April 20, 1965 E. S. TRANSUE 3,179,203

SPEAKER RE-VIBRATION SYSTEM

Filed Nov. 29, 1963 3 Sheets-Sheet 1

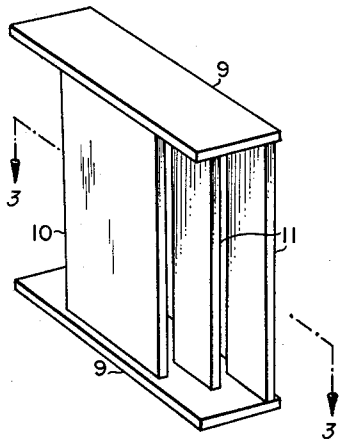


FIG. 1

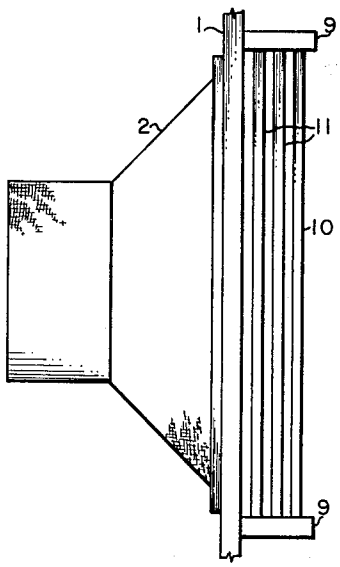


FIG. 2

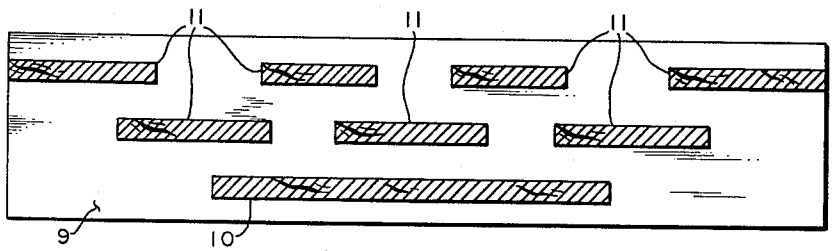


FIG. 3

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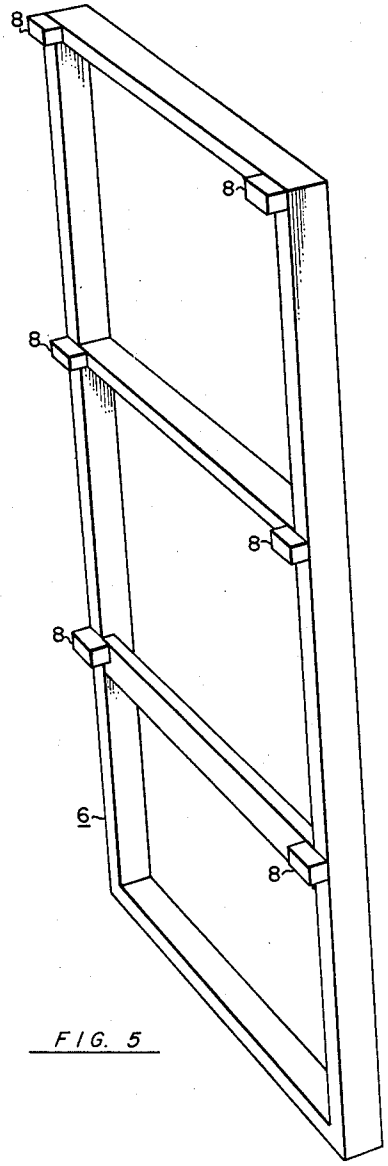


FIG. 5

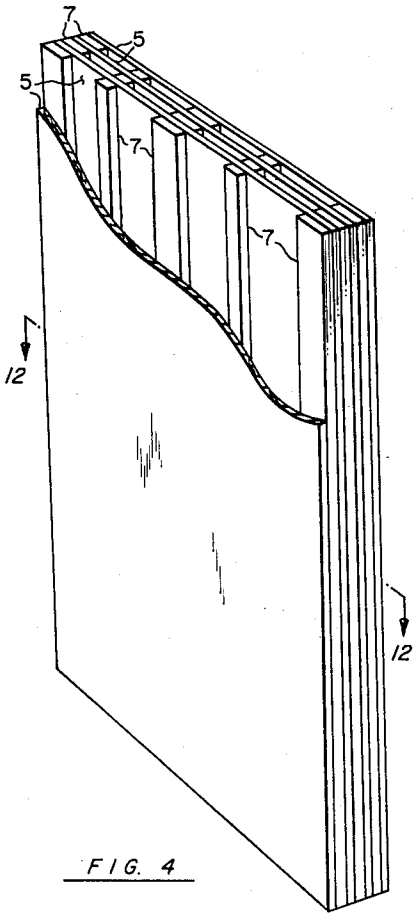


FIG. 4

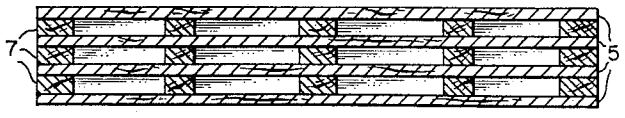


FIG. 7

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SPEAKER RE-VIBRATION SYSTEM

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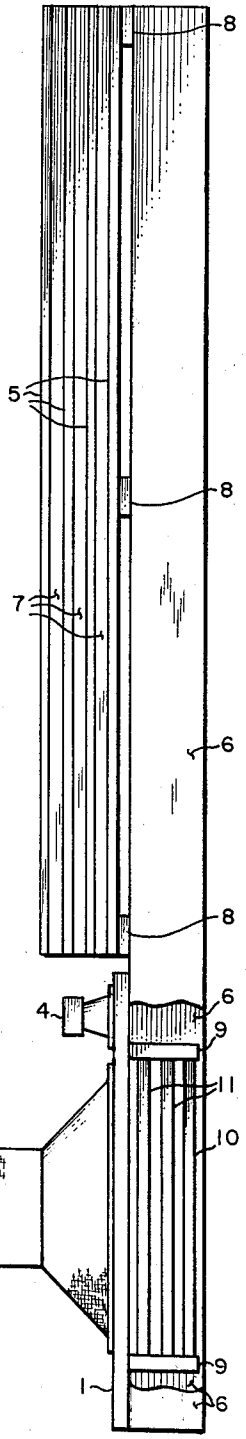


FIG. 6

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3,179,203

SPEAKER RE-VIBRATION SYSTEM

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1 Claim. (Cl. 181—31)

This invention generally relates to sound reproduction systems and more particularly to a non-enclosed construction, and in expending the energy of the loudspeaker cone.

An object of the invention is to make it possible to avoid the use of an enclosure or cabinet and to enable the listener to benefit from the sounds emanating from the rear of the loudspeaker as well as sounds from the front. And to hear the sounds from the rear in a natural relationship with the sounds from the front.

Another object of the invention is to enable the loudspeaker to reproduce equally all the frequencies above its resonance, and to reproduce the transients faithfully by expending the energy of the loudspeaker cone.

The 12" loudspeaker employed in the development of this invention resonated at 34 cycles per sec. Using a test record it is possible to hear a 40 cycle note. A 30 cycle note is more felt than heard. It is deemed impractical to mount the loudspeaker in a cabinet to develop signals below 34 cycles because a cabinet by its nature contributes unwanted coloration known variously as "ringing" and "boominess." These defects blemish the entire frequency range in the audible spectrum. Mid-frequency response is much more important than extremely low frequency response which, in the concert hall, borders upon inaudibility.

Almost every instrument in the orchestra gets below 300 cycles, only the tympany, bass and snare drums, bass viol, tuba and organ have any range below 100 cycles. The bass drum has harmonics beyond 5000 cycles and the bass viol almost to 10,000 cycles. Helmholtz showed that the distinctive quality or timbre of a complicated sound is determined by the component frequencies that compose it. For example, it would be useless to reenforce the note of a bass drum at 38 cycles if by so doing the mid-range harmonics, which impart the characteristic bass drum sound, were dissipated by use of a cabinet or enclosure.

In order to render the invention more comprehensible other basic facts will be reviewed briefly. Many resonators—acoustic, mechanical and electrical—have very complicated arrays of resonant frequencies. A bell, for instance, is capable of vibration at an irregular series of frequencies. When the clapper strikes it, these vibrations are all set up at once, and a clangorous sound of many non-harmonically related frequencies is produced. A stretched string, however, vibrates at frequencies that are multiples of the fundamental frequency, and to our ears the sound of plucked or bowed strings has a more "musical" quality than that of a struck bell. In orchestra music the string sections, woodwind, brass and percussion are frequently being heard simultaneously creating an imposing array of non-harmonically related frequencies and energies.

Sinusoidal waves of sound are produced when the cone of a radio or phonograph loudspeaker moves smoothly back and forth as if it were driven from a crankshaft vibrating at a frequency of f complete oscillations a second. Energy as defined is the power by which anything acts effectively to move or change other things or accomplish any result. The basis for this invention is the energy of the loudspeaker cone that produces the sound waves. This is contrasted with speaker systems that utilize the sound waves and the resulting air pressure within an enclosure.

Speaker energy must be fully expended in order to re-create the original sound that produced this energy. The speaker cone cannot simultaneously create and expend energy. Unexpended energy is wasted sound. Unexpended energy is evidenced by distorted sound and by excessive vibration of the floor and walls, and the air itself, in the listening room. Bass is particularly given to excessive energy that when unexpended is heard as a vibrant sound of indefinite pitch lacking in clarity. Mid-frequency response is also made obscure by excessive energy and much transient detail is lost. Expended energy permits full separation of bass and mid-range with a clarity of details that enables monaural records to attain a spatial dimension attributed to stereophonic records.

A principal feature of the invention that allows the loudspeaker to be used unenclosed by checking over excursion of the speaker cone is my compression baffle that is mounted at the front of the speaker. In a further important aspect of this invention my compression baffle aids in overcoming cone breakup, which results in phase differences between the movements of various sections of the cone, by compressing the air between the baffle and the front of the speaker. Still another object is to prevent "speaker blast," the straight forward sound from the speaker, which at periods of high volume can be most distressing to the ears of the listener.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawing forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a perspective view of the loudspeaker compression baffle according to the invention;

FIGURE 2 is a side view of FIGURE 1 and showing, in addition, a 12" loudspeaker and part of the speaker board;

FIGURE 3 is a transverse sectional view taken on the line 3—3 of FIGURE 1;

FIGURE 4 is a perspective view of the panel unit with a part of a panel broken away illustrating the preferred principle of my invention;

FIGURE 5 is a perspective view of the frame showing the positioning of the mounting blocks;

FIGURE 6 is a side view of the speaker re-vibration system according to the invention showing the panel unit of FIGURE 4 and the frame of FIGURE 5 in position with the speaker board of FIGURE 2 and attached bass and treble speakers; and attached speaker compression baffle. Part of the frame 6 is broken away to reveal the speaker compression baffle of FIGURE 2.

FIGURE 7 is a transverse sectional view taken on the line 12—12 of FIGURE 4.

In carrying out the invention, referring now specifically to the drawing, there is provided a speaker board 1 to which is attached a 12" loudspeaker 2 and a treble speaker 4 having two main purposes; to separate the sounds from the front and the rear of the speaker; and to transmit speaker cone vibrations to the panel unit 5 via the frame 6, said speaker board being provided with an opening before the 12" speaker 2 and the treble speaker 4. The speaker compression baffle 9 is attached to the speaker board directly in front of the speaker 2.

The frame 6 is considered to be the most practical mounting and transmission means for executing the principal embodiment of this invention because of the extreme rigidity required and because of the dimensions and weight of said panel unit which is suspended in so far as is practicable by means of the mounting blocks 8. Deleting the suspension principle would cancel the basic embodiment of this invention. The frame 6 is an open-

work construction to which is attached the panel unit 5 and the speaker board 1.

The panel unit 5 expends energy from the loudspeaker cone by means of the multiplicity of panels 5 that are mounted one behind the other and separated by spacer strips 7. The center spacer strip and the two outer strips are wider to accommodate bolts that secure the panel unit to said frame at those points designated by the mounting blocks 8. Only the area of said panels has meaning according to the principal embodiment of this invention, and is closed at the bottom by suitable means (not shown) in order to exclude sound waves and is not intended to resonate nor to amplify sound waves.

The speaker compression baffle 9 relates to the speaker cone and is attached to the speaker board 1 in front of the speaker 2. The baffle is essentially less than the width of the frame in order not to protrude past the frontal plane of the frame for design reasons. A speaker system without a cabinet is commonly called an "open-backed" system. Said speaker compression baffle provides the cone compression ordinarily provided by a speaker cabinet to prevent over excursion of the speaker cone. Because the compression takes place in front of the speaker the vibrating speaker cone is better able to remain intact, avoiding a defect known as "cone breakup." Additionally, the straight forward issuance of sound called "speaker blast" is prevented. Without said speaker compression baffle the remaining structure of this invention would function inadequately. FIGURE 3 shows the three rows of slats of which 10 is the speaker blast baffle and 11 are the speaker cone compression means. The two rows of compression slats 11 overlap and are spaced apart in order to compress the air between the moving cone and the compression means, and at the same time allowing the sound to escape at right angles. The speaker blast baffle 10 overlaps the two spaces between the slats in the row of three compression slats 11 in order to prevent straight forward sound and to divert sound essentially at right angles.

Example

FIGURE 6 is in the form of a room divider (floor and ceiling supports not shown) to which it is ideally suited because of its thinness. It is not recommended that the front of the frame be covered with material such as plywood because of the resonating area that will result. Loosely woven cloth is ideal and has the advantage of blending with or complementing its surroundings. The rear of the speaker is enclosed by the cloth bag accompanying the Wharfedale speaker. Other suitable cloth arrangements may be used. The panel unit comprises 9⅛" panels (four of which only are shown) with the ¼" spacer strips and the ¼" mounting blocks bolted to the 2½" frame totals approximately 6" deep. The speaker board is 2' x 3'. Experimentally increasing the number of panels to 9, each being 3' x 6', totaling 162 sq. ft. produced a high level of performance with 500 monaural records tested. More or less panels may be used in accordance with the quality of the electronic equipment and the ability of the loudspeaker, as well as the requirement of the ears of the listener. Medium quality electronic equipment and speakers requiring less area inspire design variations.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

Having thus completely and fully described the invention, what is now claimed as new is as follows:

A loudspeaker system comprising in combination:

(A) a vibration transmission means,

(B) a vibration expending means attached to the vibration transmission means for receiving vibrations from the latter, said vibration expending means including:

(1) a plurality of panels in side by side relationship,

(2) means spacing said panels from one another,

(3) means spacing said vibration expending means from said vibration transmission means,

(C) a speaker vibration board carried by the vibration transmission means in vibration transmission relationship,

(D) a speaker attached to the speaker vibration board in vibration transmission relationship,

(E) and speaker cone compression means attached to the speaker vibration board in vibration transmission relationship consisting of:

(1) a plurality of rows of slats, and said rows being arranged substantially parallel to one another, the slats in the respective rows being spaced from one another, and the slats of the adjacent rows overlapping all of the spaces between the slats of the next said adjacent rows,

(2) and a single baffle lying outwardly of the last row of slats and overlapping all of the spaces between the slats of the last mentioned row.

References Cited by the Examiner

UNITED STATES PATENTS

1,731,799	10/29	Thomas	181—31
2,476,572	7/46	Wenzel	181—31
2,580,916	1/52	Hodge	181—31
2,750,245	6/56	MacIntyre	181—31

FOREIGN PATENTS

993,444	7/51	France.

LEO SMILOW, *Primary Examiner.*