July 18, 1933. R. R. DU PUY 1,918,839

TONE CONTROL FOR LOUD SPEAKERS

Filed Oct. 29, 1931

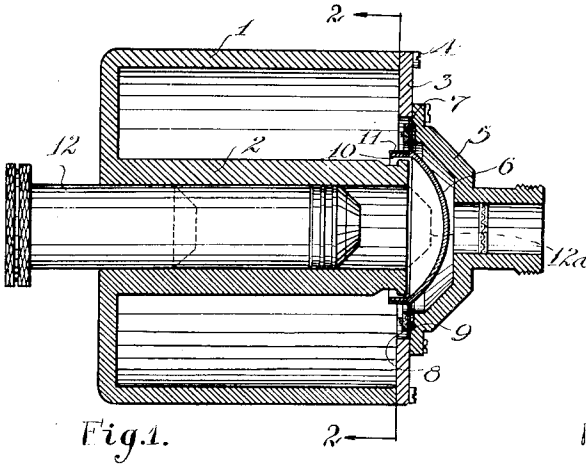


Fig. 1.

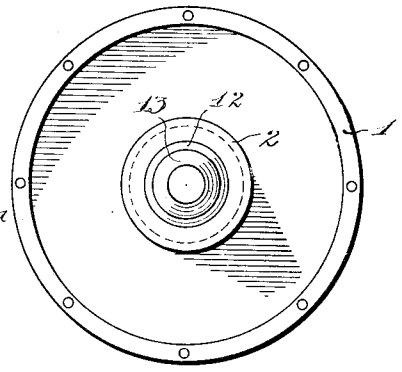


Fig. 2.

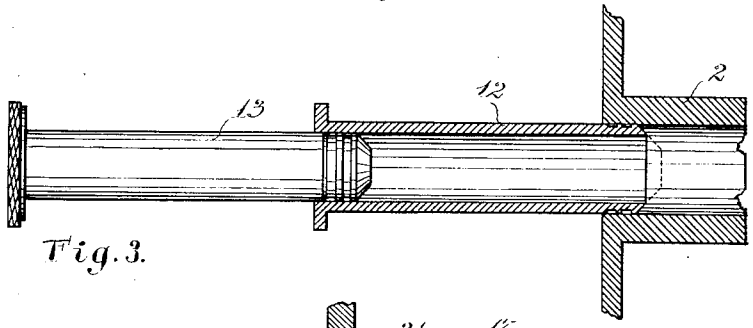


Fig. 3.

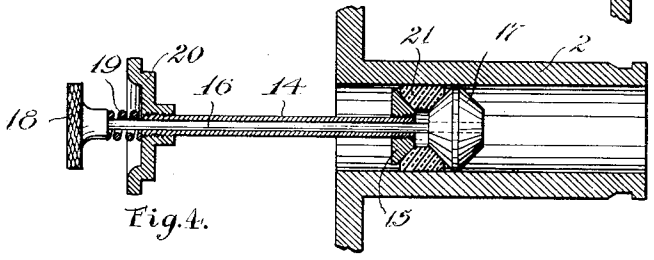


Fig. 4.

Inventor
Richard R. DuPuy

By A. D. Johnson

Attorney

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UNITED STATES PATENT OFFICE

RICHARD R. DU PUY, OF ST. PAUL, MINNESOTA, ASSIGNOR TO WRIGHT-DE COSTER, INC., OF ST. PAUL, MINNESOTA, A CORPORATION OF MINNESOTA

TONE CONTROL FOR LOUD SPEAKERS

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The present invention relates to a tone control for loud speakers.

In the recording of sound waves on a record by means of a stylus or where such sound waves are recorded on a sensitized surface by means of light rays, both of which methods are in common use at present, there is a distortion which results in the accentuation of the lower tones. When the sound record is reproduced, therefore, this accentuation of the lower tones causes a slight distortion from the original.

In sound motion picture work this is apt to be a very material factor, since in a theater having imperfect acoustic properties the accentuated low tones are apt to create a reverberatory drumming noise which reduces the intelligibility of speech and creates an undesirable undertone for music.

An object of the present invention is to make an improved tone control for loud speakers.

In order to attain this object, there is provided, in combination with an oscillatory diaphragm sound reproducing mechanism, a chamber adjacent said diaphragm and in open communication therewith, this chamber being of a variable size to create an air cushion which affects the freedom of oscillation of the diaphragm for low tone reproduction.

These and other features of the invention will be more fully brought out in the following description and the accompanying drawing, wherein:

Figure 1 is a longitudinal sectional view through a loud speaker mechanism embodying the present invention.

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

Figure 3 is a sectional view through a central core member having a tone control plunger mounted therein and extended its full lengths; and

Figure 4 is a sectional view through a central core member having a modified form of plunger therein.

Referring to the drawing in detail, a field coil housing member comprises a cup-shaped container 1 having a hollow core 2 positioned axially thereof, the cup and core being of magnetically permeable material, such as soft annealed cast iron. A field coil, not shown, of a conventional type, is wound on the central core member 2 to lie within the housing 1. A soft annealed cast iron cover 3 is secured across the top of the housing 1 by screws 4 and a horn support member 5 is mounted over a central aperture in the cover 3. A diaphragm 6 having a domed central portion and a radially disposed flange 7 is mounted between gaskets 8 and 9 to the inner face of the horn support member 5 and an axially disposed skirt 10 is provided with a customary voice coil 11. The structure and functions of these various elements form no part of the present invention and as they are well known to the art, no more than a brief description is believed necessary.

Ordinarily, this type of speaker is constructed with the central core 2 open to the atmosphere or covered on its rear or outer end with a dust proof member. In accordance with one embodiment of the present invention, a plunger 12 is telescopically inserted in the central aperture of the core 2 to be slidable longitudinally thereof. Within the plunger 12, which is tubular, a second inner plunger 13 is slidably inserted so as to permit withdrawal of the plungers to the position illustrated in Figure 3. The dotted line 12—*a* in Figure 1 indicates the position of the inner end of the plungers when fully inserted.

A modified form of plunger is shown in Figure 4. In this structure the hollow core member 2 may be the same as that illustrated in Figure 1. A tubular member 14 is provided on its inner forward end with an enlarged head portion 15 having a conical forward face. A rod 16 is slidably mounted within the tube 14 and is provided on its inner end with a knot 17 having a conical rear face and a truncated conical convex forward face. A push knob 18 is mounted on the rear or outer end of the rod 16 and a compression coil spring 19 is mounted between the knob 18 and a discoid member 20 secured to the rear of the tube 14. A resilient washer 21, which may be of felt or rub-

ber, is mounted between the head 15 and the knob 17. With the parts in normal position, the compression spring 19 draws the knob 17 toward the head 15, expanding the resilient washer 21 against the inside wall of the tubular core 2. Moving the push knob 18 toward the discoid member 20 compresses the spring 19 and separates the head 15 from the knob 17, releasing the pressure on the resilient washer 21 and permitting free longitudinal movement of the entire assembly in the core 2.

Operation.—The vibrations of the diaphragm 6 create pulsations in the air on both sides of the diaphragm. On the forward side of the diaphragm these pulsations are projected out through the horn as sound waves. On the inside these pulsations oscillate back and forth until dampened out. With the tubular core 2 open on its rear end, or with the plunger in retracted position, as shown in Figure 3, these pulsations do not affect the tone produced through the horn. As the plunger is advanced in the core, however, the larger pulsations of the diaphragm, caused by the reproduction of low tones, are dampened by the cushion of air created by the reduction in size of the chamber caused by advancing the plunger, and the low tones are thus attenuated without noticeably affecting the higher tones.

The degree of attenuation of the low tones may thus be effectively controlled by manipulation of the plunger by the operator so as to restore the tonal quality of the reproduced sounds to approximately their original values.

While the construction shown is an embodiment which operates effectively with the particular type of speaker shown, it is not intended to limit the scope of the invention to this particular embodiment, since one versed in the art and cognizant of my present invention, could readily device an enclosed chamber of variable size on any vibrating-diaphragm type of speaker, regardless of the shape or size of the diaphragm.

I claim:

1. In a loud speaker having a vibratory diaphragm, an enclosed chamber on one side of said diaphragm, said diaphragm comprising one wall of said chamber, and means mounted to vary the size of said chamber to control the magnitude of low tone vibrations of said diaphragm.

2. In a loud speaker having a vibratory diaphragm, a variable size chamber on one side of said diaphragm, said diaphragm comprising one wall of said chamber, the walls of said chamber, other than that formed by said diaphragm, being substantially non-vibratory.

3. In a loud speaker having a tubular core member, a diaphragm mounted over said core member, and a plunger mounted in said core member to be adjustably movable longitudinally thereof.

4. In a loud speaker, a vibratory diaphragm, means mounted to vibrate said diaphragm to produce sound waves, and a chamber of variable size in open communication with a side of said diaphragm to control the magnitude of low tone vibrations of said diaphragm.

5. In a loud speaker, a tubular support member, a diaphragm mounted to close an end thereof, a transverse partition member movable longitudinally of said diaphragm to vary the size of the chamber enclosed by said diaphragm, said tubular member and said partition member, said chamber being free of obstructions between said movable partition member and said diaphragm to permit free oscillation of sound waves in said chamber.

RICHARD R. DU PUY.