

Oct. 18, 1927.

1,646,261

L. SCHMIDT

DIAPHRAGM

Filed March 23, 1923

Fig. 1.

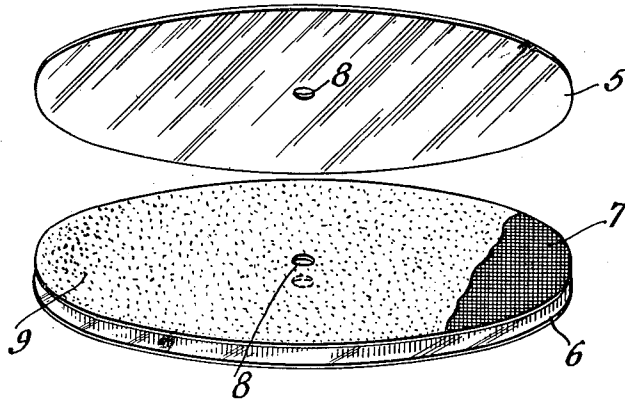


Fig. 2.

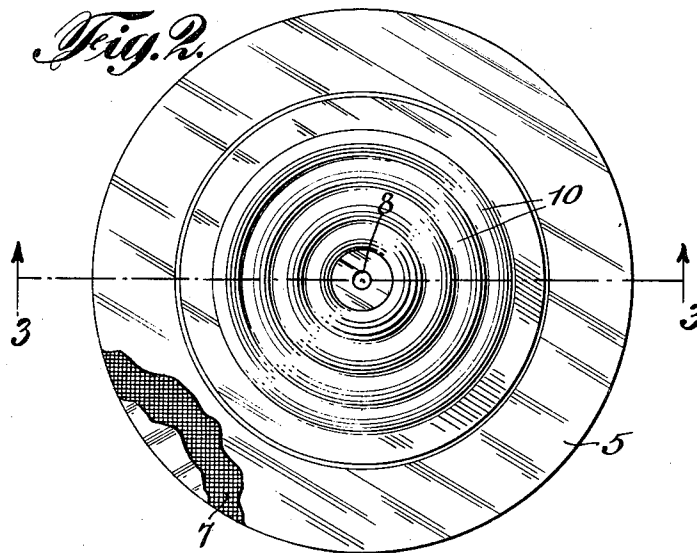
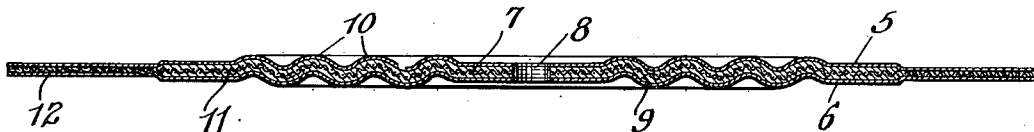


Fig. 3.



INVENTOR
Lambert Schmidt
BY *C. P. Loefel*
ATTORNEY

UNITED STATES PATENT OFFICE.

LAMBERT SCHMIDT, OF BROOKLYN, NEW YORK, ASSIGNOR TO RADIOTIVE CORPORATION, A CORPORATION OF NEW YORK.

DIAPHRAGM.

Application filed March 23, 1923. Serial No. 627,063.

This invention relates to diaphragms and more particularly to sound producing and augmenting diaphragms, such for instance as are commonly used in connection with sound receiving and transmitting apparatus.

It is the primary object and purpose of my present improvements to provide a diaphragm which is particularly intended for use in connection with what is generally referred to in the radio art as loud speakers, or as a sound producing element of sensitive head receivers constituting a part of radio receiving apparatus.

Heretofore, numerous attempts have been made to produce a sounding diaphragm which would be of comparatively small area, and yet possess a high tone quality with the desired loudness or augmentation of the sound. The comparatively recent general activity in the art relating to wireless telephonic communication has caused a renewal of such efforts, and among other attempts to solve this problem, it has been suggested that the diaphragm should be composed of a plurality of sheets or discs of fibrous material such as silk, cotton or paper, completely impregnated with and united in the form of a unitary structure by a phenolic condensation product. In the practical manufacture of diaphragms of this nature, it has been found that not infrequently, the diaphragm when removed from the mold is distorted, and in some cases this distortion is of such degree as to make it unfit for use. Consequently, it is practically impossible to obtain uniform loudness and clearness of spoken words. Diaphragms of this construction referred to are also relatively expensive owing to the nature of the materials employed.

It will, therefore, be understood that I propose by means of the present invention to eliminate the deficiencies heretofore encountered in the operation of such diaphragms and to provide a sounding diaphragm which may be advantageously employed in connection with wireless telephonic receiving or transmitting apparatus, may be very inexpensively produced, and which will possess superior tone quality and not be deleteriously affected by atmospheric conditions. In one practical embodiment of the invention, I have secured this desirable result by the use of two thin discs of celluloid and interposing between these

celluloid discs a single sheet or disc of silk. The two celluloid discs and the silk disc are permanently united under heat and pressure by an adhesive composition consisting essentially of shellac. One of the prominent characteristics of my new diaphragm resides in the fact that its inner area has a relatively thick layer of the interposed shellac composition and the celluloid discs are corrugated. In this manner, it will be apparent that the inner portion of the diaphragm will be relatively rigid. The diaphragm being centrally connected in the customary manner to the armature of the telephone magnet, it will be evident that the vibrations are uniformly distributed throughout the outer relatively thin annular portion of the diaphragm. It has been found that owing to this equalized distribution of vibration, there is obtained a maximum loudness in tone together with a tone quality which is noticeably superior to that obtainable in the use of such devices heretofore employed in the art.

With the foregoing and other objects in view, my invention consists in the improved diaphragm and in its several novel structural features, as will be hereinafter more fully described, illustrated in the accompanying drawings and subsequently incorporated in the subjoined claim.

In the drawing wherein I have illustrated one practical and satisfactory embodiment of the invention and in which similar reference characters designate corresponding parts throughout the several views:

Figure 1 is a perspective view showing the several component parts of the diaphragm before assembling the same to form the completed article;

Figure 2 is a plan view of a diaphragm embodying the present improvements, but with a part thereof broken away; and

Figure 3 is a diametrical sectional view on an enlarged scale, taken on the line 3—3 of Figure 2.

In the accompanying drawing, referring particularly to Figure 1 thereof, I have shown the diaphragm as composed of the two discs of celluloid 5 and 6 respectively and a disc of silk or other equivalent material 7, as light in weight as can be obtained, which is interposed between the two celluloid discs.

The several parts of the diaphragm are

preferably of uniform diameter, each of the discs 5, 6 and 7 being provided with a central aperture 8, to receive a centering pin on one section of a mold (not shown) so that the several parts will assume superposed positions on the mold section in proper concentric relation to each other. As indicated in Figure 1 of the drawing, the celluloid disc 6 is first arranged upon the center pin of the mold, and the silk disc 7 is positioned upon this celluloid disc. A mixture consisting of two parts of powdered shellac and one part of powdered mica is then spread over the silk disc 7 in a layer of uniform thickness as indicated at 9. I have also found that very good results can be obtained with the use of shellac alone. Finally, the other celluloid disc 5 is arranged in place on top of the powdered material 9. The other or top section of the mold is then placed upon the disc 5 and by means of a suitable pressure exerting means the two mold parts are forced towards each other and are also heated.

After a short period of time the powdered shellac will melt and combine with the mica so as to produce a plastic mass which thoroughly permeates the silk disc 7 and adhesively unites the two celluloid discs 5 and 6 with each other. I have found in practice that very satisfactory results are obtained by using celluloid discs having a thickness of approximately .004". As shown in Figures 2 and 3 of the drawing, the opposing mold faces are so formed as to produce a plurality of annular reinforcing corrugations 10 in the inner area of the diaphragm. It will also be noted that the adhesive composition mixture between the inner portions of the celluloid discs is relatively thick as shown at 11 in Figure 3, while that portion between the outer sections of the celluloid discs is relatively thin as shown at 12.

From the above it will be understood that the celluloid discs retain their individual disc form and are not amalgamated or homogeneously combined with each other or with the interposed layer of adhesive composition. The primary purpose of the silk disc is to provide a binder acting to prevent the possible disintegration or breaking down of the layer of shellac composition. I have found in actual practice that celluloid is best adapted for use in such diaphragms and is more uniformly responsive throughout the diaphragm area to vibratory influences than other materials which have heretofore been employed. However, the principal advantage resulting from my new construction is the practical elimination of deleterious effects of variations in humidity and temperature of the atmosphere upon the structure of the diaphragm, causing warping or distortion thereof. This is due to the fact that

a minimum of moisture absorption material is embodied in the diaphragm structure.

Thus this outer annular section of the diaphragm will be comparatively flexible while the inner thickened portion thereof is more rigid. Thus through the medium of the connecting rod between the armature of the telephone magnet and the center of the diaphragm, the inner portion of the diaphragm will move as a unit with the rod and the flexure of said diaphragm will take place between the outer edge of this thickened area and the extreme edge of the diaphragm which is clamped between the body and rim of the casing within which the telephone magnet is housed. Therefore, it will be seen that the entire outer annular portion of the diaphragm will partake of the vibratory movements transmitted to said diaphragm through the connection with the magnet armature. The adhesive material, whether of shellac and mica, or of shellac only, possesses a sufficient degree of elasticity to permit of such vibration of the diaphragm without cracking or disintegrating the adhesive material. Such uniform distribution of the vibrations produces a highly accurate translation of the voice currents into sound waves so that very clear, loud and distinct tones or other sounds will be produced.

From the foregoing description considered in connection with the accompanying drawing, the construction and several advantages of the invention will be readily understood. Preferably, the assembled parts of the diaphragm remain in the heated mold as above described while the mold is permitted to slowly cool, after which the two mold sections are separated and the completed diaphragm then removed. It will be understood that the celluloid discs are not porous or absorbent. They are, nevertheless, securely held by the adhesiveness of the shellac composition so that together with the interposed disc of silk, they constitute a unitary structure. It will be understood that the rod which transmits vibrations to the sounding diaphragm may be centrally connected thereto through the opening 8 in any preferred manner, such connection constituting no essential part of my present improvements.

I have above referred to the new diaphragm as designed particularly for use in connection with the loud speaker or head receiver of radio apparatus, but it is apparent that the invention might also be employed for other analogous purposes, such for instance as in phonographic sound reproducing instruments, or sound recording apparatus such as is well known in the art. Further, although I have herein described with considerable detail, a practical embodiment of the invention which has given

highly satisfactory results in actual use, it is nevertheless to be understood that the essential features of my improvements might likewise be embodied in numerous other alternative constructions. Accordingly, therefore, the privilege is reserved of resorting to all such legitimate changes in the form, construction and relative arrangement of the several parts as may be fairly considered within the spirit and scope of the invention as claimed.

I claim:

A diaphragm comprising two celluloid discs and an interposed disc of fibrous permeable material, all of said discs being of uniform diameter, a layer of composi-

tion material arranged between the celluloid discs and composed of shellac and mica rendered plastic under the action of heat and pressure to adhesively unite the several discs with each other in a unitary structure, the inner portions of the said discs being corrugated and the corresponding portion of the layer of adhesive material being of relatively greater thickness than the outer portion thereof whereby the inner area of the diaphragm is rendered relatively rigid. 20 25

In testimony that I claim the foregoing as my invention, I have signed my name hereunder.

LAMBERT SCHMIDT.