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Maekawa

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[54] **SPEAKER SYSTEM**

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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; 179/1 E, 1 GA

[56] **References Cited**

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Attorney—Richard C. Sughrue et al.

[57] **ABSTRACT**

A speaker system mounting arrangement which allows the middle and high frequency sounds to be directed in a desired direction to give a better sound reproduction without changing the position of the speaker enclosure, by mounting the middle and high frequency sound range speakers in a globe member having an opening on one side thereof and movably mounting the globe member in an opening formed in the enclosure installation or mounting board and is spring biased to allow the globe member to be rotated to position the sound axis of the speaker in any desired direction without moving the speaker enclosure.

4 Claims, 4 Drawing Figures

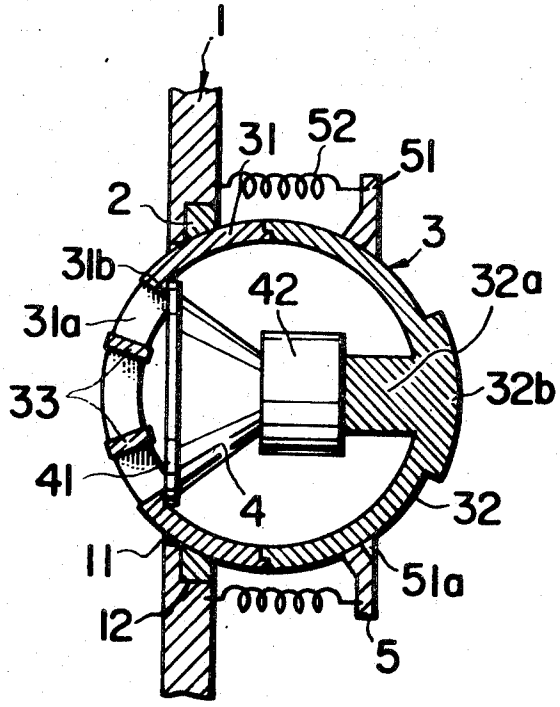


FIG. 1a

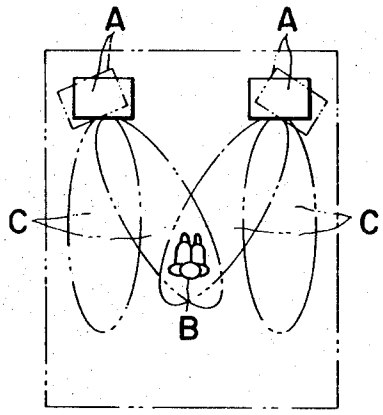


FIG. 1b

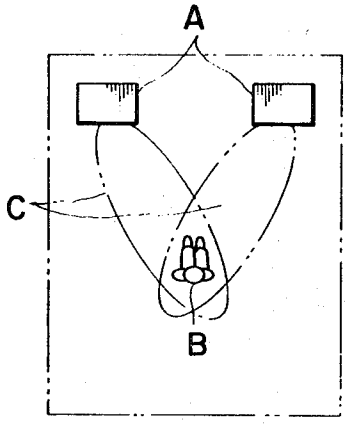


FIG. 2

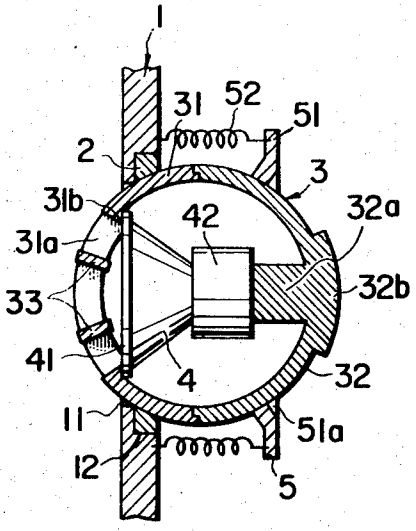
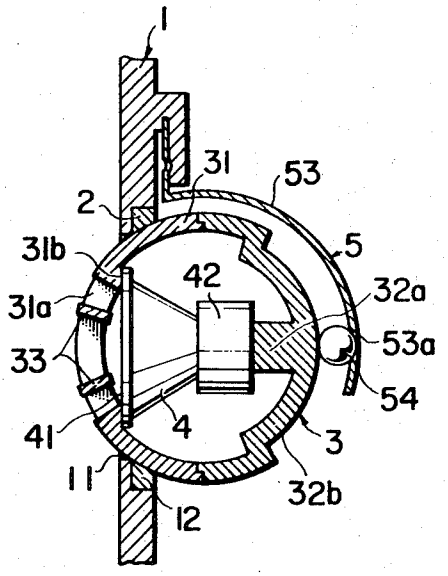


FIG. 3



SPEAKER SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention is directed to a speaker system, and more particularly to a speaker system wherein a high or a middle frequency range speaker is arranged in a special manner so that the sound may be directed in a desired direction without changing the position of the enclosure.

2. Description of the Prior Art

It is well known that the directivity of the middle and high frequency sounds is sharper than that of the low frequency sound because the wave lengths of the middle and high frequencies are shorter as compared with those of the low frequencies. As a result, with the increase in frequency of sound emitted from a speaker, the sound field of the emitted sound becomes increasingly narrower. Therefore, the middle and high frequency sounds suffer severe attenuation in a directional offset greater than 30° to 60° from the central axis of the loudspeaker.

Accordingly, when stereophonic reproduction employing conventional speaker systems A and A placed at two corners of a room and adjacent to a wall thereof is desired, as shown in FIG. 1*a*, illustrating the prior art, a listener B positioned at the apex of a triangle having the base formed by the two speaker systems A and A, cannot hear the reproduced sound sufficiently, especially in the middle and high pitch frequency sound ranges. That is, the sound fields of the middle and high frequency sounds are shaped as shown at C and C on both sides of the listener B. This tendency is even more apparent when the distance between the speaker systems A and A is increased.

In the prior art, the direction of the sound field has been changed by various means, such as varying the angle of the reflection board installed in front of the speaker, or by revolving the speaker, the directivity of which is different in the vertical direction and the horizontal direction, and is centered around the central axis of the speaker. Even by using these means of changing the sound field direction, the listener cannot accurately listen to the true high frequency sound without changing the direction of the central axis of the speaker because the speaker has the inherent above-mentioned directivity. Consequently, in order to eliminate the above-described difficulty in the conventional speaker systems, the systems have been arranged as shown by the chain lines in the prior art figure , so that an angle is formed by the central axis lines of the speaker systems, to enable a listener to hear the middle and high frequency sound ranges of the reproduced sound more completely. Such an arrangement of the speaker systems, however, has degraded the esthetic appearance of a room and has reduced the utility of the same room space.

SUMMARY OF THE INVENTION

A primary object of the present invention is to provide a speaker system whereby a listener can hear the highest quality of sound, including middle and high frequency sounds emitted from a speaker having sharp directivity characteristics more completely regardless of the arrangement of the speaker systems.

Another object of the present invention is to provide a speaker system which may be arranged in a versatile manner whereby esthetic appearance and utility of a room can be substantially improved.

A further object of the present invention is to provide a speaker system in which a speaker for middle and/or high frequency sound ranges is mounted within a globe member so arranged as to be directed as desired with regard to the front plate of a cabinet, whereby the speaker for middle and high frequency sound ranges does not suffer interference with sound emitted from a rear side of another speaker for frequency sound range mounted in the cabinet.

A still further object of the present invention is to provide a speaker system in which a globe member including a speaker for middle and/or high frequency sound ranges is pressed against a baffle board of a cabinet by means of a spring means, whereby the globe member does not move and vibrate regardless of the power driving the speaker, wherein a bookshelf type speaker system may be designed because air gaps are not formed between the baffle board and the globe member.

Other objects, advantages and features of the present invention will become apparent from the following description taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1*a* is a schematic diagram showing the sound field formed by a conventional speaker system;

FIG. 1*b* is a schematic diagram showing the sound field created by the speaker system according to the present invention;

FIG. 2 is a sectional view of one embodiment of the speaker system in accordance with the present invention;

FIG. 3 is a sectional view of another embodiment of the speaker system in accordance with the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Now, describing embodiments of this invention in accordance with the drawings, an installation board 1, such as a baffle board, fixed to a cabinet, has a circular opening 11 cut therethrough. A step portion 12 is formed around the back part of the circular opening 11. An annular bumper member 2 is fixed on the step portion 12, and is formed of material having a large coefficient of friction and elasticity, for example, rubber material. A globe member 3 for a speaker 4 to be installed therein has an outside diameter which is greater than the diameter of the opening 11 of the installation board 1 mentioned above. This globe member 3 is divided into a front hemispherical portion and a rear hemispherical portion which are joined in a suitable manner such as by screws or grooves in each other. A sound passage opening 31*a* is cut in the central portion of the front hemispherical portion 31, and a flat portion 31*b* is shaped so as to face a flange 41 of the speaker 4. Fins 33 are arranged in the sound passage opening 31*a* for improving the directivity of the speaker 4. In the inside center of the rear hemispherical portion 32 a pushing pole 32*a* protrudes to touch a rear plane portion of a magnetic circuit unit 42 and to press

and hold the flange 41 of the speaker 4 against the flat portion 31*b* of the front hemispherical portion 31 when both of the hemispherical portions 31 and 32 are joined together. In addition, the pushing pole 32*a* is shaped to incorporate or secure an elastic member with the rear hemispherical portion 32.

In the outside center of the rear hemispherical portion 32, a circular stepped portion 32*b* is shaped in the form of a protrusion as shown in FIG. 2, or in the form of an indentation as in FIG. 3. A holding or retaining unit 5 for pressing the globe member 3 from behind toward the annular bumping member 2 is fixed to the installation board 1 for holding the globe member 3 in a freely rotatable manner.

The holding or retaining unit 5, in the embodiment shown in FIG. 2, consists of an annular press board 51 in which is cut a circular opening 51*a* having a diameter less than that of the globe member 3, and coil springs 52 stretched between the press board 51 and the installation board 1. Consequently, when positioning the front hemispherical portion 31 against the annular bumping member 2 and then placing the press board 51 against the rear hemispherical portion 32 from the rear, the globe member 3 is held freely rotatable against the installation board 1.

In the embodiment shown in FIG. 3, the holding unit 5 consists of a curved plate spring 53 attached to the installation board 1 on one side thereof by suitable means, and a ball 54 placed in a small hole 53*a* cut out on the other end of the plate spring 53. Therefore, when the front hemispherical portion 31 is placed on the annular bumper means 2 and the ball 54 is placed in the small hole 53*a* of the plate spring 53 and biased toward the indented circular stepped portion 32*b*, the globe member 3 is held freely rotatable against the installation board 1.

The operation of the speaker systems comprising the above-described structural elements, as illustrated in FIGS. 2 and 3, will now be described. The globe member 3 is pressed toward the annular bumper member 2 by the coil spring 52 or the spring plate 53 of the holding unit 5 and is held in a freely rotatable manner against the installation board 1. In this position, the globe member 3 is pressed against the entire inside surface of the annular bumper member 2. These members are held with sufficient force between them to cause sufficient frictional resistance to retain the globe member 3 in its original position and to prevent a vibration from occurring between them, regardless of the power driving the speaker. Furthermore, no sound will leak out of the inside of the cabinet between the globe member 3 and the installation board 1.

For directing the center axis of the speaker 4 in the desired direction, a listener presses against the fins 33 or a portion of the globe member 3 in opposition to the coil spring 52 or the plate spring 53, thereby causing the globe member 3 to separate from the inside surface of the bumper member 2. In this condition, the globe member 3 can be rotated and the center axis of the speaker 4 may be directed in the desired direction. When the listener's hand is removed from the globe member 3 or the fins 33, the globe member is again pressed to the bumper means 2 by the force of the coil spring or the plate spring. The circular stepped portion 32*b* is arranged for limiting the range of rotation of the globe member 3. Specifically, the globe member 3 may not rotate beyond the pre-determined rotatable range because of the contact of the pressing board 51 and the wall of the circular stepped portion 32*b*, in FIG. 2, or the contact of the ball 54 and the edge wall of circular stepped portion 32*b*, in FIG. 3.

In the afore-mentioned embodiments, the speaker is mounted within the globe member 3 by the pushing pole 32*a* formed inside of the rear hemispherical portion 32. The speaker 4, however, may be installed within the globe member 3 by conventional means, such as screws or an adhesive instead of the pushing pole 32*a*.

As is apparent from the above description, the present invention is directed to a speaker system wherein a globe member including a speaker in the middle and/or high frequency sound range is usually biased from behind toward an opening portion of a baffle board of a cabinet by suitable spring means, whereby the central axis of the speaker may be directed in a desired direction and the globe member is securely retained in the desired position, regardless of the power driving the speaker or vibrating the cabinet, so that a vibration will not occur between the globe member and the baffle board.

Although the invention has been described with respect to the preferred embodiments, it will be apparent to those skilled in the art that various modifications thereof may also be carried out without departing from the scope of the invention as defined hereinabove.

What is claimed is:

1. A speaker system comprising:

a movable hollow globe member having an opening therein, a speaker for reproducing middle and/or high frequency sounds mounted within said globe member and spanning the opening thereof,

an installation board having an opening therethrough, said opening in said installation board being smaller than the outer diameter of said globe member, the opening of said globe member positioned in the opening of said installation board, and

spring biasing means for pressing said globe member against said opening in said installation board,

whereby said globe member being held freely rotatable against said installation board.

2. A speaker system as claimed in claim 1, further comprising a press board having an opening therethrough, the size of said opening through said press board being less than the outer diameter of said globe member, said press board positioned against said globe member, said spring biasing means being connected between said installation board and said press board to movably hold said globe member between said installation board and said press board.

3. A speaker system as claimed in claim 2, wherein said globe member further comprises a protrusion extending through said opening in said press board to limit the degree of movement of said globe member by contact of said protrusion with the edges.

4. A speaker system as claimed in claim 1, wherein said spring biasing means comprises a leaf spring plate having one end attached to said installation board, the other end of said leaf spring plate extending adjacent said globe member, said globe member positioned

between said other end of said spring plate and said installation board, said other end of said spring plate having means for retaining a spherical member between said other end and said globe member to bias said globe member against said installation board.

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