

W. W. YOUNG.
METHOD OF MAKING ACOUSTIC DIAPHRAGMS.
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982,027.

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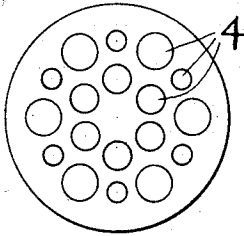


FIG. 1.

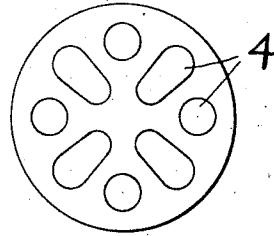


FIG. 2.



FIG. 3.



FIG. 4.



FIG. 5.

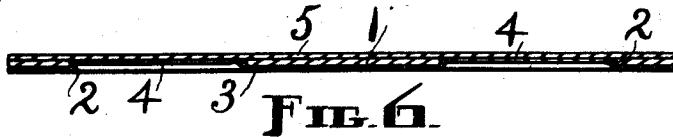


FIG. 6.



FIG. 7.

WITNESSES:

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METHOD OF MAKING ACOUSTIC DIAPHRAGMS.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WILLIAM W. YOUNG, a citizen of the United States of America, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented a new and useful Method of Making Acoustic Diaphragms, of which the following is a specification.

My invention relates to improvements in methods of manufacturing acoustic diaphragms for talking-machines, telephones, and the like, and consists in the several steps hereinafter set forth.

The object of my invention is to produce an acoustic diaphragm, of the class indicated above, which possesses in a marked degree not only the essential but the desirable characteristics and qualities of a device of this kind, such as durability and stability, resiliency and resonance, capability of giving out clear, loud and distinct tones of great volume and depth, and of evenly distributing the sound waves and quickly, completely and perfectly recovering its stable equilibrium, and immunity from blasts and scratching sounds and other alien and discordant noises.

In the accompanying drawings, which form part of this application, and in which like characters of reference indicate like parts throughout the several views, Figures 1 and 2 are side views of two diaphragms made in accordance with the new method, showing different formations and arrangements of the lesser or minor diaphragms, and Figs. 3, 4, 5, 6 and 7 are sectional views of five diaphragms, on an enlarged or exaggerated scale, illustrating different combinations or arrangements of the diaphragm-forming elements, incident to the putting into effect of said method.

Before explaining how the new diaphragm is produced, I wish to state that said diaphragm may be made individually, that is, by itself, or a sheet or strip may be prepared and the diaphragm cut from this, whichever way is most practical with any given material or materials. For the sake of brevity I will apply the following description to a single diaphragm, but as just stated this diaphragm might be a part of a strip or sheet from which it is to be cut at some particular stage or at the end of the manufacturing process.

First I take a disk of some suitable material and which has been perforated in some

suitable manner and apply with a brush or otherwise a compound, solution, mixture or emulsion which possesses the necessary qualifications; next I cover one or both sides of said disk with a thin diaphragmal integument or integuments and apply more of the compound, solution, mixture or emulsion as before; then I partially dry the disk thus prepared, by exposing it to air or subjecting it to heat; then I subject said disk to pressure between steel plates or the like, and finally I bake the disk. The only important changes in this method, that is to say, important as affecting the structure of the resulting product which is the finished diaphragm, consist—first, in using two disks, of what may be termed the base material of the diaphragm, instead of one, by placing the second disk over an integument on the first disk, the perforations in both disks being in correspondence and separated by said integument; and, second, in employing two different kinds of integuments for the lesser diaphragms; the two integuments generally comprising different materials and being arranged either both on one side of a disk of base material, or one on each side of such disk. In the first of these exceptions there is, as a rule, no outside integument or integuments on the completed diaphragm.

A diaphragm proper such as is shown in Fig. 3, wherein 1 represents a disk of base material having perforations 2 therein, 3—3 represent integuments on both sides of said disk, and 4 represents a lesser diaphragm across each of such perforations, is the resulting product of the method as first outlined. Slightly modified resulting products of the method as explained appear in the next three views, in which Fig. 4 shows a diaphragm proper which comprises two perforated disks 1 with a single integument 3 between to form the lesser diaphragm 4; Fig. 5 shows a diaphragm proper which comprises a perforated disk 1 and two integuments 3 and 5 of different materials on one side of said disk to form the lesser diaphragms 4; and Fig. 6 shows a diaphragm proper which comprises a perforated disk 1 and two integuments 3 and 5 of different materials on opposite sides of said disk. That in so far as the merits of my invention are concerned one diaphragm is as good as another and that all are, to all intents and purposes and from a patentable standpoint, substantially alike and produced in substan-

tially the same way are self-evident facts. In the Fig. 3 diaphragm the integuments 3 at the time they are applied to the disk 1 should be pressed into the perforations 2 and into contact with each other, so that in the finished diaphragm the portions of said integuments that are in said perforations and which form the lesser diaphragms 4 will be firmly stuck or cemented together and will therefore be strong and durable. And in the Fig. 6 diaphragm the integument 3 is pressed into the perforations 2, at the time of manufacture, and caused to adhere to those portions of the integument 5 which cover said perforations, as shown.

Various materials for the disk 1 may be employed, among which mention is made of mica, wire-gauze, sheet-metals such as aluminum, steel, etc., and fibrous materials such as more or less heavy paper and cardboard or bristol-board, blotting-paper, and the like. The employment of sheet-iron and some other metals renders the diaphragm fit for telephone purposes.

The perforations 2 should be clean-cut holes in the disk 1, and they may be of various shapes and sizes, arranged in any desired form regularly or irregularly, and more or less numerous. In the first two views there are shown lesser diaphragms 4 which are outlined by perforations that differ considerably, and from this it is clear that there is almost no limit to the different designs that may be given such perforations both as to outline and arrangement.

The material or combination of materials used for coating the disk or disks 1 and the integument or integuments 3 or 3 and 5 must be of such a nature that the same will adhere firmly to the base material of the diaphragm, that is, the disk or disks, and cause the integument or integuments also to adhere firmly to said base material or to each other, and where integuments are employed on opposite sides of the disk to cause them to stick together in or through the perforations 2; furthermore, the nature of the coating must be such that it will so unite with the other elements and harden during the process of manufacturing the diaphragm as to produce the stable and otherwise excellent device sought for. I have found that a coating which consists of silicate of soda, oxid of zinc, plaster of paris and barytes, gives most excellent results, the silicate of soda comprising about 95 per cent. of the emulsion thus produced, and the other ingredients comprising the other 5 per cent. in proportions of about one-third each. This emulsion when properly applied to the other elements, pressed and baked, cements such elements together and unites with them, even when the base material or one of the integuments or both is or are metal, to form a diaphragm which possesses the qualities

hereinbefore enumerated. I do not, however, intend to confine myself to any particular coating material or materials since the range of materials useful for this purpose is large. In this connection baking japans and varnishes may be mentioned as suitable materials for the coatings.

Tissue paper, silk, linen, and various other thin fabrics are exceedingly well fitted for the integument or integuments 3 out of which may be formed or by means of which may be produced the lesser diaphragms 4. These fabrics take the coating nicely, adhere firmly to the base material, and furnish lesser diaphragms of the right character. For the integument 5, which also may enter into the formation of the lesser diaphragms 4, as stated, I prefer to employ very thin metal such as metal foil, because this takes the coating well, and the results obtained therefrom acoustically are of the best, even when the foil is used alone without the fabric, as it may be.

The partial drying by either exposure to air which is substantially free from moisture or subjecting to direct heat is a step in the method which will be readily understood and needs no further explanation, and the same is true of the pressing or compressing.

The last step, that of baking, appears to be necessary in order to fix the emulsion or its equivalent, after the latter has been applied to the diaphragmal members and pressed into or against them as the case may be, and thus firmly, completely and permanently to unite the several materials into an integrate structure. With some metal disks and integuments and the aforesaid emulsion, while the latter does not, of course, enter the metal as it does fiber and fabric to a greater or less extent, nevertheless said emulsion apparently forms a chemical combination with the metal when baked, and probably does so.

The perforations 2 are made in the disk 1 when said disk consists of wire-gauze just the same as when it consists of material which is imperforate originally.

It is not imperative that two integuments, when that number is used, shall meet to be united in or through the perforations 2, although the structure is stronger when they are so united and it is thought that the desirable acoustic properties of the diaphragm as a whole are enhanced thereby.

Each of the diaphragms proper or major diaphragms shown in the drawings includes a plurality of lesser or minor diaphragms, 4, but there might be only one minor diaphragm in each case and that one may be of any suitable size and shape.

In addition to the variations already noted herein others may be made in my invention provided the scope of the claims be not

exceeded. As examples of such additional variations, I desire to call attention to the following, from which it is obvious that the different combinations or arrangements of disks and integuments that may be resorted to are quite numerous. The metal-foil integument 5 may be substituted for the fabric integuments 3 in the Fig. 4 arrangement, or said integument may be introduced into the Fig. 4 arrangement while still retaining said integument 3. In this last example, however, instead of combining only the two integuments 3 and 5, as in Fig. 5, with the second disk 1 added, I may introduce a second integument 3 so that the integument 5 shall be between the two integuments 3 and these three between the two perforated disks. Fig. 7 illustrates the last-mentioned arrangement or combination. Foil integuments 5 may be used in the Fig.

3 arrangement, but they need not necessarily meet in or through the disk perforations.

What I claim as my invention, and desire to secure by Letters Patent, is—

The method of making acoustic diaphragms, of the class described, consisting in applying a suitable moist coating to a perforated base material member and uniting a diaphragmal integument with such base material member, such integument being thinner than the base material member and extending across the perforation therein to form a lesser diaphragm, in applying such moist coating to the united parts externally, in partially drying, in pressing, and in baking.

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Witnesses:

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