G. S. KNOX.

SOUND TRANSMITTING DIAPHRAGM, COMPOSITION THEREFOR, AND METHOD OF MAKING THE SAME.

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1,412,619. Patented Apr. 11, 1922.

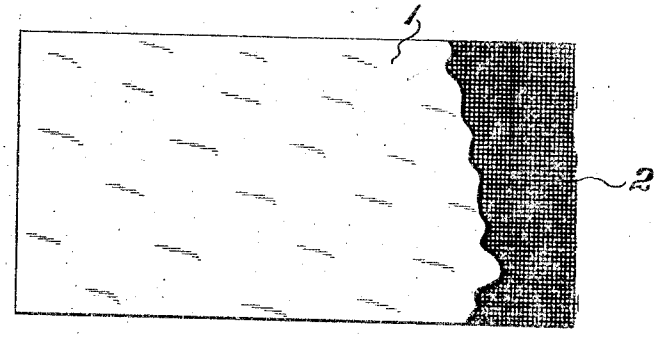


Fig. 1

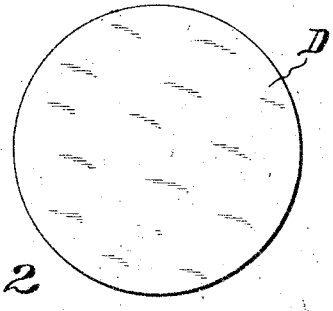


Fig. 2

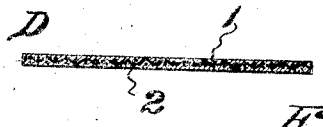


Fig. 3

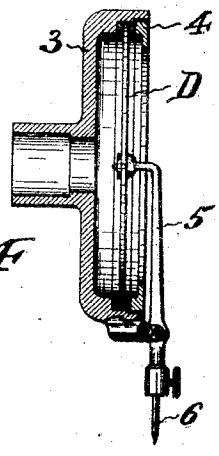


Fig. 4

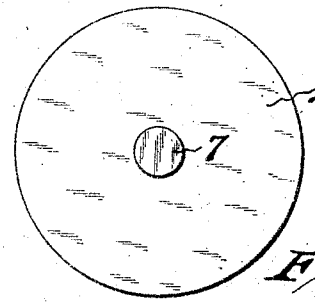


Fig. 5



Fig. 6

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SOUND-TRANSMITTING DIAPHRAGM, COMPOSITION THEREFOR, AND METHOD OF MAKING THE SAME.

1,412,619. Specification of Letters Patent. Patented Apr. 11, 1922.

Application filed May 6, 1921. Serial No. 467,500.

To all whom it may concern:

Be it known that I, GEORGE S. KNOX, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Sound-Transmitting Diaphragms, Composition Therefor, and Methods of Making the Same; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to characters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in sound transmitting diaphragms; and the invention has reference to a novel composition of materials for, and a novel method of, making such sound transmitting diaphragms, as well as to the diaphragm per se as a finished product or article of manufacture.

The invention has for its principal object to provide a very durable, flexible and sensitive sound transmitting diaphragm for phonographic, telephonic and similar uses, which is comprised of a plurality of materials producing a novel composition for the purposes mentioned, and which is made in a novel manner, all to the end that in operation the diaphragm is long lived and capable of transmitting sounds and musical tones with great accuracy, and with smooth or liquid effect, without accompanying harshness or metallic timbre.

Other objects of this invention, not at this time more particularly enumerated, will be clearly understood from the following detailed description of the same.

The invention is clearly illustrated in the accompanying drawings, in which:—

Figure 1 is a plan view illustrating the application of the novel composition, of which the diaphragm is comprised, to a base or reenforcing material, preparatory to the production of the complete diaphragm.

Figure 2 is a plan or face view of a finished diaphragm; and Figure 3 is a cross section through the same, the thickness thereof being somewhat exaggerated.

Figure 4 is a vertical cross section of a phonograph reproducer, showing my novel diaphragm assembled operatively therewith, the latter being shown in elevation.

Figure 5 is a face view of my novel diaphragm as arranged for telephonic use; and Figure 6 is an edge view of the same.

Similar characters of reference are employed in all of the above described views, to indicate corresponding parts.

The composition of ingredients from which the novel diaphragm material is produced, consists of alcohol, ether, gun-cotton, castor oil, resin, shellac and a coloring matter, such, e. g., as lamp-black.

While the relative proportions in which said ingredients may be used is subject to more or less variation, I have found the following proportions very effective in producing a diaphragm for phonographic uses, to wit:—

Alcohol	36	parts by weight.
Ether	36	parts by weight.
Gun-cotton	5	parts by weight.
Castor oil	1	part by weight.
Resin	12	parts by weight.
Shellac	10	parts by weight.
	100	

When used in the above stated proportions, there may be added to the mass a quantity of coloring matter, such as lamp-black, equivalent to one per cent of the total mass.

The manner of combining or mixing the ingredients above named to produce the initial composition is as follows:—

The major portion of the alcohol and the ether are first mixed together, whereupon the cotton is stirred therein and dissolved. The castor oil is then added to the mixture to form the preliminary solution. A small portion of the alcohol (which has been retained for the purpose) is then used to dissolve the shellac and resin, to thus produce a fluid mixture of the latter ingredients. The fluid mixture of shellac and resin is then added to the cotton-castor oil preliminary solution, and the whole mass thoroughly agitated and mixed together. Finally, the lamp-black or other desired coloring matter is added and thoroughly intermixed with

the final solution to complete the composition 1.

The composition 1 having been thus prepared, and while in fluid state, is applied to a fabric material 2. This fabric material, which is preferably linen, is stretched to hold the same taut, whereupon the composition is applied by washing, brushing or otherwise to both sides of the fabric to thoroughly impregnate the latter therewith and to evenly coat its opposite faces.

After the fabric 2 has been thus treated with the composition 1 it is allowed to dry, after which the resultant material is submitted to heat and pressure for the purpose of compressing, curing and hardening the same. Upon the completion of the curing and hardening steps, the material is trimmed to produce the final size and shape of diaphragm desired, resulting in the finished diaphragm D (see Figure 3).

The composition 1, reenforced by the imbedded fabric 2, provides a novel and highly efficient diaphragm for sound transmitting and similar purposes; the same being sufficiently flexible and sensitive to readily respond to the vibrations transmitted thereto, whereby, when vibrated, it causes very accurate reproduction of sounds and musical tones, reproducing the same with exceptional clearness and smooth rich quality without harshness or metallic timbre.

The novel diaphragm, constructed as above described, will readily withstand all ordinary strains in use, and the same will not crack, flake, peel or fracture, neither will the same buckle or warp out of shape; consequently the composition embodied in the novel structure affords an ideal material for phonograph reproducer diaphragms. When used for such a purpose, the same is clamped at its margins to the main body 3 of the reproducer by means of the clamp ring 4 in the usual manner. (See Figure 4.) The upper end of the pivoted vibrator arm 5 of the reproducer is rigidly connected to the center of the diaphragm by any suitable means, so that the oscillations of the arm 5, produced by the travel of the needle 6 (fixed to its lower end) over a phonograph record, are transmitted to the diaphragm to thereby vibrate the same and cause the reproduction of the sounds or musical tones in the usual manner.

Referring now to Figures 5 and 6 of the drawings, I have shown my novel diaphragm as arranged for telephonic use. As thus arranged I fix to its central portion a metallic button or disc 7 which serves as an armature, whereby the diaphragm is caused to respond or vibrate under the influence of magnetic impulses.

Having thus described my invention, I claim:—

1. A composition for making sound transmitting diaphragms and the like, comprising a mixture of alcohol, ether, gun-cotton, castor oil, resin and shellac.

2. A composition for making sound transmitting diaphragms and the like, comprising by weight 36 parts of alcohol, 36 parts of ether, 5 parts of gun-cotton, 1 part of castor oil, 12 parts of resin and 10 parts of shellac, adapted to be mixed together, spread upon a fabric base while in liquid state, dried and then hardened and cured by heat and pressure.

3. A sound transmitting diaphragm comprising a fabric base imbedded in a compound of alcohol, ether, gun-cotton, castor oil, resin and shellac to form a thin composite sheet, said compound being dried and then hardened and cured by the application of heat and pressure to said sheet.

4. The process of making diaphragm material comprising first preparing a liquid solution of alcohol, ether, gun-cotton, castor-oil, resin and shellac; then coating a fabric material with said solution to imbed said fabric therein; then drying the coated fabric; and finally submitting the dried coated fabric to heat and pressure for the purpose of hardening and curing the same.

5. The process of making diaphragm material comprising first preparing a solution containing by weight 36 parts of alcohol, 36 parts of ether, 5 parts of gun-cotton, 1 part of castor oil, 12 parts of resin and 10 parts of shellac; then coating a thin fabric material, such as linen, with said solution to impregnate said fabric therewith and imbed the same therein; then drying the fabric thus treated with said solution; and finally submitting the dried treated fabric to heat and pressure for the purpose of hardening and curing the compound provided by said solution.

6. A diaphragm structure consisting of a compound of alcohol, ether, gun-cotton, castor oil, resin and shellac, formed into a thin sheet, dried and then hardened by heat and pressure, and a layer of thin fabric material imbedded in said sheet thus provided.

In testimony that I claim the invention set forth above I have hereunto set my hand this 30th day of April, 1921.

GEORGE S. KNOX.

Witnesses:

GEORGE D. RICHARDS,

FREDK. C. FRAENTZEL.