Aug. 22, 1933. J. KRESSMANN 1,923,870

ELECTRIC AMPLIFICATION OF SOUNDS

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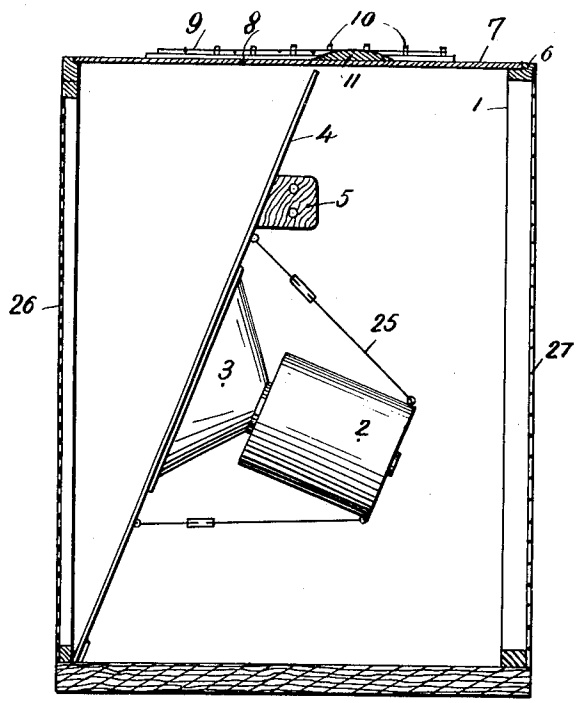


Fig. 1

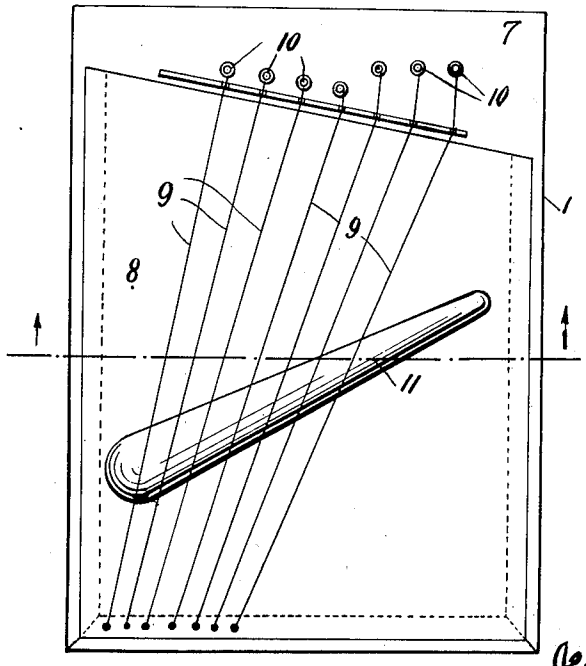


Fig. 2

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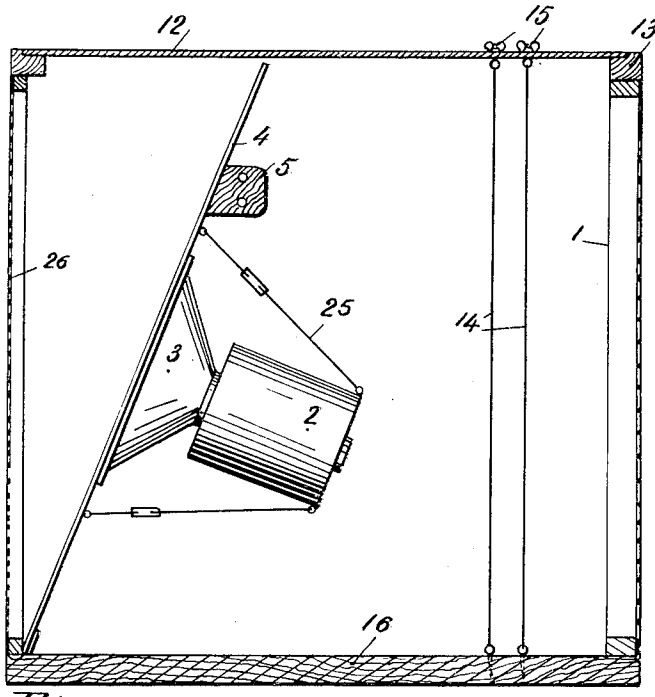
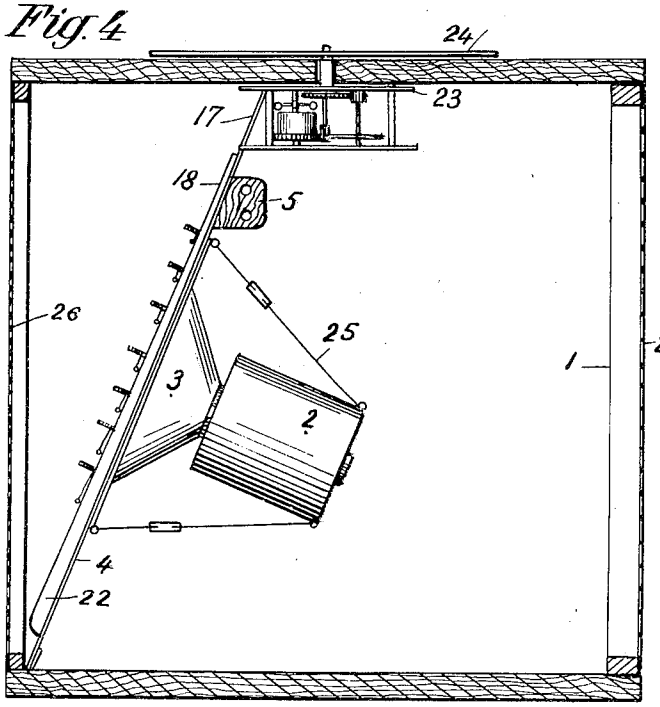


Fig. 3

Fig. 4



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Fig. 6

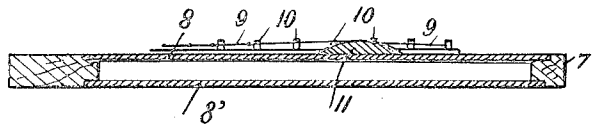
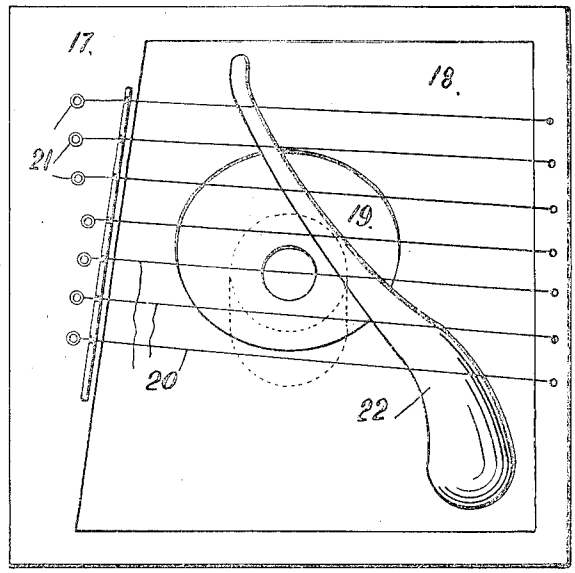


Fig. 5



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UNITED STATES PATENT OFFICE

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ELECTRIC AMPLIFICATION OF SOUNDS

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4 Claims. (Cl. 181—31)

It is known that unlike musical brass instruments such as trumpets, cornet-a-pistons etc. which emit simple sounds which have no harmonics, or very little, musical wood instruments (violins, cellos, pianos, harps, clarinets, hautboys etc.) emit sounds which owing to the resonance of the thin and sonorous wood surfaces with which they are provided and which in certain of the said instruments constitute what is called the sound board, comprise a very large number of harmonics which may be called "wood harmonics". These harmonics prolong in a way the initial sound, owing to which these instruments are given a timbre quite different from that of brass instruments.

Thus when one of the hammers of a piano for instance strikes its string, it produces an initial sound, the vibrations of which are prolonged by the sound board of the piano (wood harmonics).

When however the sounds produced by the musical instruments are recorded and then reproduced with electric amplification with the assistance of the apparatus now in existence, it is found that the loud speakers utilized (electrodynamic loud speakers) though they emit completely or practically completely the vibrations produced by the brass instruments, do not transmit, or transmit only to a very slight extent, the vibrations due to the harmonics of the wood in wood instruments.

The timbres of the sounds of different instruments thus recorded, reproduced and amplified, have therefore a tendency to resemble each other, owing to the absence of the said wood harmonics in the reproduction.

It has been attempted in the present invention to remedy the said drawbacks, and it has been found that after a large number of experiments with an electrodynamic loud speaker of any desired well-known type, it was possible to get with great exactitude the special timbre of wood instruments, that is to say to reconstitute the wood harmonics which strike the human ear perceiving the sounds emitted by the said instruments. It is sufficient for the purpose in question to combine the loud speaker with a resonance box or sound box comprising one or more sound board or sonorous surfaces which become operative under the action of the vibrations transmitted by the sound waves escaping from the loud speaker, to the air in the box so as to produce wood harmonics.

If we take for instance a piano, the sounds of which are assumed to be recorded by a microphone and reproduced in an electrodynamic speaker, only the initial sounds due to the striking of the hammers against the strings and the first harmonics which they produce will be recorded by the microphone (and therefore transmitted to the loud speaker) but not the wood harmonics produced by the sound board of the piano.

If, however, the loud speaker which amplifies the said sounds, is combined with a sound or resonance box according to the invention, the sonorous surface or surfaces of the said box (forming in reality sound boards), impressed by the vibrations imparted to the mass of air in the box by the sound waves emitted by the loud speaker (and corresponding to the sounds and to the initial harmonics of the piano, which alone are recorded), will produce complementary harmonics or wood harmonics practically in the same conditions in which the said harmonics had been produced in the piano.

On the contrary, if with the same loud speaker combined with a sound box are reproduced the sounds of a trumpet for instance (sounds which in the trumpet itself are accompanied only by rare harmonics), the sound board or boards of the box will remain silent, as the sounds in question cannot produce wood harmonics.

As another characteristic of the invention, it has been found that the sonority of the sound board or boards of the said resonance box combined with the loud speaker, could be materially increased by stretching one or more strings either between the said boards or on the said boards, preferably with the interposition in the latter case of a bridge.

It goes without saying that the present invention is applicable to electromagnetic loud speakers in general, whether these latter be used for amplifying the sounds transmitted by a gramophone or by a wireless telephony apparatus.

The accompanying drawings show diagrammatically by way of non-limitative examples, various constructions of devices enabling the object of the present invention to be achieved.

In the said drawings:

Figure 1 is a vertical section of a first construction and

Figure 2 is a view in plan of the sound board.

Figure 3 is a section of a modified construction,

Figure 4 is a section of a further modified construction and

Figure 5 is a front elevation of the sound screen.

Figure 6 is a detail view.

In Figures 1 and 2, 1 is a cabinet, preferably of wood, in the interior of which is arranged an electrodynamic loud speaker 2, of any desired well-known type.

At right angles to the axis of the said loud speaker, that is to say to the direction of the sound waves which it emits, is arranged, in contact with the horn 3 of the loud speaker, a screen 4 secured to a cross bar 5 mounted between the walls of the cabinet 1. The screen 4, provided opposite the horn 3 with an opening for the propagation of the sound waves, prevents the latter from coming back and striking the horn from the back, which would result in interferences injurious to the quality and to the good progression of the sounds. In Figure 1, the said screen is inclined to the extent of about 20° relatively to the vertical, for the reason set forth in the following.

At the upper part of the cabinet and above or in the cover 6 of the same is arranged a sound board constituted by a frame 7 supporting for instance a sonorous wood plate 8 of small thickness. Strings 9, the number of which is variable at will (seven in the example illustrated), are stretched above the sound board thus constituted, to the frame of which they are secured by means of turn-buckles or strainers 10 of any well known type. These strings pass over a bridge 11 for instance of wood of curved shape so as to divide the strings in question into sections of a length gradually increasing at one side and decreasing at the other.

With this arrangement, the cabinet 1, closed in front by a stretched cloth 26 and at the back for instance by a netting 27, forms a resonance box, and the mass of air which it contains, is set vibrating under the action of the sound waves emitted by the loud speaker. These vibrations of the mass of air of the cabinet are transmitted to the sonorous plate 8, the sonority of which is very considerably increased by the use of the stretched cords 9.

The inclination of the screen 4 relatively to the vertical and to the sound board 7—8, is required in order to prevent the latter from being within the minimum field of action of the waves emitted.

In the modified construction of Figure 3, the sound board 7—8 is replaced by a simple sonorous plate 12 mounted for instance in a frame 13 and forming a cover of the cabinet 1. Cords 14 are stretched by means of strainers 15 between the said plate and the bottom 16 for the cabinet which may also be made from sonorous wood.

The vibrations of the mass of air enclosed in the cabinet, are transmitted to the sonorous plate 12 and eventually to the sonorous bottom 16, the sonority of which is increased owing to the use of the stretched strings 14.

In the modified construction shown in Figures 4 and 5, the sound board is constituted by the screen 4 itself which may be formed then, like the sound board of Figures 1 and 2, by a frame 17 supporting a sonorous board 18 provided then with an opening 19 in front of the loud speaker 2. Strings 20 are stretched as before on the frame 17 by means of strainers 21 and pass over a bridge 22.

In such a case, the loud speaker may be with horizontal axis or not, the screen 4 being therefore vertical or inclined, but always in thorough contact with the horn 3.

In the upper part of the cabinet may be arranged the trap cover 23 supporting the rotary disc 24 of a gramophone.

The vibrations of the mass of air enclosed in the cabinet 1 are transmitted to the sonorous board 18, the sonority of which is increased by the strings 20.

In these various figures, the loud speaker 2 may be secured directly on the screen 4 by means of ties 25.

Instead of providing in Figure 1 only one sound board 7—8—9 on one of the walls of the cabinet 1, other similar ones could be provided on other walls of the cabinet, the frames 7 of these sound boards being connected to the walls in question by cross-bars, keys or other suitable devices.

Finally each sound board could comprise a single sonorous plate (like the plate 8 of Figure 1) or two plates 8 and 8' as in Figure 6 for instance at either side of the frame 7.

I claim:—

1. In a mechanism for the electric amplification of sounds by means of electro-dynamic loud speaker, a box for said loud speaker, a light screen dividing said box into two compartments and supporting said loud-speaker in said sound box in a manner to allow free vibration of the cone of said loud speaker.

2. In a mechanism for the electric amplification of sounds by means of electro-dynamic loud-speaker, the combination with an electric dynamic loud speaker, of a sound box for said loud speaker, a frame member forming a wall of said box, a vibratory plate secured to said frame member, a light screen supporting said loud-speaker in a manner to allow the free vibration of the cone of said loud speaker, said screen allowing the waves to reach said plate and at the same time interrupting passage of the sound waves to the rear thereof thereby preventing interference with subsequently produced sounds.

3. In a mechanism for the electric amplification of sounds by means of electro-dynamic loud-speakers, the combination with an electro dynamic loud speaker, of a sound box for said loud speaker, a frame member forming a wall of said box, a vibratory plate secured to said frame member, a light screen supporting said loud speaker in a manner to allow the free vibration of the cone of said loud speaker and inclined with respect to said plate.

4. In a mechanism for the electric amplification of sounds by means of electro-dynamic loud speaker, the combination with an electro dynamic loud speaker, of a screen formed by a sounding board and supporting said loud speaker in a manner to allow the free vibration of the cone of said loud speaker.

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