P. B. DELANY.

SOUND REPRODUCING DIAPHRAGM.

APPLICATION FILED OCT. 1, 1920.

1,403,849. Patented Jan. 17, 1922.

Fig. 1,

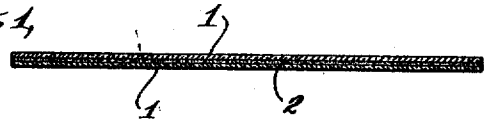


Fig. 2,

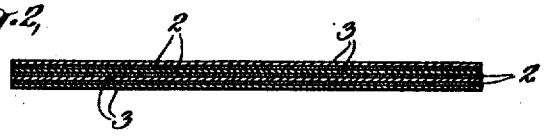


Fig. 3,

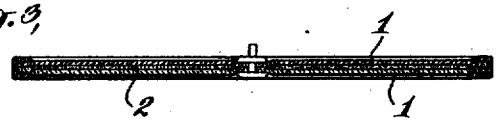
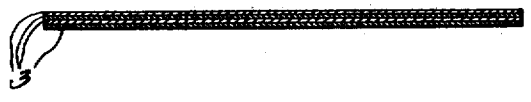


Fig. 4,



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SOUND-REPRODUCING DIAPHRAGM.

1,403,849. Specification of Letters Patent. Patented Jan. 17, 1922.

Application filed October 1, 1920. Serial No. 414,112.

To all whom it may concern:

Be it known that I, PATRICK B. DELANY, a citizen of the United States, residing at South Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Sound-Reproducing Diaphragms, of which the following is a specification.

This invention relates to diaphragms for phonograph sound boxes.

In a pending application Serial No. 331,974, filed October 20, 1919, I have described and claimed a laminated diaphragm consisting of layers of paper or other fibrous material alternating with layers of permanently flexible adhesive material, the whole assemblage being clamped between rigid or non-yielding gasket members. Diaphragms of this type have given greatly improved results as compared with the ordinary mica diaphragm particularly in the excellence of rendition of musical tones unaccompanied by extraneous metallic sounds characteristic of the use of mica diaphragms. In the course of continued experiments conducted for the purpose of obtaining, if possible, still more perfect results, I have discovered that a greatly improved laminated diaphragm can be formed of layers of fibrous or other material alternating with layers of a viscous substance, such as vaseline, in which the factor of adhesiveness is largely replaced by a lubricating characteristic and which not only permanently retains a pronounced yielding or pliant capacity but also renders the diaphragm, as a whole, impervious to moisture.

I do not confine myself to the use of any specific material to the exclusion of other materials and I find that excellent results can be obtained by the use of layers of mica, metal or glass alternating with films of vaseline, castor oil or other similar materials of animal, vegetable or mineral origin, or combinations of such materials, the assembled diaphragm being clamped between yielding gaskets. When sheets of fibrous material alternating with viscous substances are used, I prefer to clamp the diaphragm formed between non-yielding gaskets of metal, hard rubber, celluloid or the like. I find that diaphragms of either one of the two general forms referred to are greatly superior to the ordinary solid disk diaphragm formed of mica, in that the normal resonance and metallic ring of the ordinary diaphragm are wholly overcome and that there is almost a complete elimination of scratching and other extraneous sounds. In addition, there is developed a marked mellowness and human quality to vocal tones and a harmonious blending of sympathy instrumentation.

I attribute the superior results obtained to an increased degree of flexibility of the thin layers of material between which the viscous substance is spread and the consequent damping of inherent resonance in the case of mineral or hard disks as well as to the increased flexibility, owing to the lubrication of the disks, in their bowed flexation under the action of the vibrating arm of the reproducer.

I find that the amount of lubricating material used may be extremely small and in some cases I may omit the lubricant altogether and place the thin sheets in immediate contact with each other. However, in the preferred form of the invention I employ a sufficient quantity of the lubricating material to, at least, prevent the absorption of moisture by the disks.

In order to exclude air from the viscous substance between the disks comprising the diaphragm, I arrange to clamp the disks together tightly at their central as well as at their peripheral portions, thereby an annular air-tight receptacle or series of receptacles for the substance as will be clear, and which will preserve the material for an indefinite period of time unimpaired.

In the drawing:

Fig. 1 shows in cross-section a diaphragm formed of two disks of thin mica with an interposed layer of viscous lubricating material.

Fig. 2 shows a similar view of a diaphragm formed of four layers of paper alternating with lubricating material.

Fig. 3 shows a composite diaphragm such as is shown in either Fig. 1 or 2, clamped together both at the center and at the periphery.

Fig. 4 shows a composite diaphragm formed of sheets of fibrous material placed in immediate contact with each other.

In Fig. 1 of the drawing there is illustrated a diaphragm formed of two thin sheets of mica 1, with an interposed layer of lubricating material 2, such as vaseline. Fig. 2 shows a similar structure in which sheets of paper 3 or other fibrous material

alternate with films of vaseline 2. I have found a tough-fibred writing paper or wrapping paper well adapted for this purpose. As has been already indicated, the composite diaphragm thus produced is much more pliable and sensitive than a solid diaphragm of the same thickness, owing to the freedom of movement of the disks relative to each other as contrasted with the strains and compression effects on the outer surfaces of the solid or unitary type of diaphragm.

In Fig. 3 of the drawing there is shown a clamping arrangement in which the central as well as the peripheral portion of the diaphragm is clamped or compressed to thereby produce a sealing effect which will prevent the access of air to the lubricating material and thereby maintain the material indefinitely against deterioration.

As already indicated, the amount of lubricating material employed may be very small and may even be wholly omitted in certain cases. In Fig. 4 of the drawing there is shown a diaphragm formed of a plurality of sheets of fibrous material such as paper, the sheets or disks being clamped into intimate superficial contact with each other, without making use of either adhesive or lubricating material between the disks.

What I claim is:

1. A diaphragm formed of a plurality of layers of mica with a lubricant therebetween, the mica being clamped together at its periphery and also near the center to prevent access of air to the lubricant.

2. A diaphragm formed of a plurality of layers of mica with vaseline therebetween, the mica being clamped together at its periphery and also near the center to prevent access of air to the vaseline.

3. A diaphragm for sound boxes comprising a plurality of layers of normally resonant material with a lubricant therebetween, whereby normal resonance is overcome, the layers of material being clamped together at their periphery and also near the center to prevent access of air to the lubricant.

Signed at Nantucket, in the county of Nantucket and State of Masachusetts, this 13th day of September, 1920.

PATRICK B. DELANY.