May 3, 1932. F. L. DESBRIERE 1,856,749

VIBRATING FILM FOR ACOUSTIC DEVICES

Filed April 23, 1930

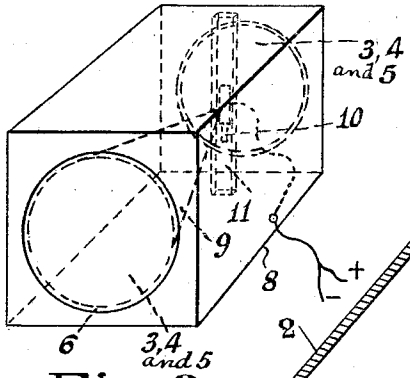


Fig. 3.

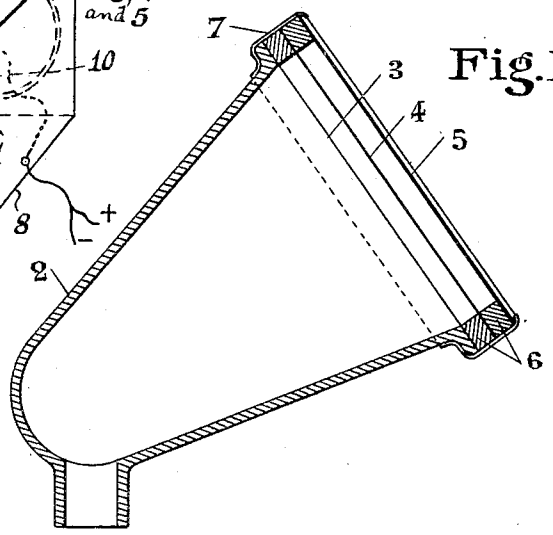


Fig. 1.

Fig. 2

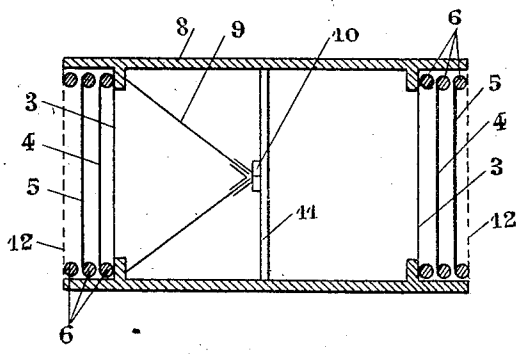
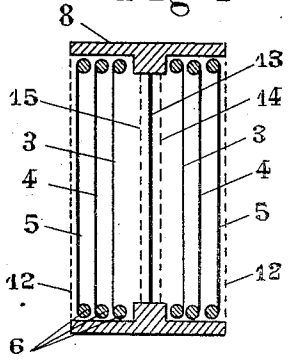


Fig. 4



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UNITED STATES PATENT OFFICE

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VIBRATING FILM FOR ACOUSTIC DEVICES

Application filed April 23, 1930, Serial No. 446,603, and in Germany May 15, 1929.

The present invention relates to acoustic devices and has for its principal object the provision of means for improving the tone of sounds emitted by any acoustic machines, phonograph, loud speaker, sound amplifier for wireless or so-called "pick-up", telephone receiver, telephone emitter or the like and giving to every sound wave even to weak ones, emitted at the same time as the principal sound, power enough to be heard, by the effect of reaction and resonance. The device is not intended for submarine use. The aforesaid object is obtained by the employment of a plurality of films arranged so as to close tightly the sound emission openings of any desired acoustic device between the atmosphere and the sound producer, the films being thin flexible flat air-tight and easily vibrating and being made of non-sonorous material and arranged parallel to one another. Air at atmospheric pressure is tightly enclosed between the said films. The innermost film is caused to vibrate by variations of the pressure of air located between itself and the sound producing member in a closed space which is also at atmospheric pressure, without any mechanical impulse from the said piece. The said films are made of any easily vibrating material, for instance celluloid, thin metal, leather, paper and so on, but the materials must be air-tight.

The films vibrate only by changes of their plane surface produced by changes of pressure of enclosed air between the films themselves and, as aforesaid, between the innermost one and the sound producing member in an enclosed space. The rings on which the films are mounted are arranged so as to leave a space between the said films, and must be as rigid as possible. Thus it is only the films that transmit the sounds to the atmosphere and it must be remarked that the oblique sound waves emitted, for example, by the vibrating cone of a sound amplifier or transmitted by a horn of any shape which would have crossed each other outside of the acoustic device are caught by the innermost film and changed into parallel ones by transmission to the other films thus improving the tone without any loss of power.

The said films may be used in any number, according to the shape and use of the acoustic device. When the films are intended for the reproduction of music they are preferably made of different thicknesses so that the overtones which are, as is known, always produced by such films in addition to the fundamental tone during their resonant vibration extend over different ranges of sound. For instance, when three films are employed, the innermost one may produce, in addition to the fundamental tone, overtones extending over a given definite range of 2½ octaves, the middle one may produce, in addition to the fundamental tone, overtones extending over a second different range of 2½ octaves, and the outer one may produce, in addition to the fundamental tone, overtones extending over a third and again different range of 2½ octaves, so that the total range over which the overtones produced extends amounts to 7½ octaves. It will be understood that the films are all adapted to produce and transmit properly the fundamental tone, but that the ranges of overtones added to the latter in its passage through the films vary according to the thickness and other dimensions thereof. The invention will now be more specifically described with reference to the arcompanying drawings, which are given as an example of some of the applications of the invention, and in which:

Fig. 1 is a longitudinal section through a horn fitted with vibrating films and adapted for use in phonographs, gramophones, "pick-up" devices or wireless apparatus.

Fig. 2 is a longitudinal section of an acoustic device, known as a sound amplifier, for wireless or "pick-up" apparatus fitted with vibrating films and provided with an electro-magnetic or magneto dynamic or electro-dynamic motor causing a cone to vibrate.

Fig. 3 is a perspective view of the sound amplifier shown in Fig. 2, the same reference numerals being used as in this last-named figure, and

Fig. 4 shows a longitudinal section and a front view of an electrostatic acoustic device fitted with films.

Referring to Fig. 1 of the drawings, the

reference numeral 2 denotes a horn of any suitable form or shape for use in phonographs, gramophones, "pick-up" devices and wireless apparatus. At the small end of the horn the sound waves are received from a phonograph or the like or are produced by an electro-magnetic motor as used for wireless and "pick-up". The large opening of the horn is entirely closed by the vibrating films 3, 4 and 5, set on rigid rings 6 and spaced by them. Those rings are fixed on the aperture of the horn by any known and suitable means, for example by means of an india-rubber ring 7. The films are preferably of different thickness as before stated for musical purposes.

Referring to Figs. 2 and 3, the motor 10 fixed on a base 11 attached to the box 8 acts on a vibrating or moving cone 9 which transmits by variations of air pressure in a closed space, the sound waves to the vibrating films 3, 4 and 5, spaced by the rigid rings 6 fixed on the box 8 in such manner that no air may escape and that the spaces between the films are thus air-tight. A thin but non-vibrating disc 12 made of loose or perforated material giving free passage to the air may be added for protecting the vibrating films. A similar set of vibrating films adapted to close the aperture of the cone without touching it may be placed on any other side of the box 8 if another sound aperture is wanted.

Referring to Fig. 4 which illustrates the application of the invention to an electrostatic acoustic device of known construction, the body 8 of the device contains a magnetic and very thin film 13 placed between two metallic gratings 14 and 15 polarized by a strong electric current, the variations of which cause vibrations of the film 13. The vibrating non-magnetic films 3, 4 and 5 are placed outside of the gratings and the sound emission openings are tightly closed by them; the films are held in position and spaced by non-vibrating rings 6 which allow of no escape of air. Two non-vibrating discs 12 made of loose or perforated material giving free access to the air may be placed outside of each set of vibrating films to protect them.

I claim:

1. In an acoustic device, the combination of: a sound reproducing device; a sound emitting member co-operating with said sound reproducing device; a plurality of thin flexible flat air-tight easily vibrating films made of non-sonorous material which are arranged parallel to one another at the extreme sound emitting end of said sound emitting member and the outermost one of which is in contact with the atmosphere; a plurality of non-vibrating rings on which said films are mounted and by which said films are spaced so as to form closed spaces between them; whereby the innermost one of said films is caused to vibrate by variations of the pressure of the air contained in the sound emitting member and the remaining films are caused to vibrate by variations of the air pressure in the closed spaces, said films being final producers of sounds.

2. In an acoustic device, the combination of: a plurality of thin flexible flat air-tight easily vibrating films made of non-sonorous material and arranged parallel to one another; a plurality of non-vibrating rings on which said films are mounted and by which said films are spaced so as to form closed spaces between them; a box in which said films are arranged; a sound amplifier enclosed in said box; and a vibrating cone on said sound amplifier; whereby said films are caused to vibrate by variations of the air pressure in the closed spaces and the innermost film is also caused to vibrate by variations of the pressure of the air located between said innermost film and said vibrating cone, said films being final producers of sounds.

3. In an acoustic device, the combination of: a plurality of thin flexible flat air-tight easily vibrating films made of non-sonorous material and arranged parallel to one another; a plurality of non-vibrating rings on which said films are mounted and by which said films are spaced so as to form closed spaces between them; a box in which said films are arranged; and an electrostatic acoustic apparatus arranged in said box and closed at its sound openings by said films; whereby said films are caused to vibrate by variations of the air pressure in the closed spaces and the innermost film is also caused to vibrate by variations of the pressure of the air enclosed between said innermost film and the walls of said box, said films being final producers of sounds.

4. In an acoustic device, the combination of: a plurality of thin flexible flat air-tight easily vibrating films made of non-sonorous material and arranged parallel to one another; a plurality of non-vibrating rings on which said films are mounted and by which said films are spaced so as to form closed spaces between them; a closed acoustic chamber at the extreme end of which said films are arranged so that the outermost film is in contact with the atmosphere; and a sound producing member associated with said closed chamber; whereby said films are caused to vibrate by variations of the air pressure in the closed spaces and the film located nearest to said sound producing member is also caused to vibrate by variations of air pressure in said closed chamber without receiving any mechanical impulse from said sound producing member, said films being final producers of sounds.

In testimony whereof I have signed my name to this specification.

FERNAND LESIEURE DESBRIÈRE.