Dec. 30, 1952 A. J. CORKE 2,623,606

SOUND REPRODUCTION APPARATUS

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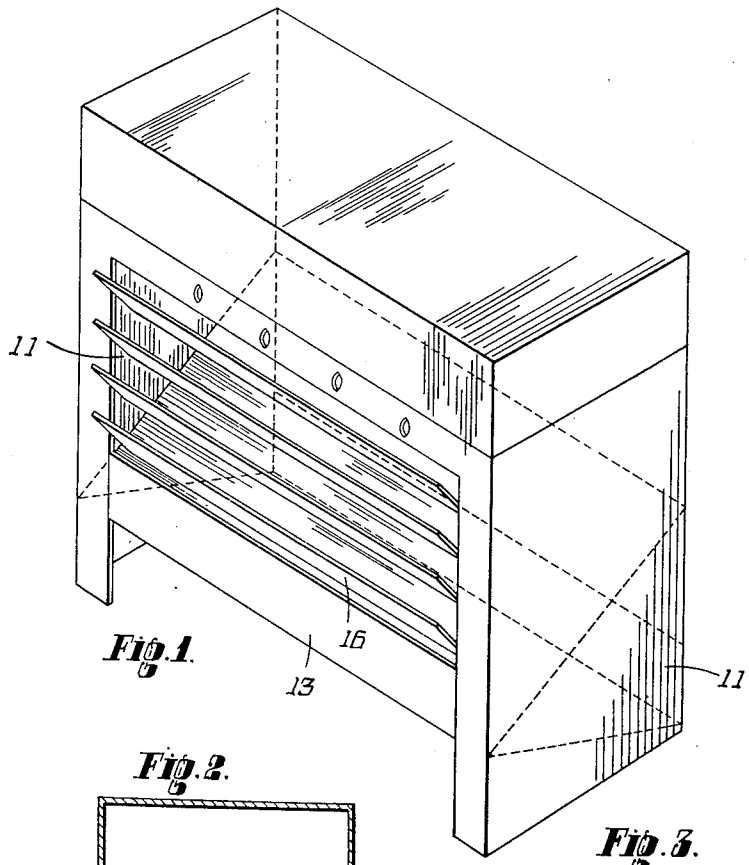


Fig. 1.

Fig. 2.

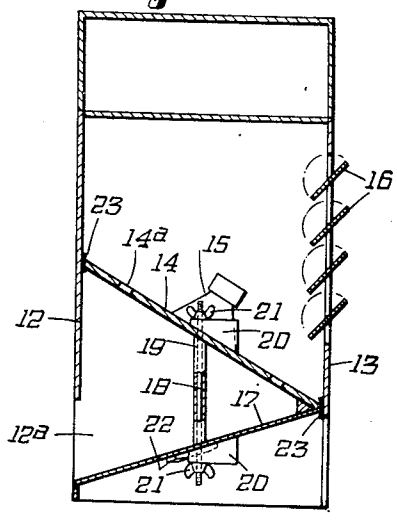
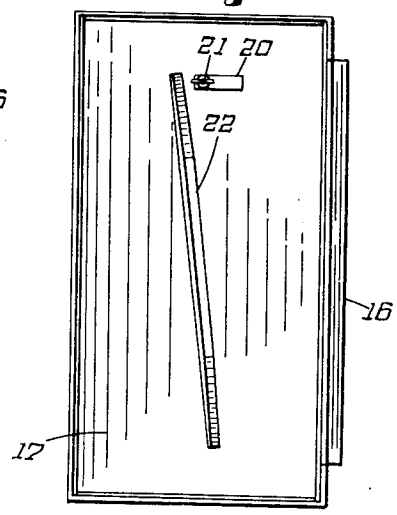


Fig. 3.



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SOUND REPRODUCTION APPARATUS

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8 Claims. (Cl. 181—31)

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This invention which is a continuation in part of my application Serial No. 98,837, filed June 13, 1949, concerns sound propagation from sources such as loudspeakers.

It is an object of the invention to provide a sound reproduction unit which has a pleasing appearance and possesses good acoustic properties.

It is a further object of the invention to provide a sound reproduction cabinet which does not reveal, by its external appearance, that any sound reproduction means are contained therein.

According to the present invention an electro-acoustic apparatus includes four upstanding elements comprising two sides, a back and a front, a top for said apparatus, said top together with said four upstanding elements enclosing said apparatus at the top, the back and the two sides, said front extending downwardly and defining with a lower edge thereof, the upper limit of a transverse aperture, a mounting plate upwardly and forwardly inclined inside the four upstanding elements dividing the space defined by said four elements into an upper compartment, and a lower compartment of substantially constant transverse dimension, a sound reproduction device mounted on said mounting plate orientated to emit sound mainly in a downwardly and forwardly inclined direction into said lower compartment, and a downwardly and forwardly inclined reflecting board forming the base of said lower compartment, which compartment is adapted to serve as a resonance chamber, said front extending downwardly past the forward edge of said mounting plate to a lower level than any part of said sound reproduction device, said aperture thereby serving as a restricted outlet from said lower compartment.

According to a further feature of the invention a substantially vertical tie connects said mounting plate and said reflecting board.

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

Fig. 1 is a general perspective view of a sound reproduction cabinet in accordance with the invention,

Fig. 2 is a transverse vertical section of the cabinet shown in Fig. 1, and

Fig. 3 is an inverted plan view corresponding to Fig. 2.

The cabinet includes two end faces 11, a front face 12 and a back 13. The front face 12 terminates above the level of the lower edges of end faces 11, thus providing an aperture 12a at the base of the cabinet. A mounting plate 14 is disposed within the cabinet and carries centrally thereon a loudspeaker 15. The position of the mounting plate is such that the loudspeaker cannot be seen when the cabinet is viewed from the front at other than very oblique angles. The mounting plate 14 is inclined downwardly from the front of the cabinet to the back, so that the axis of the loudspeaker 15 is downwardly inclined from the back of the cabinet to the front. Mounting plate 14 may have a number of holes 14a drilled therein.

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A number of louvres 16 are situated in the back 13 of the cabinet, these louvres being rotatable about horizontal axes. Variation in the setting of the louvres varies resonating properties of the cabinet to some extent and such variation thus constitutes a mechanical means of tone control.

The back 13 also has a number of ventilation holes therein.

At the base of the cabinet is a sound reflecting board 17. This sound reflecting board slopes downwardly from the back of the cabinet to the front, preferably at an angle of about 20° to the horizontal.

The angle of the mounting plate 14 to the horizontal may be between about 15° and about 50°. Preferably this angle is about 30°.

Air should have free access to the space beneath the sound reflecting board 17 and for this purpose the back 13 of the cabinet terminates above the base level of the apparatus, or an architrail may be provided with air holes or slots therein. This is necessary since the board 17 as well as reflecting sound is designed to resonate in sympathy with impinging sound waves.

Between the mounting plate 14 and the sound reflecting board 17 a tie comprising a metal bar 18 and a coaxial tube 19 of suitable material such as wood or synthetic resin, is provided. The ends of the metal bar 18 pass through the mounting plate 14 and the reflecting board 17 respectively and thereafter are accommodated in clearance holes in blocks 20 secured to the outer surfaces of board and plate. The upper surface of the block 20 secured to the mounting plate 14 and the lower surface of the block 20 secured to the reflecting board 17 are flat, parallel and at right angles to the metal bar 18. The ends of the metal bar 18, which are threaded, extend beyond these block surfaces and receive wing nuts 21 for tightening purposes. The coaxial tube 19 extends only between the board 17 and the plate 14 and its ends are suitably chamfered to provide good contact therewith.

Along the underside of the reflecting board 17

is glued and/or screwed a narrow strip 22 of material suitable for weighting and reinforcing the board 17. It extends substantially transversely of the cabinet for the maior part of the width of the sound reflecting board 17. It has been found advantageous to have the strip 22 of material either close to or on the transverse centre line of the reflecting board 17 and also to have the tie disposed substantially centrally of the board length and near to the speaker aperture. The tie will of course have to be offset transversely of tie board 17 because of the loud-speaker aperture.

Seatings 23 of sorbo rubber have been found suitable for supporting at least the mounting board 14, which may be conveniently angularly adjustable. The sound reflecting board 17 has been found satisfactory when it has a hard smooth surface given, for example, by a hard wood veneer and a satisfactory thickness for many types of loud speaker used for domestic purposes has been found to be approximately ⅛''. The mounting plate should be about four times this thickness.

For uses such as public sound reproduction e. g. in cinemas the ratio 4:1 of the thickness of the mounting plate reflecting board should be maintained, the actual dimensions increasing, for instance, to approximately 1'' and ¼'' respectively.

The improvements and modifications which are the subject of the present invention have been found extremely beneficial to the quality of the reproduced sound. The tie prevents the sound reflecting board 17 and the mounting plate 14, which both tend to vibrate, when the apparatus is in use, doing so out of phase, and prevents any consequent "woolly" acoustic effect. The wing nuts enable the tie to be adjusted within small limits and a suitable condition can be found under most circumstances by trial and error. The extra strip of material added to the underside of the sound reflecting board also improves the quality of sound emitted from the cabinet and in particular aids in the reproduction of a pure base response.

In some circumstances it may be found necessary to adjust the angle between the board and the plate and it is for this purpose that the mounting plate may be made adjustable.

I claim:

1. An electro-acoustic apparatus including four upstanding elements comprising two sides, a back and a front, a top for said apparatus, said top together with said four upstanding elements enclosing said apparatus at the top, the back and the two sides, said front extending downwardly from the top of said apparatus and being cut away in its lower region to form a transverse aperture, the upper and side edges of which are defined by the lower edge of said front and by the two sides of said apparatus respectively, a plane mounting plate upwardly and forwardly inclined inside the four upstanding elements dividing the space defined by said four elements into an upper compartment, and a lower compartment of substantially constant transverse dimension, a sound reproduction device mounted on said plane mounting plate within said upper compartment orientated to emit sound mainly in a downwardly and forwardly inclined direction into said lower compartment, and a downwardly and forwardly inclined plane reflecting board forming the base of said lower compartment and so disposed within said apparatus as to meet the back thereof at the same place as said mounting plate so that the lower compartment comprises a resonance chamber of substantially constant width across said apparatus and of generally triangular cross section, with said transverse aperture disposed in that side of the triangle presented by the front of the apparatus, said resonance chamber serving to increase the reverberation time within said apparatus of sound waves emitted by said reproduction device, said front extending downwardly past the forward edge of said plane mounting plate to a level lower than any part of said sound reproduction device whereby the resonating properties of said lower compartment are improved and said transverse aperture serves as a restricted outlet from said lower compartment.

2. An electro-acoustic apparatus including four upstanding elements comprising two sides, a back and a front, a top for said apparatus, said top together with said four upstanding elements enclosing said apparatus at the top, the back and the two sides, said front extending downwardly from the top of said apparatus and being cut away in its lower region to form a transverse aperture, the upper and side edges of which are defined by the lower edge of said front and by the two sides of said apparatus respectively, said back having at least one aperture therein, upwardly and backwardly inclined louvre means for closing said aperture, pivotal means rotatably mounting said louvre means in said back whereby said aperture is adjustable in size, a plane mounting plate upwardly and forwardly inclined inside the four upstanding elements dividing the space defined by said four elements into an upper compartment, and a lower compartment of substantially constant transverse dimension, a sound reproduction device mounted on said plane mounting plate within said upper compartment and orientated to emit sound mainly in a downwardly and forwardly inclined direction into said lower compartment to emerge from said transverse aperture, and a downwardly and forwardly inclined plane reflecting board meeting the back of the apparatus at the same place as said plane mounting plate and forming the base of said lower compartment which is adapted to serve as a resonance chamber to increase the reverberation time within said apparatus of sound waves emitted by said reproduction device, said front extending downwardly past the forward edge of said plane mounting plate to a level lower than any part of said reproduction device, whereby the resonating properties of said lower compartment are improved and said transverse aperture serves as a restricted outlet from said lower compartment, said louvre means being disposed at the rear of said upper compartment to form a variable sound outlet therefrom.

3. An electro-acoustic apparatus including four upstanding elements comprising two sides, a back and a front. a top for said apparatus, said top together with said four upstanding elements enclosing said apparatus at the top, the back and the two sides, said front extending downwardly from the top of said apparatus and being cut away in its lower region to form a transverse aperture, the upper and side edges of which are defined by the lower edge of said front and by the two sides of said apparatus respectively, a plane mounting plate upwardly and forwardly inclined inside the four upstanding elements dividing the space defined by said four elements into an upper compartment, and a low-

er compartment of substantially constant transverse dimension, a sound reproduction device mounted on said plane mounting plate within said upper compartment orientated to emit sound mainly in a downwardly and forwardly inclined direction into said lower compartment, a downwardly and forwardly inclined plane reflecting board forming the base of said lower compartment and so disposed within said apparatus as to meet the back thereof at the same place as said mounting plate, so that the lower compartment comprises a resonance chamber of substantially constant width across said apparatus and of generally triangular cross section, with said transverse aperture disposed in that side of the triangle presented by the front of the apparatus, and a substantially vertical tie connecting said mounting plate and said reflecting board, said resonance chamber serving to increase the reverberation time within said apparatus of sound waves emitted by said reproduction device, said front extending downwardly past the forward edge of said plane mounting plate to a level lower than any part of said sound reproduction device whereby the resonating properties of said lower compartment are improved and said transverse aperture serves as a restricted outlet from said lower compartment

4. An electro-acoustic apparatus as set forth in claim 3 including a long narrow strip of material fixed, substantially transversely of the apparatus, to the underside of said reflecting board to act as a reinforcement and weighting therefor.

5. An electro-acoustic apparatus including four upstanding elements comprising two sides, a back and a front, a top for said apparatus, said top together with said four upstanding elements enclosing said apparatus at the top, the back and the two sides, said front extending downwardly from the top of said apparatus and being cut away in its lower region to form a transverse aperture, the upper and side edges of which are defined by the lower edge of said front and by the two sides of said apparatus respectively, said back having at least one aperture therein, upwardly and backwardly inclined louvre means for closing said aperture, pivotal means rotatably mounting said louvre means in said back whereby said aperture is adjustable in size, a plane mounting plate upwardly and forwardly inclined inside the four upstanding elements dividing the space defined by said four elements into an upper compartment, and a lower compartment of substantially constant transverse dimension, a sound reproduction device mounted on said plane mounting plate within said upper compartment and orientated to emit sound mainly in a downwardly and forwardly inclined direction into said lower compartment to emerge from said transverse aperture, and a downwardly and forwardly inclined plane reflecting board meeting the back of the apparatus at the same place as said plane mounting plate, so that the lower ocmpartment comprises a resonance chamber of substantially constant width across said apparatus and of generally triangular cross-section, with said transverse aperture disposed in that side of the triangle presented by the front of the apparatus, a substantially vertical tie connecting said mounting plate and said reflecting board, and a long narrow strip of material, fixed substantially transversely of the apparatus to the underside of said reflecting board to act as a reinforcement and weighting therefor, said resonance chamber

serving to increase the reverberation time within said apparatus of sound waves emitted by said reproduction device, said front extending downwardly past the forward edge of said plane mounting plate to a level lower than any part of said sound reproduction device whereby the resonating properties of said lower compartment are improved and said transverse aperture serves as a restricted outlet from said lower compartment.

6. An electro-acoustic apparatus including four upstanding elements comprising two sides, a back and a front, a top for said apparatus, said top together with said four upstanding elements enclosing said apparatus at the top, the back and the two sides, said front extending downwardly from the top of said apparatus and being cut away in its lower region to form a transverse aperture, the upper and side edges of which are defined by the lower edge of said front and by the two sides of said apparatus respectively, said back having at least one aperture therein, upwardly and backwardly inclined louvre means for closing said aperture, pivotal means rotatably mounting said louvre means in said back whereby said aperture is adjustable in size, a plane mounting plate upwardly and forwardly inclined inside the four upstanding elements dividing the space defined by said four elements into an upper compartment, and a lower compartment of substantially constant transverse dimension, a sound reproduction device mounted on said plane mounting plate within said upper compartment and orientated to emit sound mainly in a downwardly and forwardly inclined direction into said lower compartment to emerge from said transverse aperture, and a downwardly and forwardly inclined plane reflecting board meeting the back of the apparatus at the same place as said plane mounting plate so that the lower compartment comprises a resonance chamber of substantially constant width across said apparatus and of generally triangular cross-section, with said transverse aperture disposed in that side of the triangle presented by the front of the apparatus, a substantially vertical tie connecting said mounting plate, and said reflecting board, said tie consisting of a bar which passes at its ends through the mounting plate and the reflecting board respectively, means beyond said mounting plate and said reflecting board respectively to secure said bar in position, a tube disposed coaxially on that part of said bar lying between the mounting plate and the reflecting board, and a long narrow strip of material, fixed substantially transversely of the apparatus to the underside of said reflecting board to act as a reinforcement and weighting therefor, said resonance chamber serving to increase the reverberation time within said apparatus of sound waves emitted by said reproduction device, said front extending downwardly past the forward edge of said plane mounting plate to a level lower than any part of said sound reproduction device whereby the resonating properties of said lower compartment are improved and said transverse aperture serves as a restricted outlet from said lower compartment.

7. An electro-acoustic apparatus as set forth in claim 6 in which the ends of said bar are threaded, and including blocks attached to said mounting plate and said reflecting board through which the threaded ends of said bar are adapted to pass, and wing nuts to fit the threaded ends of said bar to adjust and secure said bar in position.

8. An electro-acoustic apparatus including four

upstanding elements comprising two sides, a back and a front, a top for said apparatus, said top together with said four upstanding elements enclosing said apparatus at the top, the back and the two sides, said front extending downwardly from the top of said apparatus and being cut away in its lower region to form a transverse aperture, the upper and side edges of which are defined by the lower edge of said front and by the two sides of said apparatus respectively, a resiliently secured plane mounting plate upwardly and forwardly inclined inside the four upstanding elements dividing the space defined by said four elements into an upper compartment, and a lower compartment of substantially constant transverse dimension, a sound reproduction device mounted on said plane mounting plate within said upper compartment orientated to emit sound mainly in a downwardly and forwardly inclined direction into said lower compartment, a downwardly and forwardly inclined reflecting board having a hard and smooth surface, and forming the base of said lower compartment, which reflecting board is so disposed within said apparatus as to meet the back thereof at the same place as said mounting plate, so that the lower compartment comprises a resonance chamber of substantially constant width across said apparatus and of generally triangular cross-section, with said transverse aperture disposed in that side of the triangle presented by the front of the apparatus, a substantially vertical tie connecting said mounting plate and said reflecting board, said tie consisting of a bar which passes at its ends, through the mounting plate

and the reflecting board respectively, means beyond said mounting plate and said reflecting board respectively to secure said bar in position, a tube disposed coaxially on that part of said bar lying between the mounting plate and the reflecting board, and a long narrow strip of material, fixed substantially transversely of the apparatus to the underside of said reflecting board to act as a reinforcement and weighting therefor, said resonance chamber serving to increase the reverberation time within said apparatus of sound waves emitted by said reproduction device, said front extending downwardly past the forward edge of said plane mounting plate to a level lower than any part of said sound reproduction device whereby the resonating properties of said lower compartment are improved and said transverse aperture serves as a restricted outlet from said lower compartment.

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