United States Patent [19]

Tamura

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[54] **SPEAKER BOX**

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[52] **U.S. Cl.** ..... **181/31 B**

[51] **Int. Cl.** **G10k 13/00,** H04r 1/28

[58] **Field of Search** ..... 181/31 B, 31 R

[56] **References Cited**

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Attorney—Sughrue, Rothwell, Mion, Zinn & Macpeak

[57] **ABSTRACT**

A speaker box has a baffle plate with a speaker mounting hole provided in either the upper or lower portion. A duct for inverting a phase of sound in the neighborhood of the lowermost resonant frequency of the speaker is provided to introduce the sound outside the speaker. Sound absorbing means is provided on the duct so as not to unduly interfere with the sound discharged from the front surface of the speaker in the range that the sound discharged rearwardly of the speaker is of a higher frequency band than the lowermost resonant frequency when the speaker mounting hole is provided in displacement in the neighborhood of the duct.

4 Claims, 3 Drawing Figures

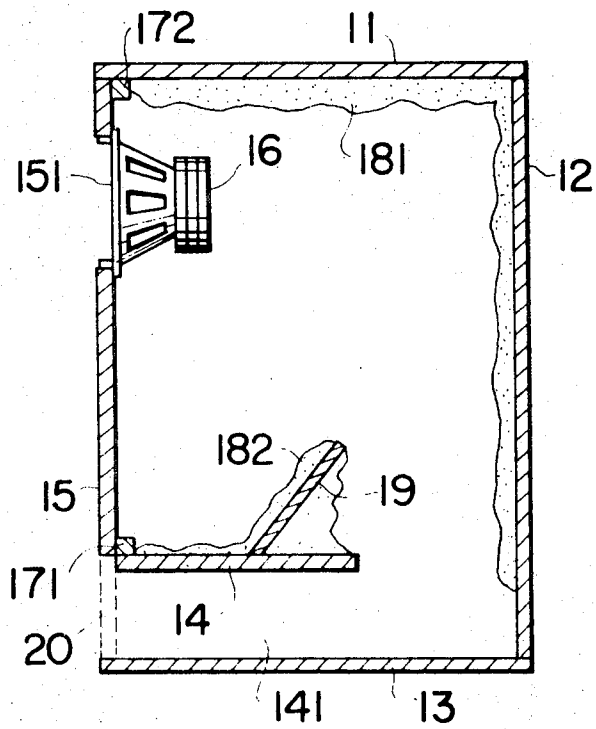


FIG. 1

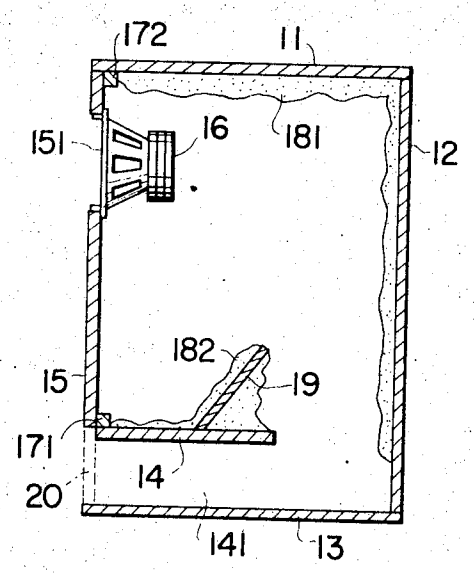


FIG. 2

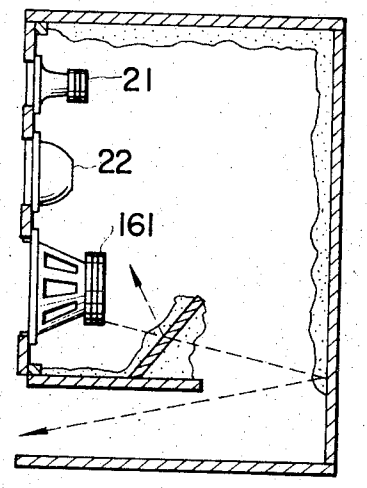
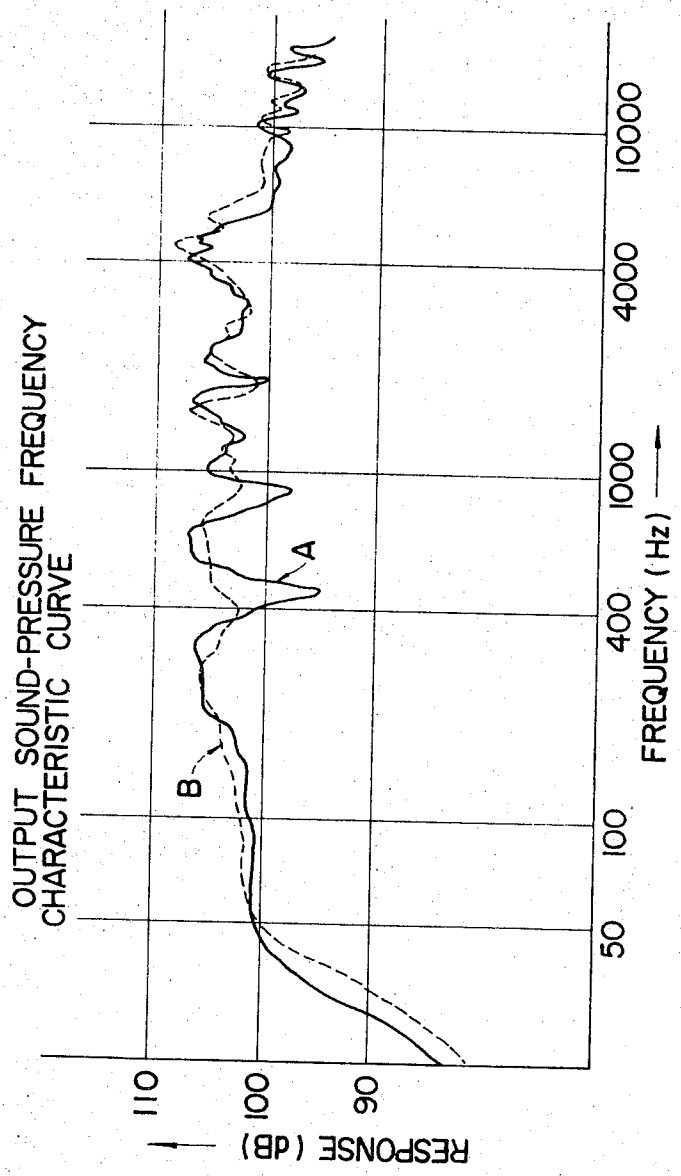


FIG. 3


OUTPUT SOUND-PRESSURE FREQUENCY CHARACTERISTIC CURVE
RESPONSE (dB)
110
100
90
FREQUENCY (Hz)
50
100
400
1000
4000
10000
A
B

SPEAKER BOX

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a speaker box, and more particularly to a speaker box which may alternately be a closed type or phase inverting type of speaker and which also permits the selection of a single speaker mounting position or a number of mounting speakers.

2. Description of the Prior Art

Heretofore, most of the speaker boxes generally sold and used were of the closed type or phase inverting type, and it was not preferable to try and use either type of speaker box from the view point of sound characteristics. In addition the speaker mounting position and the number of speakers were generally predetermined so that it was almost impossible for the buyer or user to optionally select his preferred arrangement.

SUMMARY OF THE PRESENT INVENTION

This invention eliminates the aforementioned disadvantages of the conventional speaker box and provides a novel and improved speaker box which may alternately be a closed type or phase inverting type of speaker according to the desires of the purchaser or user and which permits the selection of the speaker mounting position or a number of speakers, while still providing the good sound characteristics of both types.

It is, therefore, one object of the present invention to provide a speaker box which may readily alternate between either a closed type or phase inverting type without losing the sound characteristics thereof.

It is another object of the present invention to provide a speaker box which permits the ready alteration of the speaker mounting position without losing the sound characteristics of the speaker.

It is a further object of the present invention to provide a speaker box which allows the selection of a number of mounting speakers without losing the sound characteristics.

According to one aspect of the present invention, there is provided a speaker box which comprises a baffle plate having a speaker mounting hole provided in either the upper or lower portion from a center thereof; a duct for inverting a phase of sound in the neighborhood of the lowermost resonant frequency of the speaker is provided to introduce the sound outside; sound absorbing means is provided on the duct so as not to unduly interfere with the sound discharged from the front surface of the speaker in the range that the sound discharged rearwardly of the speaker is of a higher frequency band than the lowermost resonant frequency when the speaker mounting hole is provided in displacement in the neighborhood of the duct.

DESCRIPTION OF THE DRAWINGS

The other objects, features and advantages of the present invention will become apparent from the following description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a sectional view of a speaker box showing the basic configuration thereof;

FIG. 2 is a sectional view of one embodiment of a speaker box contructed according to the present invention; and

FIG. 3 is a graph showing one example of output sound pressure frequency response using a speaker box of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Reference is now made to FIG. 1, which shows the basic configuration of a speaker box.

Reference numeral 11 illustrates an upper plate, 12 a rear plate installed vertically with respect to the upper plate 11, 13 a bottom plate installed in parallel with the upper plate 11 connected to the rear plate 12. The upper plate 11, rear plate 12 and bottom plate 13 form a box opening at the front together with both side plates (not shown). 14 illustrates a duct plate forming a duct or port 141 for phase inverting together with the bottom plate 13. A baffle plate 15 is installed in close contact with the upper plate 11, duct plate 14 and both side plates. A speaker mounting hole 151 is located on the baffle plate 15. 171 and 172 are pads for securing the baffle plate 15. 181 and 182 are sound absorbing materials, while 19 is a mounting plate for installing the sound absorbing material 182. 20 is a duct closing plate for blocking the duct 141 if required, and in FIG. 1, is shown by a broken line. In FIG. 2, 21 is a tweeter for high frequency band, while 22 is an intermediate frequency speaker.

If the speaker 16 in FIG. 1 can reproduce generally the entire sound range, a phase inverting speaker box may be constructed without installing the duct closing plate 20, while if the duct closing plate 20 is installed to close the duct, a closed speaker box may be constructed. If a woofer for low frequency is used as a speaker 16, the tweeter for high frequency or an intermediate frequency speaker may be installed at the mounting hole of the baffle plate 15 at an appropriate location. Generally, considering the directional nature of these speakers, it is better that the tweeter, intermediate frequency speaker, and woofer be installed in that order from the upper portion, and accordingly if these speakers are installed the baffle plate 15 is installed upside down. It follows that as shown in FIG. 2 it is better that the tweeter 21, intermediate frequency speaker 22 and woofer 161 be installed in that order from the top. In such a case, it is optional whether the duct closing plate 20 is installed or not.

As shown in FIG. 2, if the baffle plate 15 is installed upside down so that the woofer 161 is installed at the lower portion to be used as a phase inverter, the woofer 161 may be located adjacent to the duct plate 14 so that sound projected rearwardly of the woofer 161 is discharged outside through the duct 141 as designated by a broken line. Accordingly, the sound projected forwardly of the woofer 161 and the sound projected forwardly through the duct 141 are out of phase by 180° in a certain sound range to cancel each other with the result that as shown in FIG. 3 by the characteristic curve A there occurs a valley of sound characteristic of higher frequency than the lowermost resonant frequency f_o of the woofer 161. This invention provides with the sound absorbing material mounting plate 19 on the upper surface of the duct plate 14 and the sound absorbing material 182 provided on the sound absorbing means a method of preventing the characteristic valley from occuring as shown by the characteristic curve B in FIG. 3.

If the speaker box of this invention is used, though the speaker mounting hole **151** is already provided, the tweeter **21** and intermediate frequency speaker **22** need not always be installed in straight line with respect to the speaker mounting hole **151** with the mounting holes, and two or more tweeters and intermediate frequency speakers may also be provided.

It should be understood from the foregoing description that the buyer or user may optionally select the configuration of the speaker box so as to satisfy his personal desire for the sound reproducing device.

What is claimed is:

1. In an essentially closed speaker box for projecting sound, the improvement comprising:

a baffle plate forming one wall of said box, said baffle plate having an off-center speaker mounting hole;

a speaker capable of projecting a frequency range of sound mounted in the speaker mounting hole;

duct means carried by said speaker box and extending inwardly of said baffle plate for inverting a phase of sound approximately of the lowermost resonant frequency of the speaker and for introducing the sound outside of the speaker box;

a mounting plate fixed to said duct means rearwardly of said baffle plate and extending towards said speaker; and

sound absorbing means lining said duct means and said mounting plate to prevent interference with the sound phase discharged from the front surface of the speaker in a range where the sound phase discharged is higher than the lowermost resonant frequency when the speaker is mounted adjacent to the duct means.

2. A speaker box as set forth in claim **1** including woofer means installed in the lower portion of the baffle plate for phase inversion.

3. A speaker box as set forth in claim **2** wherein a top wall and rear side wall are lined with sound absorbing material.

4. A speaker box as set forth in claim **3** including an intermediate frequency speaker and tweeter mounted respectively above the woofer.

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