# United States Patent [19]

**Gregory**

[11] **3,779,337**

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[54] **VIBRATIONLESS SPEAKER ASSEMBLY**


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[52] **U.S. Cl.** ..... **181/31 B,** 179/115.5 R

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

[58] **Field of Search** ..... 181/31 B, 31 R, 32 A; 179/115.5 R



[56] **References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 1,997,790 | 4/1935 | Heidrich | 181/32 A |
| 3,135,349 | 6/1964 | Lahti | 181/31 B |
| 3,177,301 | 4/1965 | Hecht | 181/31 B |
| 3,617,654 | 11/1971 | Heidrich | 181/31 B |



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[57] **ABSTRACT**

A vibrationless speaker assembly includes a speaker, an enclosure, and a speaker mount within the enclosure. The speaker mount is formed from alternate layers of rigid mounting blocks and vibration damping material with a split collar attached to one end of the mount. The other end of the mount is fixed in a speaker enclosure spaced from a baffle board having an orifice. An annular member of vibration damping material is secured around the periphery of the orifice. The speaker is mounted in the enclosure by pressing the speaker cone firmly against the annular member on the baffle board and securing the driving portion of the speaker by friction in the split collar to hold the speaker in position.


**7 Claims, 2 Drawing Figures**

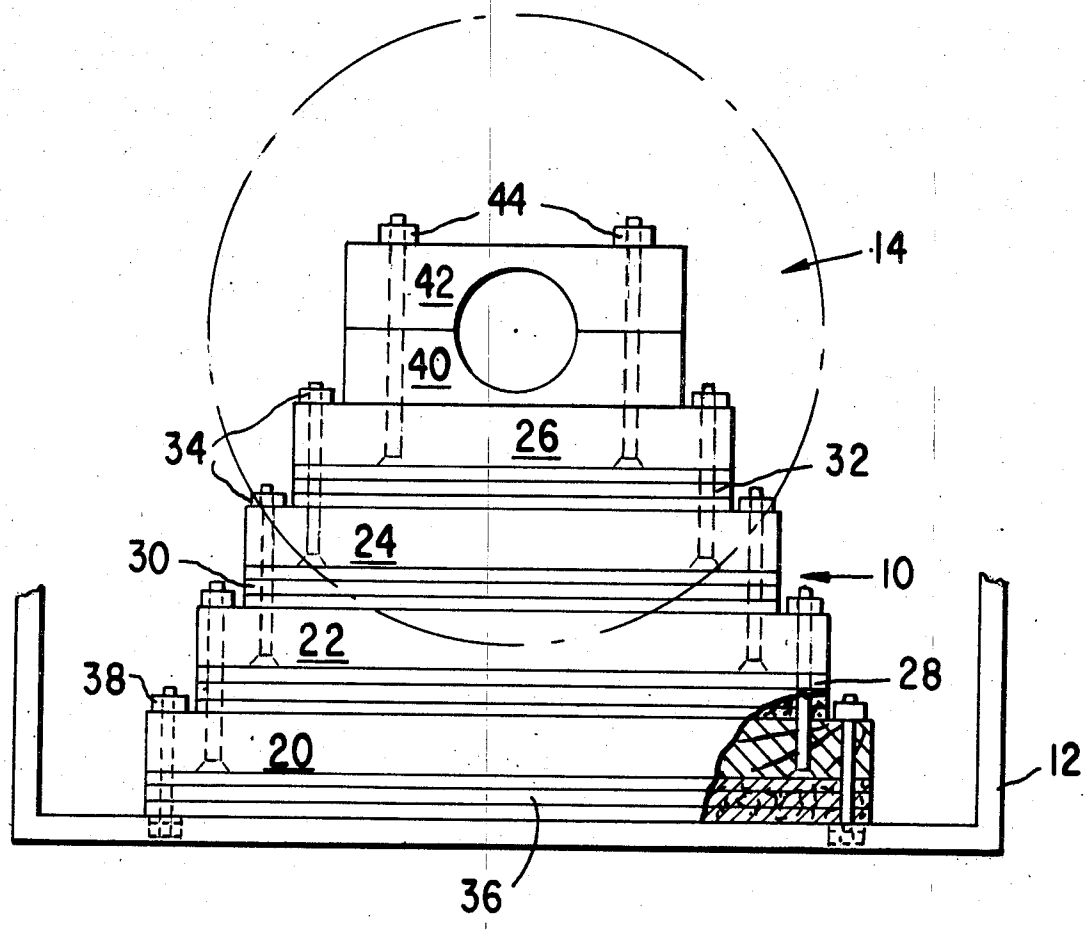

FIG. 1

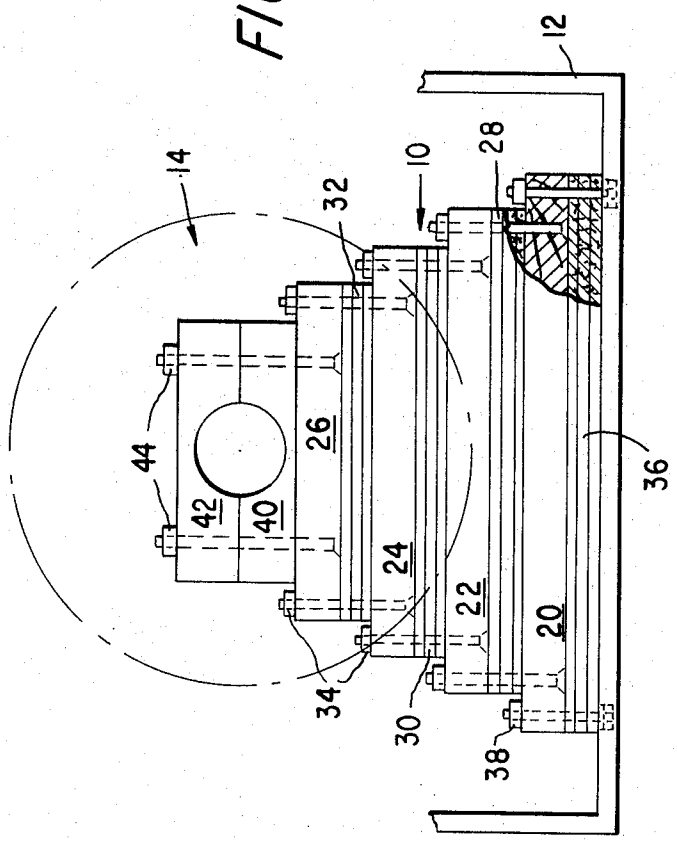
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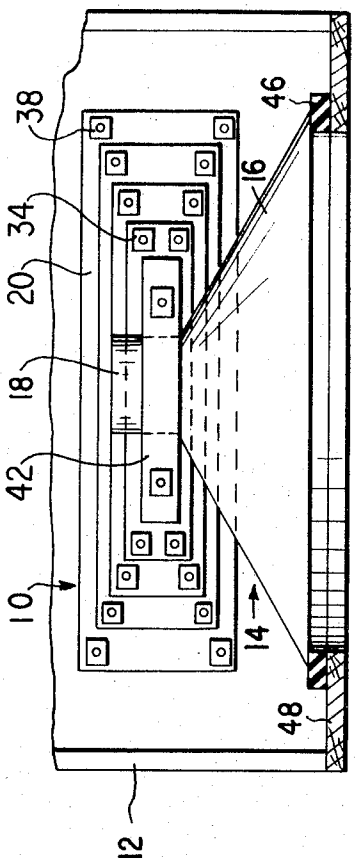
FIG. 2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# VIBRATIONLESS SPEAKER ASSEMBLY

## BACKGROUND OF THE INVENTION

1. The Field of the Invention

The present invention relates to a vibrationless speaker assembly, and in particular to a speaker mounting means which will positively dampen vibration of all parts of the speaker except the cone.

2. Description of the Prior Art

Many attempts have been made to provide speaker systems which are substantially free of distortion. One of the most common sources of distortion and masking tones is in the speaker mounting itself. Thus much attention has been given to developing a mounting for the speaker which will prevent relative movement between the speaker and its frame and between the speaker and the enclosure, with the goal being a system in which only the speaker cone vibrates to produce sound.

An example of the prior art is U. S. Pat. No. 3,177,301 which shows a speaker constructed without a basket or frame. The speaker cone is glued at one end to an annulus, which is in turn glued to a baffle board of the enclosure, and at the other end to a voice coil, which is attached to the magnet. The sole support for the magnet is a member which extends transversely across the enclosure and is glued to the side walls thereof without benefit of any damping or isolation means. Thus this arrangement relies upon the absence of direct contact between the baffle and the speaker support member and the use of an enclosure of non-resonant material to accomplish vibration damping. Such an arrangement has inherent assembly problems including alignment of the support member with respect to the aperture in the baffle and positively securing the magnet to hold it properly and firmly positioned in the support member.

## SUMMARY OF THE INVENTION

The present invention is summarized in that a vibrationless speaker assembly includes a speaker having a driving portion and a cone attached thereto, an enclosure having a baffle wall with an opening therein, an annular member of relatively rigid resilient material fixed to the baffle wall about the opening, a plurality of rigid support members fixed in the enclosure in spaced relation to the baffle wall, a plurality of vibration damping layers interleaved with the plurality of rigid support members, means securing each rigid support member to its immediately adjacent rigid support members through the adjacent damping layer in a series of pairs, and collar means carried by the interleaved rigid support members and the vibration damping layers, such collar, means engaging the driving portion of the speaker and retaining the speaker with the cone thereof disposed against the annular member.

An object of this invention is to dampen external vibrations from both the driving and cone portions of the speaker.

It is a further object of the present invention to substantially eliminate masking tones resulting from parasitic vibration by a speaker in an enclosure so that only the speaker cone vibrates thereby doing substantially all of the sound producing work.

Yet another object of the present invention is to construct a speaker mount which can be readily and economically manufactured for use with a wide variety of types and sizes of speakers and enclosures.



Other objects and advantages of the present invention will become apparent from the following description of a preferred embodiment taken in conjunction with the accompanying drawing.

## BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a partial front elevation, partially in section, of a vibrationless speaker mounting assembly according to the present invention; and

FIG. 2 is a top plan view of FIG. 1 with parts added.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

The present vibrationless speaker assembly includes a mount, generally indicated by reference numeral **10**, fixed in an enclosure **12**, only a portion of which is shown, and a speaker, generally indicated by reference numeral **14**. The speaker includes a cone **16** attached to driving portion **18** which is schematically illustrated to include all types of electroacoustic transducing means such as a magnet and diaphragm. The mount **10** is formed by a plurality of rigid members **20, 22, 24** and **26**, for example ¾ inch plywood, assembled with layers of vibration damping material **28, 30** and **32**, for example fibrous material or expanded foam material, therebetween in sandwich fashion. The entire mount is held together by a plurality of suitable securing devices, such as nut and bolt fasteners **34**. Each fastener **34** is arranged to pass only through two adjacent rigid members and the intervening layer of vibration damping material. A similar layer of vibration damping material **36** is positioned between the bottom most rigid member **20** and the enclosure **12** and suitable securing devices, such as nut and bolt fasteners **38**, secure the mount in the enclosure **12**. At the free end of the mount there is a pair of rigid collar members **40, 42**, for example wood, which are secured together and to the upper end most rigid member **26** by suitable fastening devices, such as nuts and bolts **44**. A vibration isolating ring **46** of solid rubber, pure high density latex, or like high density resilient material is mounted about the periphery of an opening in the baffle board **48** of the enclosure **12**.

The mount **10** is formed according to the dimensions of the enclosure **12** and speaker **14**. A mount of the required height is constructed of alternate layers of rigid members **20, 22, 24** and **26** and layers of vibration damping material **28, 30** and **32**, topped by a split collar of rigid members **40, 42** and held together by fastening devices **34** and **44**. Preferably each layer of vibration damping material **28, 30, 32** and **36** includes multiple individual layers of vibration damping material in order to insure good vibration isolation between the successive rigid members **20, 22, 24** and **26**. The mount **10** is fixed in the enclosure **12** spaced from the baffle board **48** by fastening devices **38** and isolated from vibration by layer **36** of vibration damping material. The fastening devices **44** holding the split collar members **40, 42** are loosened and the driving portion **18** of a speaker **14** is placed within the collar. The speaker **14** is then positioned so that the rim of the cone **16** is firmly pressed against the vibration isolating ring **46** on the baffle board **48** and the collar fastening devices **44** are tightened to firmly frictionally grip the driving portion of the speaker in the collar **40, 42**. No securing means, which might either vibrate or transmit vibra-

tions, are used to hold the cone rim **16** against the isolating ring **46** on the baffle wall **48.**

The size and number of the rigid mounting members will, of course, vary according to the needs of the particular speaker and enclosure. The generally pyramidal configuration of the mount **10** provides clearance for the speaker cone, even if it has a relatively flat pitch. This configuration also makes it easy to construct the mount **10** since the fastening devices preferably only extend through an adjacent pair of rigid members and the intervening damping material to form a continuous series of pairs, each pair serving as a vibration isolating stage.

The mount **10,** as mentioned above, has a series of vibration isolating stages formed by the pairs of rigid members, for example rigid members **20** and **22** are fastened together as a first pair and rigid members **22** and **24** are fastened together as a next successive pair. Because of the pyramidal configuration of the mount, each rigid member is wholly supported by the next larger rigid member with which it is paired and is vibration isolated therefrom by the intervening layer of vibration damping material. Thus the mount has a progressive series of vibration isolating stages which prevent the development and transmission of any natural, parasitic, resonant or sympathetic vibrations between the speaker and the enclosure. Also, since the cone is pressed against the annular member and held there only by engagement of the speaker driving portion in the split ring, no vibrations are transmitted to the baffle wall by the speaker housing. The only vibration in this assembly will be by the cone.

The present vibrationless speaker mounting assembly is capable of damping out substantially all of the vibrations originating in the speaker frame and the enclosure by the above mentioned progressive vibration isolation steps, regardless of the enclosure size or the size and make of speaker. Since only the speaker cone will be vibrating and masking tones will be substantially eliminated, a conventional Bass reflex enclosure can be used to achieve increased sensitivity, improved Bass response, and greater clarity over the entire range of audible sound. Also, since only the speaker cone can vibrate, the system will be more efficient in operation allowing the use of low power amplifiers to produce a large volume of sound, i.e., 20 watts is sufficient for normal home use.

Inasmuch as the present invention is subject to many variations, modifications and changes in detail, it is intended that all matter contained in the foregoing description or shown in the accompanying drawing shall be interpreted as illustrative in nature and not in a limiting sense.

What is claimed is:

**1.** A vibrationless speaker assembly comprising,

a speaker including a driving portion and a cone attached thereto,

an enclosure having a baffle wall with an opening therein,

an annular member of relatively rigid resilient material fixed to said baffle wall about said opening,

a plurality of rigid support members fixed in said enclosure in spaced relation to said baffle wall,

a plurality of vibration damping layers interleaved with said plurality of rigid support members,

means securing each rigid support member to its immediately adjacent rigid support members through the adjacent vibration damping layer in a series of pairs, and

collar means carried by said interleaved rigid support members and said vibration damping layers,

said collar means engaging the driving portion of said speaker and retaining said speaker with the cone thereof disposed against said annular member.

**2.** The invention as recited in claim **1** wherein each said vibration damping layer comprises multiple individual layers of vibration damping material.

**3.** The invention as recited in claim **1** wherein each said vibration damping layer comprises fibrous material.

**4.** The invention as recited in claim **1** wherein each said vibration damping layer comprises expanded material.

**5.** The invention according to claim **1** wherein said annular member comprises a ring of high density rubber.

**6.** The invention as recited in claim **1** wherein the interleaved rigid support members and vibration damping layers are dimensioned to define a mount having a stepped configuration whereby a clearance precludes any contact between the mount and the cone of said speaker.

**7.** The invention as recited in claim **6** wherein the stepped configuration of said mount defines a generally pyramidal arrangement with each rigid support member being carried by its adjacent larger rigid support member.

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