March 18, 1930. A. P. PINKLER 1,751,356

DIAPHRAGM

Filed July 21, 1925

Fig. 1.

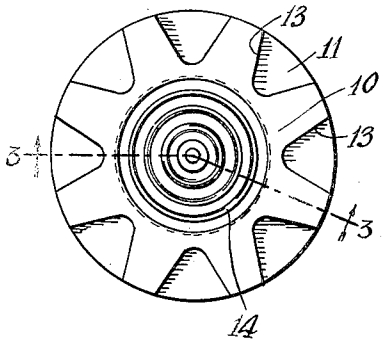


Fig. 2.

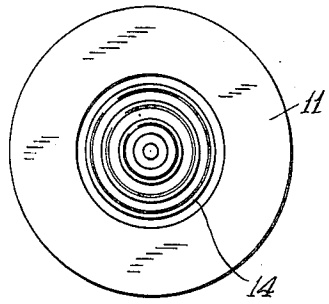


Fig. 3.

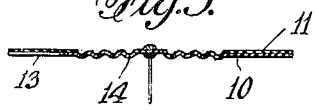
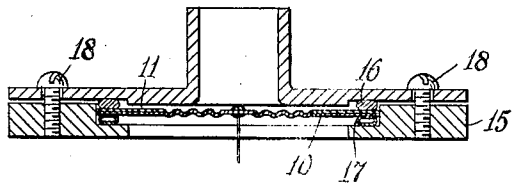


Fig. 4.



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Patented Mar. 18, 1930 1,751,356

UNITED STATES PATENT OFFICE

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DIAPHRAGM

Application filed July 21, 1925. Serial No. 44,991.

The invention relates to diaphragms for use with sound producing or sound reproducing devices, for example as employed in telephone receivers, loud speaking receivers, phonographic sound boxes and the like. It has for its object to provide a diaphragm of sufficient strength to take a substantial load yet withal be extremely light so as to be readily responsive to the variations in intensity of the actuating force applied thereto. A further object of the invention resides in a construction which will admit of the diaphragm responding over a wide range of sound frequencies, that is to say, there will be no sacrifice of quality, as both the high and low notes are equally well reproduced notwithstanding the substantial construction involved.

The nature of the invention, however, will best be understood when described in connection with the accompanying drawings, in which—

Fig. 1 is an underneath view of the improved diaphragm.

Fig. 2 is a plan thereof.

Fig. 3 is a vertical section therethru taken on the line 3—3, Fig. 1.

Fig. 4 is a vertical transverse section thru a sound box illustrating the novel manner of mounting the improved diaphragm.

Referring to the drawings, the diaphragm is shown as circular in form, as is the usual practice; and is composed of two members—a substantial and more or less rigid member 10, and a flexible non-resonant annular member 11 carried thereby and secured thereto in any suitable manner as by means of an adhesive, cement or the like. The member 10 may consist of a thin disk of light metal such as aluminum, while the annular member 11 is of non-resonant material such as paper, parchment, celluloid, etc., and which is of greater flexibility, either inherently or due to its reduced thickness, than the supporting disk member 10. The latter member, further, is formed with a plurality of equidistantly spaced and radially disposed arms 13 upon which is secured the annulus 11 to close over the intervening spaces. Moreover, it is desirable to render the central portion of the member 10 more rigid than the outer portions; and to this end, the same is provided with a series of concentric corrugations 14.

In mounting the novel diaphragm, as in a sound box 15, Fig. 4, the same is to be held substantially at its circumference between two rings 16 and 17 of resilient material, for example soft rubber. Moreover, the upper ring, and which is arranged to bear against the paper annulus, is solid throughout; while the lower ring 17 arranged to be located on the under side of the diaphragm is preferably made hollow. The two rings are designed to clamp the diaphragm over its circumference thru pressure exerted thereon by the two separable members of the sound box 15, which clamping action may be accomplished by taking up on the screws 18. When pressure is thus applied by the screws, the soft rubber material will conform perfectly to the differences in the surface of the diaphragm due to the notched out portions of the metal supporting member 10, the hollow ring 17 tending to fill up the spaces in forcing the paper of the flexible annulus of the diaphragm against the solid upper ring 16. In this manner, an air-tight seal is provided about the diaphragm, obviating any losses of sound waves thru leakage around the circumference of said diaphragm.

In thus providing a diaphragm of which a portion of the supporting member 10 is notched out as set forth and covered with an annulus of light, non-resonant material, the weight of same is considerably reduced without sacrificing appreciably its strength; and the radial arms resulting therefrom provide for the desired flexibility at the outer portion of the diaphragm while the corrugations 14 at its central portion maintain the stiffness of the diaphragm at this portion. It will be noted that this is accomplished without increase of weight or by making up the diaphragm of laminations of different thicknesses and diameters as has heretofore been proposed. Moreover, in thus providing the radial arms, a beneficial result is obtained in that all radial stresses in the diaphragm material are substantially eliminated, the diaphragm retaining its original flat condition.

Three or four concentric corrugations of a depth of some .018″ have been found to satisfactorily stiffen the central portion of the diaphragm, a suitable thickness of which, when aluminum is employed, being .020″. I have found, also, that the paper annulus will give satisfactory results if of an approximate thickness of .0035″; and the two members thus combined into a single diaphragm provide an extremely light member which, however, is sufficiently substantial to withstand heavy loads such as are frequently encountered in connection with the operation of loud speaking receivers. Furthermore, the diaphragm is constructed to respond both to the high pitched notes and to the low pitched notes, the former being taken care of by arms 13 and the annulus 11 while the central and stiffened corrugated portion 14 responds to the latter.

I claim:—

1. A diaphragm for sound recording or reproducing units, comprising a thin substantially flat disk having a plurality of integral free-ended arms extending radially outward therefrom in the plane of said disk, and an annular member of non-resonant material and more flexible than said disk secured to its arms to cover the intervening free spaces thereof.

2. A diaphragm for sound recording or reproducing units, comprising a thin substantially flat disk circularly corrugated at its central portion and having a plurality of integral free-ended arms extending radially outward therefrom in the plane of said disk, and an annular member of non-resonant material and more flexible than said disk secured to its arms to cover the intervening free spaces thereof.

3. A diaphragm for sound recording or reproducing units, comprising a thin substantially flat metal disk having a plurality of integral free-ended arms extending radially outward therefrom in the plane of said disk, and an annulus of paper secured to said arms to cover the intervening free spaces thereof.

In testimony whereof I affix my signature.

ARTHUR P. PINKLER.