Aug. 27, 1963 A. Z. DOSCHEK 3,101,810

LOUDSPEAKER RESONATOR

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Fig. 1

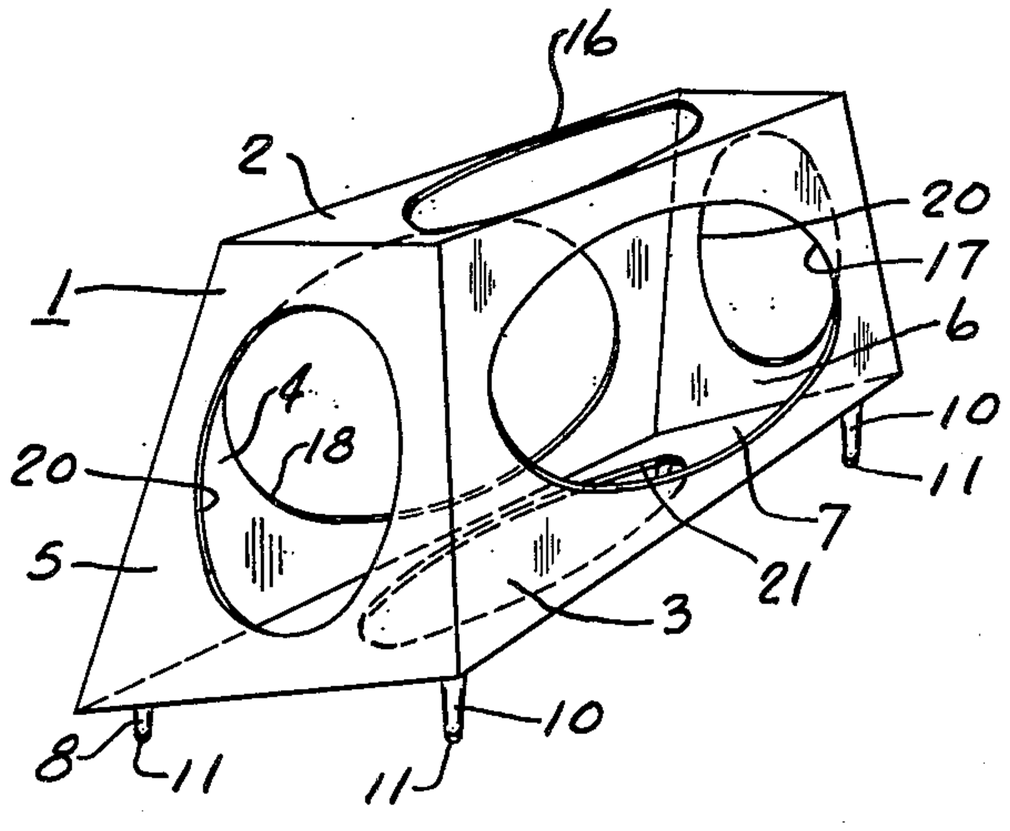

Fig. 8

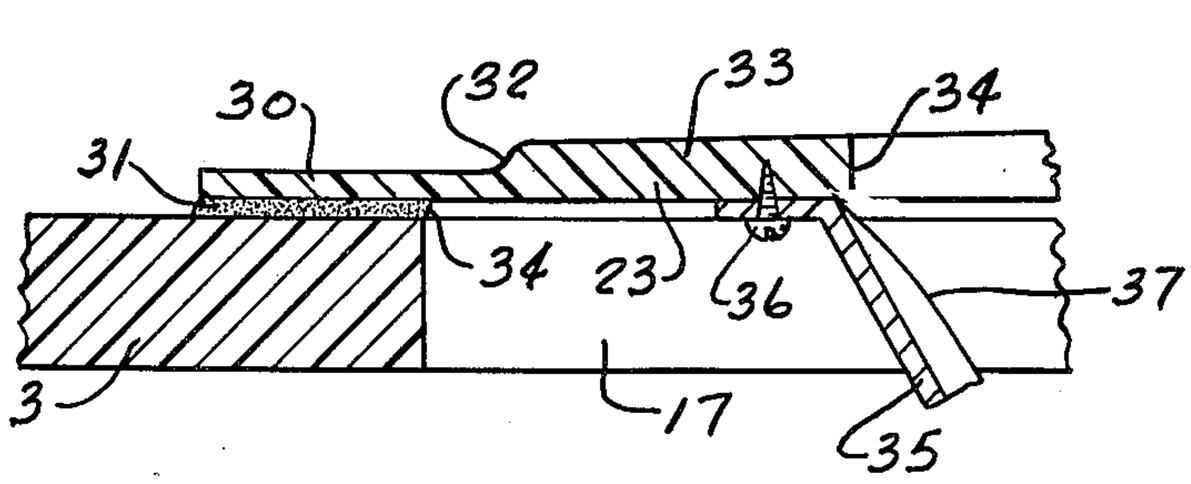

Fig. 9

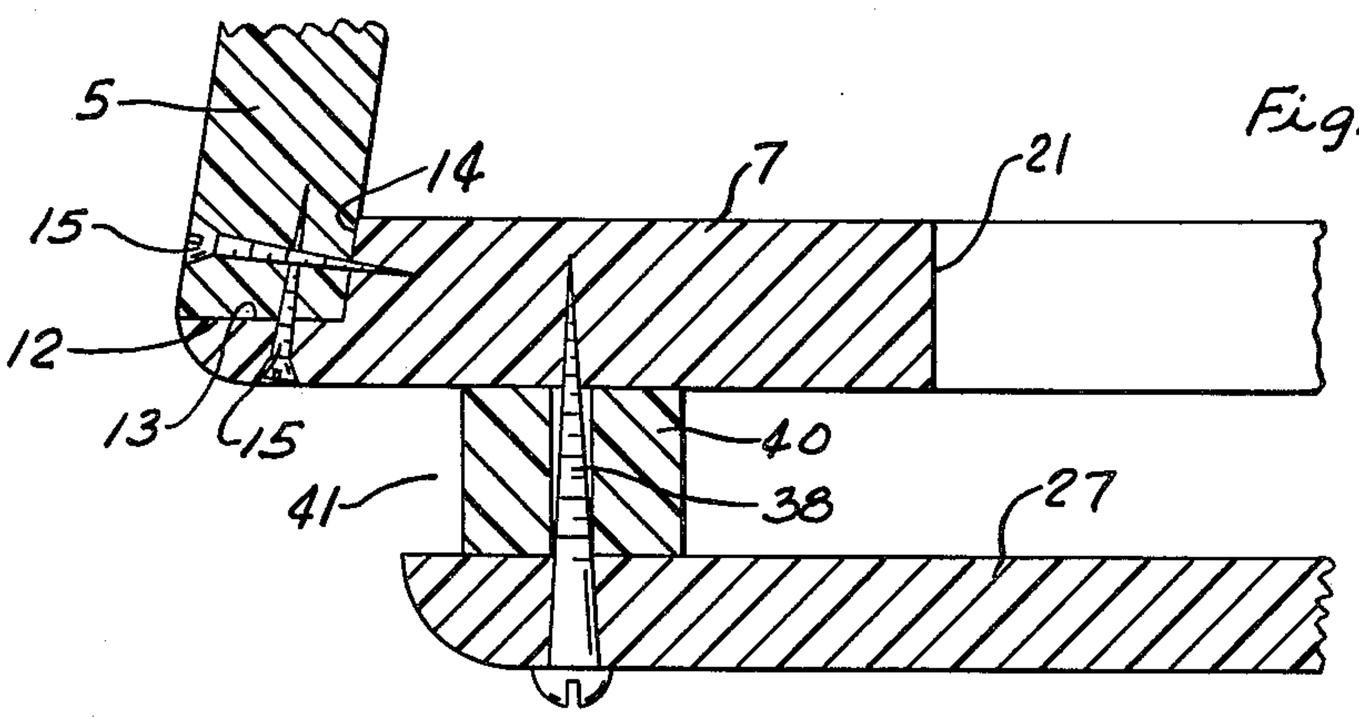

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Fig. 5

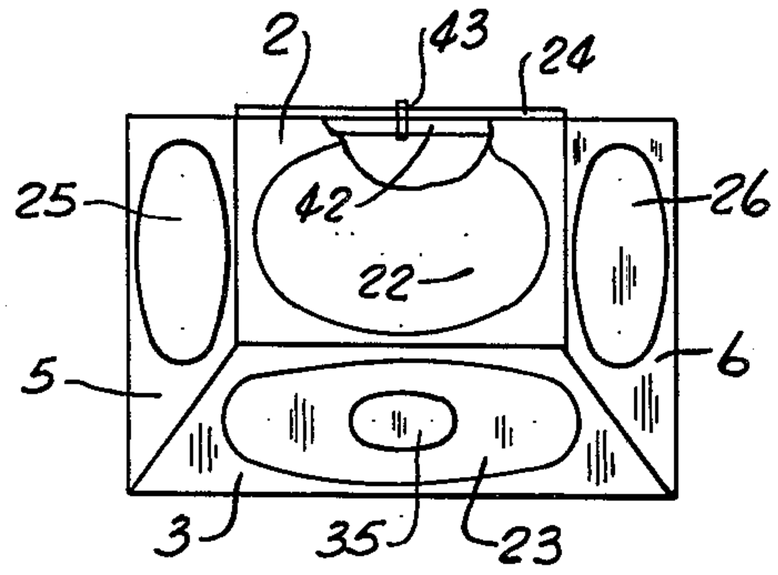

Fig. 4

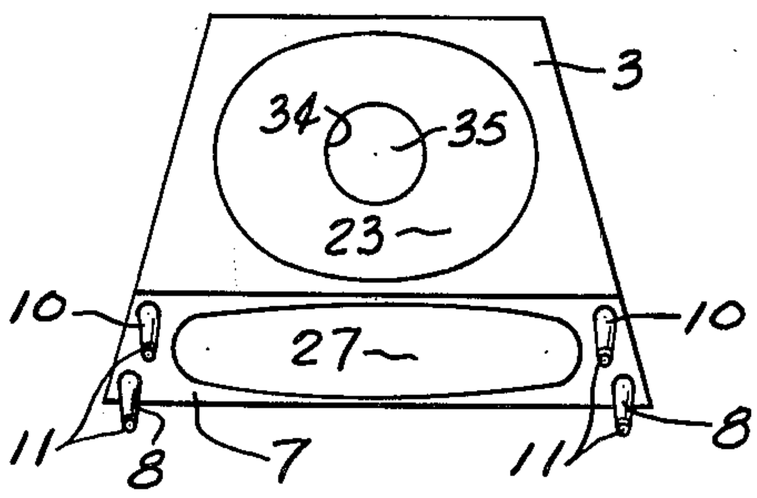

Fig. 3

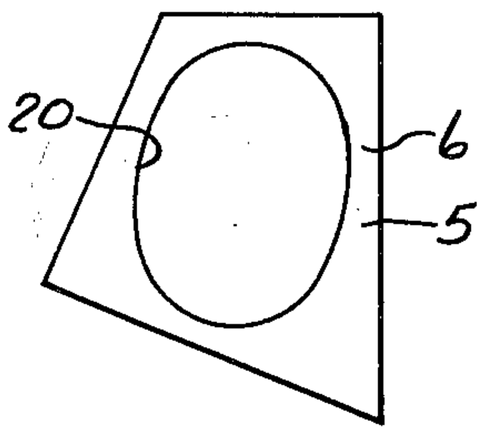

Fig. 6

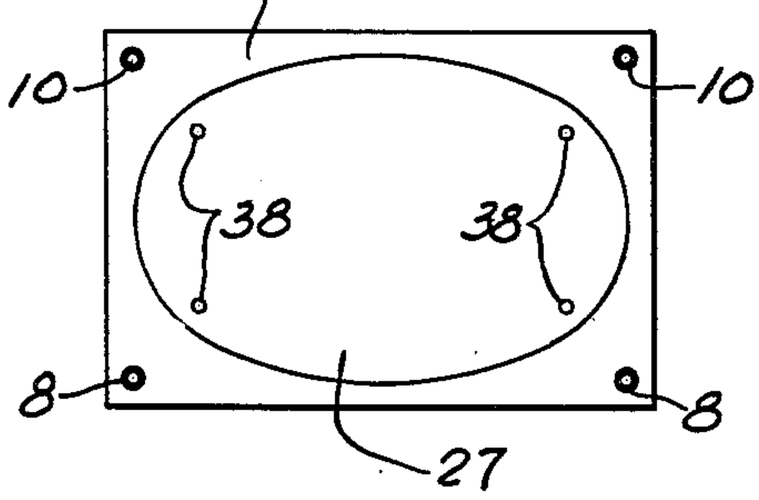

Fig. 7

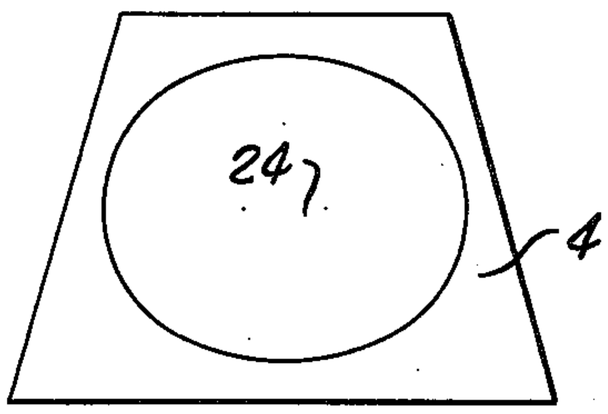

Fig. 2

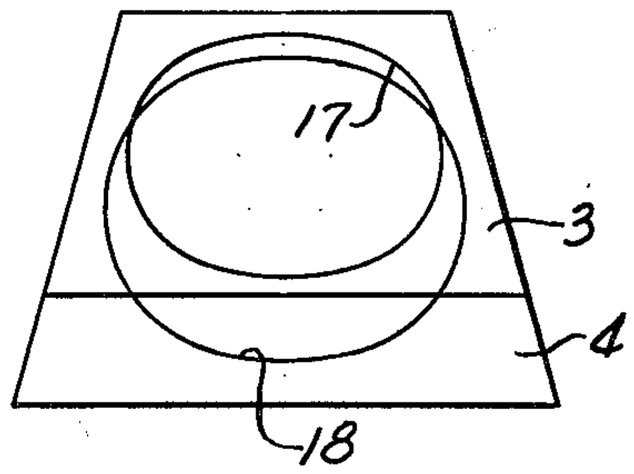

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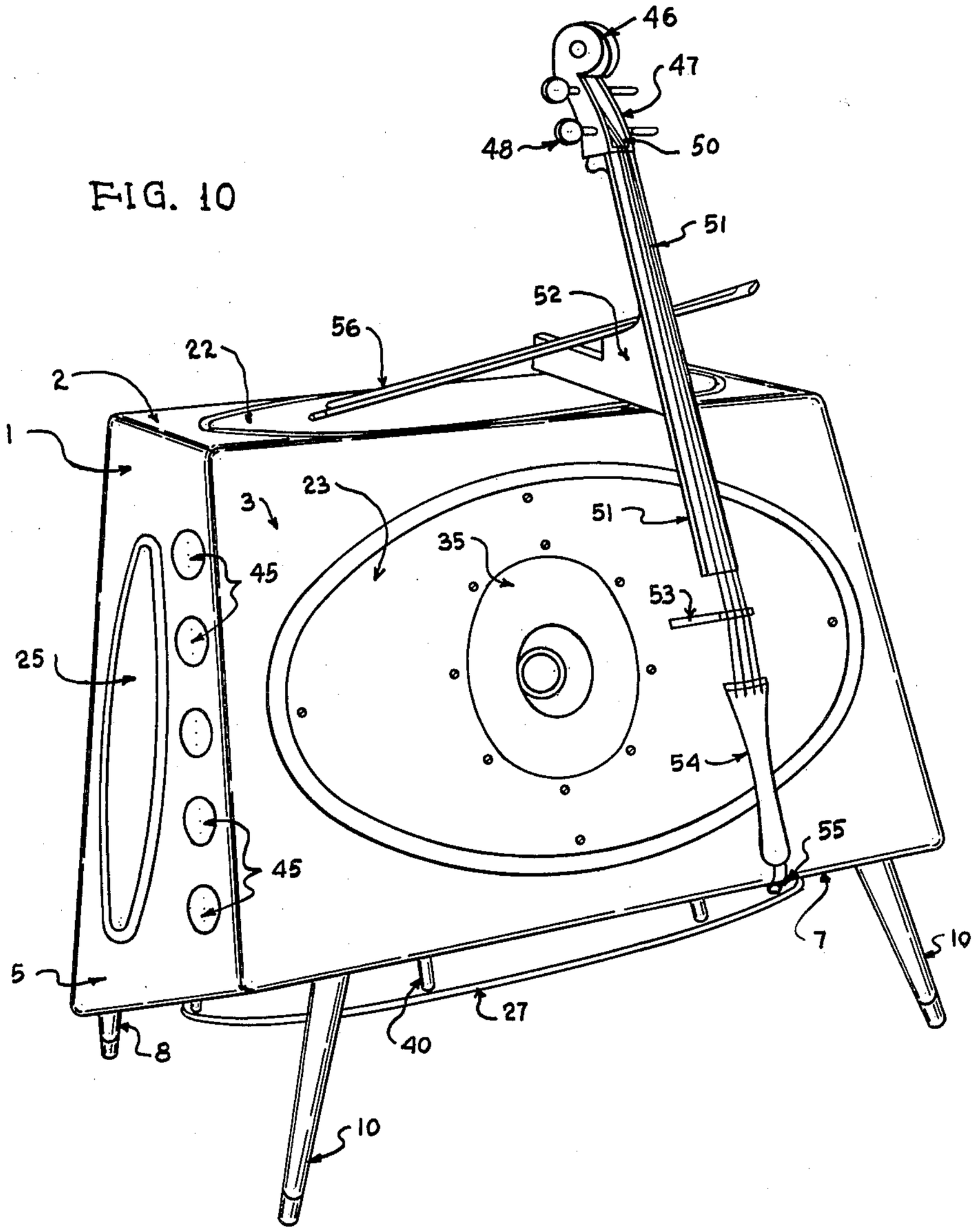
FIG. 10



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United States Patent Office

3,101,810

Patented Aug. 27, 1963

3,101,810
LOUDSPEAKER RESONATOR

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Filed July 8, 1959, Ser. No. 825,737
7 Claims. (Cl. 181—31)

This invention relates generally to speakers for audio reproduction and more particularly to an audio resonator in polyhedron form, none of the vibratory paneled sides of which are parallel.

The audio resonator comprising this invention is a mounting for one or more speakers. The speaker mounting is preferably an independent structure suspended in the area to which the audio is to be transmitted.

The principal object of this invention is the provision of an audio resonator in the form of a polyhedron having a speaker attached to one of its faces.

Another object is the provision of a polyhedron audio resonator speaker mounting having none of its faces parallel to each other.

Another object is the provision of a polyhedron audio resonator speaker mounting in which the panel to which the speaker is fastened is enabled to vibrate.

Another object is the provision of a polyhedron audio resonator speaker mounting in which each side has mounted thereon a vibratory panel, one of which carries the speaker.

Another object is the provision of a six-sided polyhedron audio resonator speaker mounting having selected sides provided with a panel capable of vibrating.

Another object is the provision of a vibratory panel for closing a side on a polyhedron audio resonator speaker mounting, which has improved tone quality by reason of sealing the wood pores on at least one face without adding a material coating to the whole of the surface of the panel.

Another object is the provision of a vibratory panel for an audio resonator having a contoured surface for vibrating within a predetermined range to emphasize different tone phases from the speaker.

Another object is the provision of a vibratory panel for an audio resonator that has a reduced marginal perimeter that is secured to a perimetral surface bounding an opening in the resonator. The panel is preferably secured continuously to the boundary surface as by cementing.

Another object is the provision of a vibratory panel perimetrally secured to the surface surrounding an opening in an audio resonator and which panel varies in thickness so that it will respond more readily to selected vibratory ranges.

Another object is the provision of a bass bar secured intermediate of its ends to a vibratory panel at a position spaced from the perimeter thereof.

Another object is the provision of an audio polyhedron resonator speaker mounting in which none of the sides are parallel with each other making only the ends equal to each other in size.

Another object is the provision of an audio polyhedron resonator speaker mounting comprising a heavy nonvibratory frame structure providing an opening each face which is covered by a vibratory panel. These panels may be elliptical in shape for accentuating tone reproductions.

Another object is the provision of an audio polyhedron resonator having six sides of predetermined size each having an opening covered by a vibratory panel, five of which are secured to and seal their openings whereas the sixth covers its opening but is spaced therefrom to provide a resonator opening into the polyhedron.

Another object is the provision of an audio polyhedron resonator having no sides parallel to each other and supported to position the planes of its faces at an angle to the floor and wall and spaced therefrom.

Another object is the provision of an audio polyhedron resonator box having sides of vibratory panels and an opening at the bottom covered by a vibratory panel secured to and spaced from the box.

Other objects and advantages appear hereinafter in the following description and claims.

The accompanying drawings show for the purpose of exemplification a practical embodiment illustrating the principles of this invention wherein:

FIG. 1 is a perspective view of a polyhedron frame having six faces none of which are parallel and each of which is provided with a hole.

FIG. 2 is a plan view of the front face superimposed on the back panel.

FIG. 3 is a plan view of a side face.

FIG. 4 is a front view in elevation of a paneled polyhedron with speaker.

FIG. 5 is a top plan view of the paneled polyhedron wtih parts broken away.

FIG. 6 is a bottom view of the paneled polyhedron.

FIG. 7 is a rear elevation of the paneled polyhedron.

FIG. 8 is an enlarged sectional view of the front panel showing its attachment to the frame and the speaker with parts broken away.

FIG. 9 is an enlarged sectional view of the bottom panel and the resonator opening with parts broken away.

FIG. 10 is a perspective view of the six-faced polyhedron with vibrating panels in each face and having attached thereto the strings and fingerboard of a cello converting the same into a musical instrument.

Referring to the drawings the polyhedron resonator shown is a preferable form being a six-sided box-like frame. The frame shown is made of a thick plasticized material that has practically no vibration. Such material may be made of shavings or ground wood compressed and cemented into panels that are cut and formed to provide the frame in which the openings are made to receive the vibrating panels. This frame can be made of metal, plastic or wood but it should be constructed of a suitable material that will properly support the vibratory panels. The six-faced polyhedron frame **1** has the top face member **2**, the front face member **3**, the back panel **4**, the end panels **5** and **6** which in the structure shown are equal in size. The bottom face member **7** carries the four legs, the two short back legs **8** and the two long front legs **10**. These legs are preferably positioned near the four corners of the bottom face member **7** so that they are practically situated at points of very few vibrations. Each leg is preferably heavy where it fastens to the frame and narrows to a small end with a rubber button indicated at **11** to insure that substantially no vibrations will be conducted to or from the frame or box **1**. Thus the legs actually suspend the box isolating it from vibration. This audio resonator must be suspended to insure that no vibrations will be absorbed by the frame and thus transmitted to the vibratory panels.

As shown in FIG. 1 each of the face members of the box or frame has one or more openings. Openings of different sizes may be employed for the purpose of utilizing vibratory panels of different sizes which would be responsive to different ranges of vibrations. However, upon constructing this resonator it became apparent that its function was best served by treating it as a musical instrument and allow the panels to remain large rather than small and provide a full vibratory range that is similar to the string musical instruments.

The different faces making up the frame are preferably secured by interlocking their marginal edges together as illustrated in FIG. 9 wherein the side face such as **5** is secured to the bottom face **7** and its perimetral edge is cut

angularly as indicated at 12 to fit the horizontal face 13 of the grooved edge 14 of the bottom face member. The bottom edge 12 of the face 5 and the edge 14 of the face member 7 are cut at an angle so as to insure perimetral fitting of each of the face members along the edges forming the resonator box 1 of which there are twelve edges and when selected sides are grooved as indicated in FIG. 9 the box parts will fit together forming a frame which has substantially heavy face members which will not vibrate. The mating edges between the face members are preferably glued so as to provide a continuously sealed joint between these edges forming the box. These corners are reinforced by screws indicated at 15 in FIG. 9.

Any suitable interlocking arrangement such as illustrated in FIG. 9 may be employed for fastening the face members to one another to form a solid box. If these face members were made of metal they would be similarly joined along their twelve edges to form a solid box member that is made in such a way as to be practically unaffected by vibrations. In other words, the box itself should function as a vibratory base or reaction member.

Each of the face members 2 to 7 are shown in plan view in FIGS. 2 and 3 wherein the face members 3 and 4 which represent the front and rear face members are superimposed to illustrate the different sizes of the openings therein and FIG. 3 shows side face members 5 and 6 superimposed on one another wherein the openings therein are preferably the same since these panel members are of the same size.

It will be noted that the top face member 2 is provided with an opening 16 which is a long and narrow elliptical opening. The front and back face members 3 and 4 likewise have elongated elliptical openings 17 and 18 respectively which are slightly longer than the elliptical opening 16 but materially wider so as to provide a goodly portion of the area of these face members for the vibratory panels. The end face members have the openings 20 which are wider than the top opening 16 but not as long because of the limitation of size in these face members 5 and 6. The bottom face member 7 is provided with a large opening 21 which is illustrated in FIG. 9. Owing to the fact that the bottom face member 7 is larger, it is preferable to make its perimeter with the horizontal flange 13 and angular flange 14 extend all the way around the perimeter of the lower face member 7 to receive the edges of the adjacent faces 3, 4, 5 and 6. The same is true of the perimeter of the top panel member 2. Thus with these formed faces in the perimetral edges in the top and bottom faces 2 and 7, the front and back and end faces 3, 4, 5 and 6 may readily be assembled to provide the proper angulation of each face in the box. The vertical end edges of the front and back panels 3 and 4 may likewise be formed similar to that shown in FIG. 9 on the perimetral edges of the bottom face 7 so as to receive the vertical edges of the side face members 5 and 6. By providing this or other similar interlocking marginal edges between adjacent face members one may make a very strong resonator box out of wood or plastic or combinations of the two as well as metal all of which provides a structure that prevents inherent vibration making it an excellent box as a resonator and is believed to improve the tone quality of the vibratory panels.

The vibratory panels are shown in FIGS. 4 to 9 wherein the top face member 2 is provided with a panel member 22 and the front face 3 is provided with the panel member 23. The rear face member 4 is provided with the vibratory panel member 24. The end face members 5 and 6 are provided with their respective vibratory panel members 25 and 26 and the bottom face member 7 is provided with its vibratory panel member 27.

As shown in FIG. 8 the front face member 3 is provided with its vibratory panel member 23 and it is constructed to provide a reduced section 30 which extends around the perimeter of the opening 17 and is cemented in place as indicated at 31. This thin section extending

into the opening 17 is then gradually shaped through the curve 32 to the original panel thickness indicated at 33. Any of the large panels such as illustrated may be formed in this manner. The adhesive actually being indicated as providing a spacing as indicated at 34 need not be a heavy thick layer that would be readily noticed as illustrated but it could be an adhesive of this character. The shape of the curve 32 together with the incline to the full thickness of the panel may be provided in different curvatures depending upon the size of the resonator box and the relative parts thereof. The vibratory panels 25 and 26 which cover the openings 20 of the end faces 5 and 6 may be of thinner material and need not be shaped as shown in FIG. 8 but merely uniform in thickness throughout its entire surface.

As previously stated it is preferable that each of these vibratory panels be filled on one face with a thin coat of paint or varnish that merely seals the pores to provide a nice finish but is insufficiently thick to change the resonance or tuning of the vibratory panel.

As shown in FIG. 8 the panel 23 is provided with an opening 34 and the speaker 35 is attached to the panel as indicated at 36 and is thus retained within the resonator. Since the same sounds produced on opposite sides of a speaker are 180° out of phase and the perimeter of the speaker provides a continuous contact with the inner face of the vibratory panel 33 the vibrations from the speaker cone 37 within the box are 180° out of phase with the vibrations from the face of the speaker produced exteriorly of the box. Thus the resonator box is provided with the opening 21 in the base 7 and this opening is covered by the bottom vibratory panel 27 which is secured to the bottom 7 by means of the screws 38 which pass through the collar members or thick spacing washers 40 and enter the base 7 to secure the vibratory panel thereto. It will be noted from FIG. 9 that the panel 27 overlaps the opening 21 to a materially greater extent than did the panel 33 on its opening 17. This together with the length of the cylindrical collar 40 determines the actual size of the opening from the resonator box since this opening is perimetral of the vibratory panel 27. Thus all of the vibratory sounds released 180° out of phase within the resonator box are effective in vibrating each of the vibratory panels and must also pass through the opening 21 and the perimetral opening 41 around the perimeter of the vibratory panel 27. The exterior vibration not having traveled through this distance and this opening, these sound vibrations from the interior of the box are brought into phase with the sound vibrations emitted from the face of the speaker to the exterior of the box by the panel 27 which produces a true resonator so as to bring out the full qualities of the sound vibrations emitted by this speaker.

These resonator boxes may be made in different sizes or in different shapes. However, the structure illustrated is merely exemplary of the present invention.

In producing smaller resonator boxes one is enabled to increase the size of the openings 16 to 21 owing to the fact that these openings may be made closer to the edges of the face members because the vibratory panels themselves are materially smaller in size and do not require as great a perimetral area for cementing them to the side faces.

As shown in FIG. 5 the rear panel member 24 is provided with a tuning device such as an artifact or bass bar 42 which is secured by means of the bolts 43 to the inner face of the vibratory panel. This bass bar is a bar of polygon cross section which may be of various lengths. It is preferably made of a hardwood highly polished and secured at its center to an appropriate spot on the panel for the purpose of tuning that panel. Thus by adding bass bars of this character to the inside of the panels or by changing the thickness or the varied thickness of the vibratory panels one is enabled to effect a resonator that enhances specific ranges of sound vibrations emitted by

the speaker the overtones of which would be lost without such tuning.

Referring to FIG. 10 the polyhedron frame 1 has the panel 22 in its top face 2, the panel 25 in its side face 5 and the panel member 23 in the front face 3 together with the speaker 35 mounted in the center of the panel 23. The bottom of the polyhedron has its opening 21 covered by the spaced vibratory panel member 27, which is spaced by means of the cylindrical spacer collars 40 as previously described in reference to FIG. 9. Additional small vibratory panels 45 that respond to high frequency notes are placed in the sides 5 and 6 by cementing in the same manner as that described in regard to the panel 23 for the reproduction of high frequency notes. The speaker 35 is shown secured to the panel 23 by means of screws.

The cello parts are shown attached to the polyhedron wherein the scroll 46 with the peg or key support 47 receives and locks the keys 48 in carrying the strings over the nut 50 which lies across the fingerboard 51. The fingerboard 51 is mounted by the neckplate 52 that is attached to the upper face of the polyhedron frame 2 being in spaced relation with the vibratory panel 22 so that the neckplate will not interfere with the vibration of the latter. A bridge member 53 is seated on the vibratory panel 23 and supports the strings from the tailpiece 54 that is held in place by the button 55 on the under face 7 of the polyhedron. Being a cello the sound post would be mounted therein between vibratory panels and would not be shown.

One using the bow 56, which is shown laying across the neckplate 52 in FIG. 10, may produce music of better quality than a present manufactured violoncello.

I claim:

1. A speaker cabinet supported by vibratory isolators and consisting of a polyhedron enclosure formed by not less than six sides joined together, each cabinet side is disposed at an angle other than ninety and one hundred eighty degrees to every other cabinet side, at least two of said sides having openings, a vibratory panel secured to each side having an opening, each of said panels being larger than and covering its opening, one of said vibratory panels being supported in spaced relation from the side to which it is secured to provide an exterior opening for said cabinet around the perimeter of its panel, the other of said panels being perimetrally secured to its side to close the opening therein, at least one of the other of said panels having a speaker opening, and a speaker covering and closing said speaker opening.

2. The speaker cabinet of claim 1 in which each of said other sides of said cabinet has at least one opening and a vibratory panel perimetrally secured to its respective side to close the opening therein.

3. The speaker cabinet of claim 1 in which each of the openings and the vibratory panels covering the same are of different sized areas.

4. The speaker cabinet of claim 1 in which said openings and the vibratory panels covering the same are oval in shape.

5. The speaker cabinet of claim 1 in which selected of said vibratory panels have a varied thickness to respond to different frequencies.

6. The speaker cabinet of claim 1 which also includes a bass bar means secured adjacent the central portion of a panel.

7. The speaker cabinet of claim 1 which also includes a mass artifact secured in a predetermined position on a panel.

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