal operation the resistors 6'L and 6'R are usually shorted by the closed muting switches 7'L and 7'R, and only when
30 the button 7 is pressed or the muting switches 7'R and 7'L opened will the left and right audio signals pass through the resistors 6'R and 6'L and be attenuated so as to render the output of the headphone units 1L and 1R very low.

In the above embodiments, the muting switch 5 is not necessarily
35 connected at the separation point of the input cords 3L and 3R, but it could also be provided at a selected position where the left and right input cords 3L

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and 3R are parallel together.

Also, the muting switch 7 need not be a mechanical switch but can also be an electrical touch type switch.

5 Other embodiments of the invention can comprise a switch in the series branch of the left and right channels without any resistors, such that when the switches are closed the sound will pass through the voice coils and when the switches are open no signal will be supplied to the voice coils.

10 In another embodiment, a single channel is utilized, with a switch and a resistor R2 in parallel with the voice coil and a second resistor R1 in series with the voice coil. The resistor R1 is much larger than the resistor R2 and the resistor R1 is much smaller than the total input impedance to the resistor R1 and the voice coil.



CLAIMS

1. A headphone comprising a signal input terminal, left and right headphone units of open air type, an input cord with a Y branch point connected between said signal input terminal and said left and right headphone units respectively, and a muting switch means mounted at a predetermined position between said terminal and said Y branch point or at said Y branch point of said input cord.

2. A headphone according to claim 1 wherein said signal input terminal has left and right signal input terminals, and said input cord has a left signal transmitting line connected between said left signal input terminal and said left headphone unit, and a right signal transmitting line connected between said right signal input terminal and said right headphone unit.

3. A headphone according to claim 1 wherein said input terminal has left, right and common terminals, and said muting switch means comprises a pair of resistors and normally-open switching devices.

4. A headphone according to claim 3 wherein a pair of series circuits of said resistors and switching devices are connected between said left and common terminals, and between said right and common terminals, respectively.

5. A headphone according to claim 3 wherein a pair of parallel circuits of said resistors and switching devices are connected between said left terminal and left headphone unit and between said right terminal and right headphone unit, respectively.

6. A headphone comprising left and right headphone units of open air type, an input plug, a left signal cord connected between said input plug and said left headphone unit, a right signal cord connected between said input plug and said right headphone unit, and a muting switch means attached to said left and right signal cords between said input plug and said right and left headphone units and electrically connected to said cords for selectively muting said headphones.



7. A headphone according to claim 6 wherein said left signal cord has a left signal conductor and a first common conductor and said right signal cord has a right signal conductor and a second common conductor electrically connected to said first common conductor.

8. A headphone according to claim 7 wherein said muting switch comprises a first switch connected between said left signal conductor and said left headphone unit and a second switch connected between said right signal conductor and said right headphone unit.

9. A headphone unit according to claim 8 wherein said first and second switches are connected in parallel respectively with said left and right headphones.

10. A headphone according to claim 8 wherein said first and second switches are connected in series with said left and right headphones.

11. A headphone according to claim 9 comprising first and second resistors respectively connected in series with said first and second switches.

12. A headphone according to claim 10 comprising third and fourth resistors connected in parallel with said first and second switches.

13. A stereo headphone comprising left and right headphone units, left and right signal input terminals, and a common terminal, an input cord with a Y branch point having a left signal transmitting line connected between said left signal input terminal and said left headphone unit, and a right signal transmitting line connected between said right signal input terminal and said right headphone unit, and a muting switch mounted at a predetermined position between said terminal and said Y branch point or at said Y branch point of said input cord and including a pair of switching devices normally conducting the left and right signal from said input terminals to said left and right headphone units and a switching actuating member for operating said pair of switching devices together so as to mute the left and right signals from said left and right signal transmitting lines respectively.



14. A stereo headphone comprising left and right headphone units, an input plug having left, right and common terminals, a left signal cord connected between said left terminal of said input plug and said left headphone unit, a right signal cord connected between said right terminal of said input plug and said right headphone unit, and muting switch means comprising first and second switches attached to said left and right signal cords between said input plug and said right and left headphone units and electrically connected to said cords and a switch actuating member for operating said first and second switches together so as to mute said headphones.

15. A headphone substantially as hereinbefore described with reference to Figures 1 and 2 of the accompanying drawings.

16. A headphone substantially as hereinbefore described with reference to Figures 1 and 2 as modified by Figure 4 of the accompanying drawings.

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