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CONICAL DIAPHRAGM FOR SOUND REPRODUCING AND RECORDING APPARATUS

Filed Nov. 30, 1931

FIG. 1.

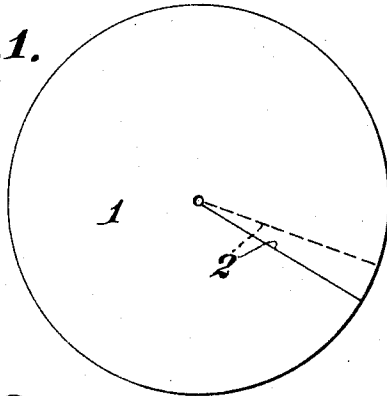


FIG. 2.

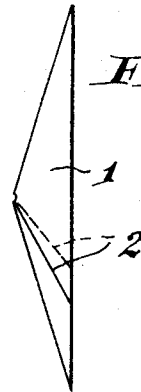


FIG. 3.

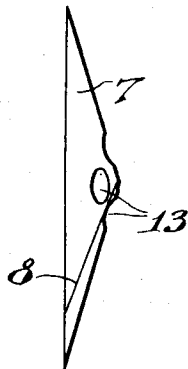


FIG. 4.

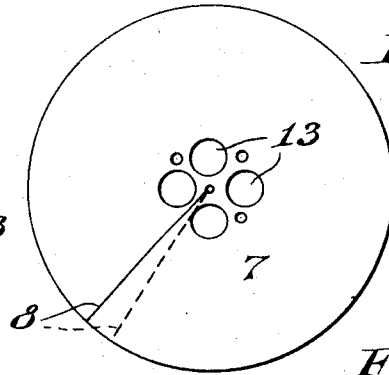
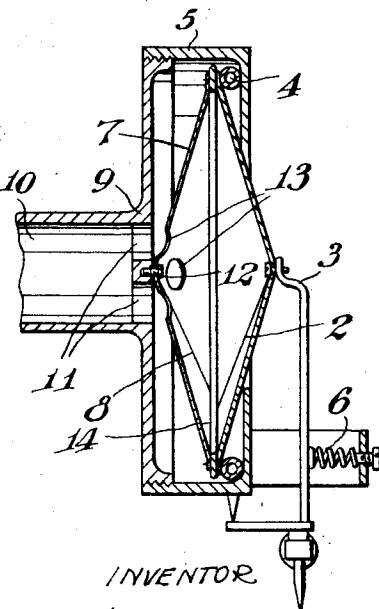
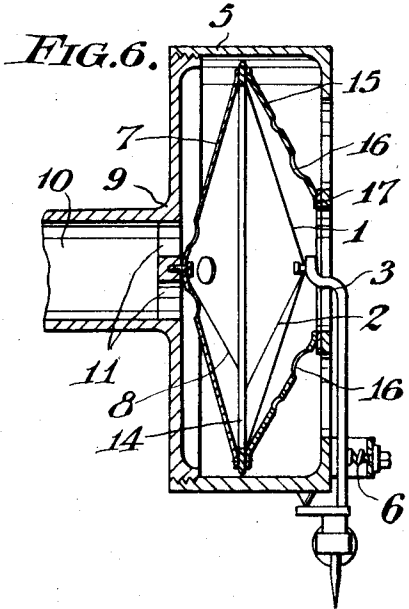


FIG. 5.



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CONICAL DIAPHRAGM FOR SOUND REPRODUCING AND RECORDING APPARATUS

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This invention has reference to conical diaphragms for sound reproducing and recording apparatus. The present invention provides a novel construction of diaphragm which is characterized by its capacity to move or expand freely under the slightest pressure. The invention is especially applicable to the diaphragms of gramophone sound boxes, and enables a sturdier diaphragm to be used than heretofore possible, whilst at the same time increasing the sensitiveness of the diaphragm so that it readily responds to the oscillatory movements of the stylus bar during tracking.

Broadly, the invention consists in a diaphragm for the sound-box of a gramophone made from a shaped flat blank which is bent to conical form so that the radiating edges slidably overlap one another to permit of the free expansion of the conical member under the slightest pressure, and the contraction of said conical member to its normal size when pressure is removed.

The blank constituting a diaphragm is preferably an aluminium blank, or an alloy thereof, and the amount of overlap is gauged so that the maximum degree of pressure, resulting either from the movement of the stylus bar (as in a sound-box) does not cause the overlapping edges of the conical member to slide too far or gape open.

In order that the invention may be readily understood, reference is to be had to the following description and accompanying sheet of drawing, wherein:—

Figures 1 and 2 are, respectively, a front view and a side view of a main diaphragm for a sound-box.

Figures 3 and 4 are, respectively, a sectional view and a rear view of an insulating diaphragm for use in conjunction with the main diaphragm.

Figure 5 is a vertical sectional view illustrative of a side-box fitted with the said diaphragms.

Figure 6 is a view similar to Figure 5 but illustrative of a modification hereinafter referred to.

In carrying out the invention and referring to the drawing, a blank 1 of disc form made from aluminum or an alloy thereof is slit radially from the centre of the circumference. The disc 1 is then shaped or bent to conical form, the edges 2, 2 of the slit overlapping one another in a slidable manner.

The conical diaphragm thus formed has a springiness which is readily responsive to the slightest pressure applied to its apex, to which point the inner end of the stylus bar 3 is affixed, as shown in Figure 5.

The diaphragm 1, at its outer edge, bears against a tubular rubber ring 4 located in the front part of the sound-box 5, and is held under spring pressure, preferably by means of a spring 6 loading the stylus bar 3. A second diaphragm 7, somewhat smaller in diameter and similarly constructed with overlapping slidable edges 8, is preferably employed with the mouth thereof opening towards the mouth of the first-mentioned or main diaphragm 1 aforesaid.

This second diaphragm 7—hereinafter termed the insulating diaphragm—is preferably secured at its apex to the back 9 of the sound-box 5, the point of fixture being centrally disposed with relation to the tone-arm neck 10. A series of apertures 11 in the back 9 of the sound-box 5 are concentrically arranged around the fixing screw 12 of the insulating diaphragm, and the said apertures 11 are adapted to register with a series of apertures 13 formed in the insulating diaphragm 7 to afford a recess for the sound waves (emanating from the main diaphragm 1) to the tone-arm neck 10.

A flat ring 14 (of either resilient or non-resilient material) is interposed between the rims of the opposed diaphragms 1 and 7 to prevent their direct contacting together. Said ring may be of rubber, or, for example,

of paper or other thin packing material not necessarily of a yielding nature, as a thin non-yielding ring will pass on vibrations from the main diaphragm 1 to the insulating diaphragm 7 with greater truth.

Referring now to Figure 6 of the drawing, the buffer ring 4 of the previously described arrangement of diaphragm, is dispensed with, and an extra cone 15, similar in construction to the main and insulating diaphragms 1 and 7, and provided with perforations 16, is positioned between the main diaphragm 1 and the front of the sound-box 5 so that the mouth of the extra cone 15 contacts with the main diaphragm 1, whilst the apex end of said extra cone 15 is carried by a ring 17 affixed to the front of the sound-box 5 aforesaid, the main diaphragm 1 having affixed thereto the inner end of the spring-loaded stylus bar 3, the same passing freely through the ring 17 aforesaid.

This extra cone 15 tends to contract in diameter at its mouth and urge the diaphragm assembly 1, 7 inwards, thus compensating for the outward pushing effort of the insulating diaphragm 7 and effecting a true floating suspension of the centre cone or main diaphragm 1.

The outer and inner cones 15 and 7 (where three cones are employed) must be of equal tension and thicker material than the floating cone or main diaphragm 1, but when two cones, i. e. main diaphragm 1 and insulating diaphragm 7, only are used then both said cones 1 and 7 must have the same tension and thickness or gauge, the same being greater than the known flat diaphragms of gramophone sound-boxes.

It is pointed out that the insulating diaphragm 7 need not necessarily be affixed to the apertured back 9 of the sound-box, as it may merely rest thereagainst, in which case there will be a single central aperture in said diaphragm for the emission of sound instead of the apertures 13. In this case a paper or other packing ring may be inserted between the diaphragm and back 9.

I claim:—

1. In sound reproducing and recording apparatus, a diaphragm consisting of a shaped flat blank which is bent to conical form so that the radiating edges slidably overlap one another to permit of the free expansion and contraction of the cone.

2. A diaphragm for sound recording or reproducing apparatus consisting of a flat circular disc slit radially from the centre to the circumference thereof, the disc being shaped to conical form so that the edges of the slit slidably overlap one another to permit of the free expansion and contraction of the cone.

3. A diaphragm assembly for sound recording and reproducing apparatus comprising a main diaphragm, an insulating dia-

phragm, each of said diaphragms comprising a radially slit blank bent into conical shape with the radial edges thereof slidably overlapping, a packing ring, said diaphragms being disposed in opposed relationship with their mouth ends adjacent to each other and the packing ring interposed therebetween, the insulating diaphragm being apertured for the passage of sound waves.

4. A diaphragm assembly as set forth in claim 3 including a sound box containing the diaphragms, a tubular buffer ring interposed between the main diaphragm and an adjacent wall of the sound box and against which the main diaphragm rests, a connection between the apex of the insulating diaphragm and an adjacent wall of the sound box, and spring means urging the main diaphragm in the direction of the insulating diaphragm.

5. A diaphragm assembly as set forth in claim 3 including a sound box containing the diaphragms, a connection between the apex of the insulating diaphragm and an adjacent wall of the sound box, and spring means urging the main diaphragm in the direction of the insulating diaphragm.

6. A diaphragm assembly as set forth in claim 3 including a sound box containing the diaphragms, a connection between the apex of the insulating diaphragm and an adjacent wall of the sound box, a stylus bar connected at its inner end to the apex of the main diaphragm, and spring means loading said stylus bar and urging the inner end thereof in a direction to urge the main diaphragm in the direction of the insulating diaphragm.

7. A diaphragm assembly as set forth in claim 3 including a sound box containing the diaphragms, a third diaphragm constructed similarly to the main and insulating diaphragms and interposed between the main diaphragm and the front of the sound box, said third diaphragm being open at its apex and being secured at its open apex to the front of the sound box, said third diaphragm being perforated and bearing at its mouth on the main diaphragm so as to tend to urge the main and insulating diaphragms inwardly thus to compensate for any tendency of the insulating diaphragm to push the main diaphragm outwardly.

8. A diaphragm assembly as set forth in claim 3 wherein the main and the insulating diaphragms are of substantially equal thickness and tension.

9. A diaphragm assembly as set forth in claim 3 including a sound box containing the diaphragms, a third diaphragm constructed similarly to the main and insulating diaphragms and interposed between the main diaphragm and the front of the sound box, said third diaphragm being open at its apex and being secured at its open apex to the front of the sound box, said third diaphragm being perforated and bearing at its mouth on

the main diaphragm so as to tend to urge the main and insulating diaphragms inwardly thus to compensate for any tendency of the insulating diaphragm to push the main diaphragm outwardly, said insulating and third diaphragms being of substantially equal thickness and tension, and the main diaphragm being of less thickness and tension than the insulating and third diaphragms.

In testimony whereof I have affixed my signature hereto this 19th day of November, 1931.

HAROLD BERTRAM MEAD.