

Oct. 27, 1942.

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2,300,012

MUSICAL INSTRUMENT

Filed April 2, 1941

2 Sheets—Sheet 1

Fig. 1.

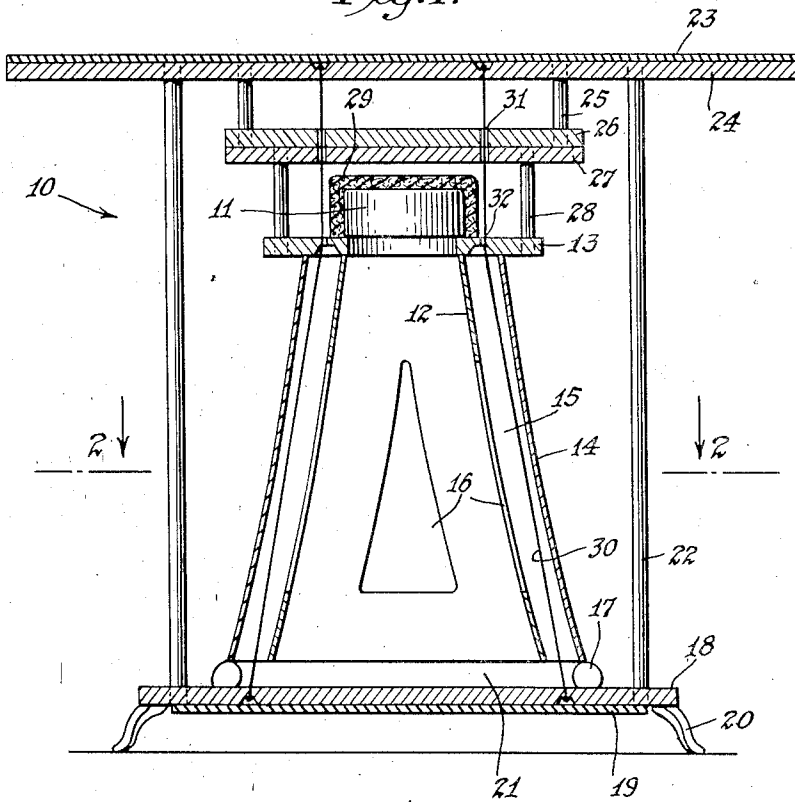
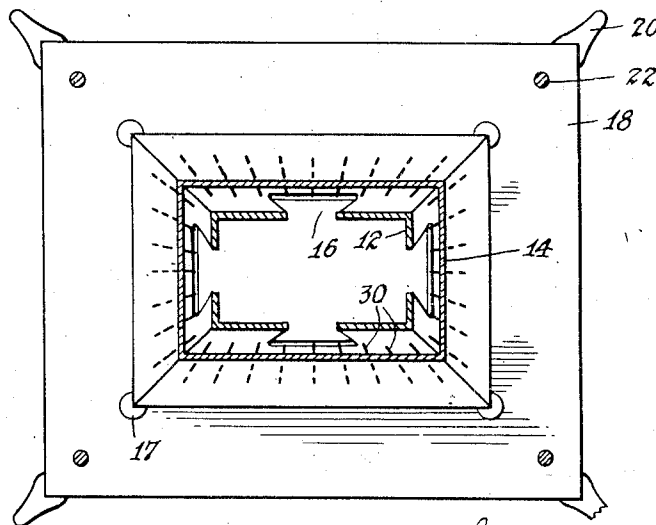


Fig. 2.



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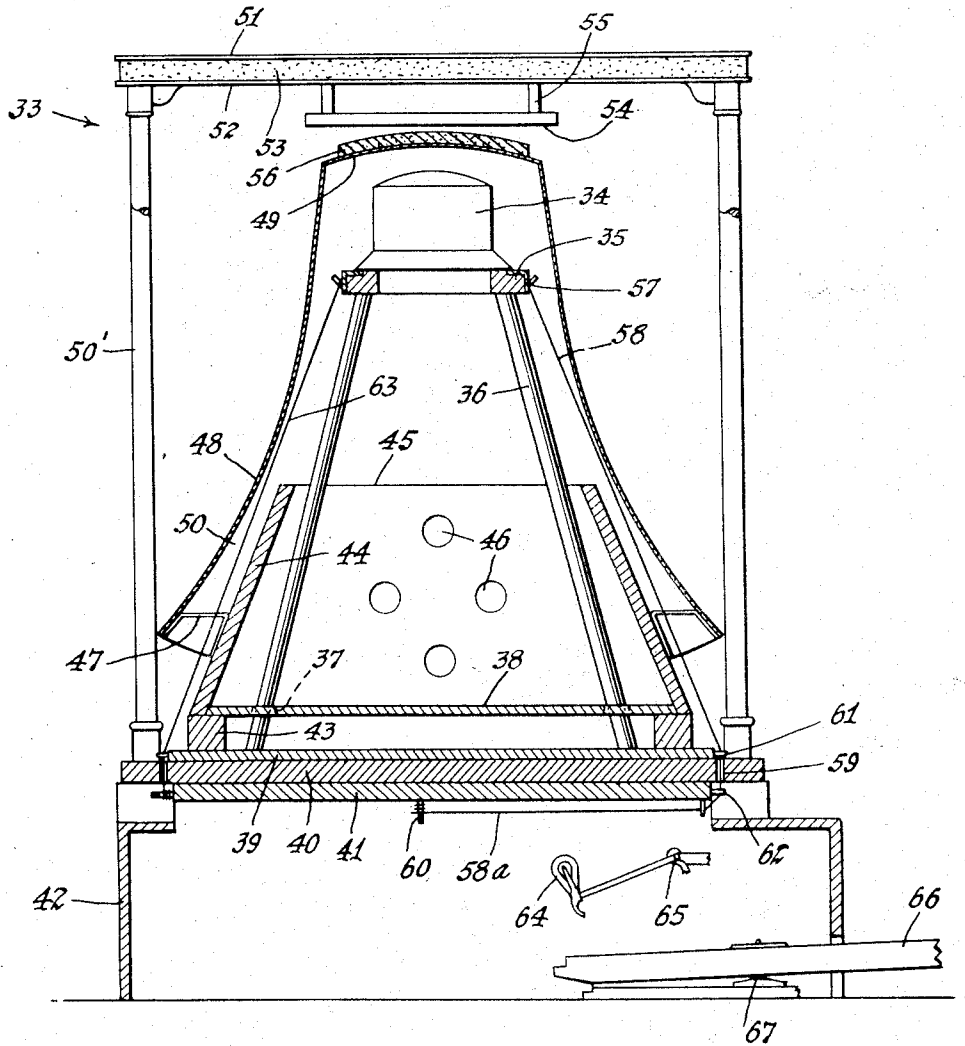
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Fig. 3.



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2,300,012

MUSICAL INSTRUMENT

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Application April 2, 1941, Serial No. 386,410

6 Claims. (Cl. 84—174)

This invention relates to musical instruments. One object of the invention is to provide a musical instrument having improved means for conducting sound from an amplifying device and simultaneously automatically enriching the same.

Another object of the invention is the provision of a musical instrument having improved means whereby a series of musical strings and a cooperating sound chamber or conduit coact with an independent source of sound to greatly increase the range and variety of musical tones and overtones and the resonance qualities thereof, while avoiding or suppressing undesired or discordant vibrations.

Another object of the invention is to provide a combined sound amplifier as a source of sound, and a piano in a single unitary device for obtaining superior tonal effects with each.

Other objects and advantages of the invention will become apparent as the specification proceeds.

With the aforesaid objects in view, the invention consists in the novel combinations and arrangements of parts hereinafter described in their preferred embodiments, pointed out in the subjoined claims, and illustrated in the annexed drawings, wherein like parts are designated by the same reference characters throughout the several views.

In the drawings:

Figure 1 is a view in vertical section showing a musical instrument embodying the invention.

Fig. 2 is a sectional view on the line 2—2 of Fig. 1.

Fig. 3 is a vertical sectional view, with parts removed, showing a modification of the invention.

The advantages of the invention as here outlined are best realized when all of its features and instrumentalities are combined in one and the same structure, but, useful devices may be produced embodying less than the whole.

It will be obvious to those skilled in the art to which the invention appertains, that the same may be incorporated in several different constructions. The accompanying drawings, therefore, are submitted merely as showing the preferred exemplification of the invention.

Referring in detail to the drawings, 10 denotes a musical instrument embodying the invention. The same may include any suitable source of sound, such as a sound amplifier or loud-speaker or other device 11 which may comprise a vibrating diaphragm, whether electrically or mechanically energized. Communicating

therewith is a sound chamber or conduit 12 which tapers toward the amplifier. This communication is established by a transverse wall or bridge 13 whereby the amplifier and chamber are interconnected in alinement with each other. Axially enclosing the chamber 12 is a secondary chamber or conduit 14, which is spaced therefrom to provide a circularly continuous passage 15, said chamber similarly tapering toward said amplifier and being connected to said bridge 13. Intercommunicating the chamber 12 with the passage 15 are a plurality of circularly spaced triangular openings 16. At its lower end, the member 14 rests on posts or blocks 17 which are mounted on a wall comprising the laminations 18, 19, and resting on the feet 20. This arrangement results in an opening 21, whereby the otherwise closed chamber 14 communicates with the outside, while the wall 18 constitutes a baffle or restriction for the chamber 12 facing the amplifier 11.

Carried by the wall 18, 19 are spaced standards 22 upon whose upper end rests a wall consisting of the laminations 23, 24, and being substantially larger than the bottom wall 18, 19. Connected to the wall 23, 24 are spaced posts 25, to whose lower end is connected a wall consisting of the laminations 26, 27. Connected to the latter are spaced posts 28, whose lower ends are connected to the bridge 13. Disposed on the top and sides of the sound amplifier 11 is a coating of insulation or padding material 29.

Interconnecting the laminations 18 and 24 are musical string elements 30 which form a circular series, and pass vertically through holes in the wall 26, 27 as at 31, and through the bridge 13 as at 32, thence diverge downwardly, passing through the passage 15.

It will be understood that the walls 12 and 14 are highly sound responsive, and are adapted to readily vibrate and to transmit sound vibrations. The musical strings 30 may consist of wire or any other suitable material and are adapted to operate under high tension and so as to be readily sensitive to the vibrations in the passage 15. The operation of the instrument 10 will be more fully described hereinafter.

In Fig. 3 is shown a modified device 33 embodying the invention. The same may include a sound amplifier or loudspeaker 34, resting upon a bridge 35, which is carried by diverging standards 36 which pass through openings 37 in a wall 38, and rest upon a wall consisting of laminations 39, 40, 41. The latter in turn, is carried by an annular base 42. The wall 38 rests

upon an annular ring member 43 which is fixed to the wall 39, 40, 41. Carried by said ring member 43 is an upwardly tapered chamber or passage 44 which is open at its upper end as at 45, and is formed with a series of lateral openings 46 at opposed sides thereof. Fixed externally on the chamber 44 is an annular series of spaced brackets 47 to which is connected the lower end of a secondary sound chamber or conduit 48 which tapers upwardly and may be of bell-shape. This chamber 48 has a top wall 49 and encloses the sound source 34 and provides a narrow annular passage around the chamber 44. Mounted on the lamination 40 are a plurality of spaced standards 50 carrying at their upper ends a wall consisting of thin laminations 51, 52 with an intermediate layer of sound insulation material 53. A baffle plate 54 is suspended above the wall 49 by means of spaced posts 55, while covering the top of the wall 49 is a layer of sound absorbent material or padding 56. It is noted that the walls 38 and 44 are substantially thicker than that of the conduit 48, so as to be relatively unadapted to vibrate at the frequency of musical sounds.

Connected to the bridge 35 at 57 is a series of musical string elements 58 which diverge downwardly, passing through the passage 50, thence through openings 59 in the lamination 40 and through openings in the base 42. These elements then extend at 58a under the lamination 41 and are fixed to individual posts as at 60. At the openings 59, suitable bridge pieces 61, 62 may be provided for the string elements. Another series of string elements 63 extend through the passage 50, being connected at their ends to the bridge 35 and to the lamination 41.

Co-operating with the string portions 58a are individual hammer means 64 of any suitable character, pivotally mounted as at 65, and operative by any suitable keyboard 66 which may be pivotally mounted at 67, to thus provide a piano.

In the device 33 all the parts are symmetrically annularly arranged, except as may be otherwise indicated. The wall 48 is vibrational in character. The strings 58 and 63 are responsive to sound vibrations in the passage 50, caused by the loud speaker 34. Alternatively, the instrument may be operated as a piano with the strings 58, 58a vibrating, and the superposed sound chambers enhancing and enriching the tone.

Both of the devices 10 and 33 exemplify sound chambers or conduits one within the other, the inner communicating with the sound source directly, the outer indirectly or through openings in the inner chamber; both chambers tapering toward the sound source and providing a narrow passage therebetween. In each case, the inner chamber is at least partially closed by a wall which confronts the sound source, while the outer chamber is closed at the top and open at the bottom. Thus the sound path is reversing; its path of travel is angular and hence sound vibration is greatly emphasized in the intermediate passage through which the musical tension strings pass so that the latter are highly responsive to the musical vibrations. The general arrangement is somewhat like a horn, but with vastly improved characteristics, with the provision of one or more vibrational walls near or between which the musical strings are so arranged and in such close proximity as to pick up vibrations with high efficiency. Moreover, 75

the instrument may be used as a piano by a reverse action, with the strings becoming the sound source, and the vibrations being enhanced in the inner chamber and amplified by the outer one. Finally, the loud speaker is suitably baffled and cushioned against sound distorting effects, while the walls such as 23, 24 and 51, 52, 53 reverse part of the vibration downward to reinforce the volume of vibration. Thus tonal quality and range are greatly improved, with particular reference to complementary harmonics. When used as a piano, the tones are carried for a longer period than was heretofore possible with a piano. The strings and chamber mutually excite each other in either use of the instrument. The hammers or strings or both may be graduated in size or position to obtain musical scales.

I claim:

1. A musical device including a tapered sound conducting conduit open to atmosphere at its large end and having its walls adapted to respond to sound vibrations, a sound source of the diaphragm type located at the small end of said conduit and being in communication therewith, strings free of the sound source and responsive to sound vibrations, and means for mounting the strings so that they lie within the conduit and in close operative proximity to the walls thereof and in spaced relation to the central region of the conduit.

2. A musical device including a source of sound, a horn having a side wall adapted to vibrate in response to sound waves from said source, the latter being at the small end of the horn, the large end of the horn being open to atmosphere, a tubular member within the horn tapering toward the source of sound and extending approximately to the large end of the horn, the large end of the tubular member having a closure wall therefor and the small end of the member being open and being spaced from the source of sound, said horn and said member providing therebetween a passage which is open at both ends thereof, and musical string means mounted in said horn free of the sound source so that parts of said means lie within said passage and parts thereof lie adjacent to the source of sound outside of said passage but within the horn, said string means being closely adjacent to the wall of the horn, and the horn and the member being spaced from each other and being otherwise open and unobstructed so that the parts of the string means adjacent to the sound source are vibrated directly by waves therefrom and the parts in said passage are vibrated mainly in response to the wall of the horn.

3. A musical device according to claim 2, wherein the walls of said member are substantially thicker than those of said horn.

4. A musical device according to claim 2, wherein sound-rebound walls are located at opposite ends of the horn transversely to the axis thereof and in spaced relation thereto.

5. A musical device including a source of sound, a horn having a side wall adapted to vibrate in response to sound waves from said source, the latter being at the small end of the horn, the large end of the horn being open to atmosphere, a tubular member within the horn tapering toward the source of sound and extending approximately to the large end of the horn, the large end of the tubular member having a closure wall therefor and the small end of the member being open and being spaced from the source of sound, said horn and said member pro-

viding therebetween a passage which is open at both ends thereof, and means for supporting said horn, said tubular member and said sound source so that they are vibrationally relatively free of direct connection with each other, with the interior of the horn and the tubular member being otherwise so free and open as to pro-

vide full access of sound waves to all parts of the horn.

6. A musical device according to claim 5 comprising sound-rebound walls located at opposite ends of the horn transversely to the axis thereof and in spaced relation thereto.

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