W. W. YOUNG.

TALKING MACHINE DIAPHRAGM.

APPLICATION FILED JAN. 5, 1910.

**973,735.** Patented Oct. 25, 1910.

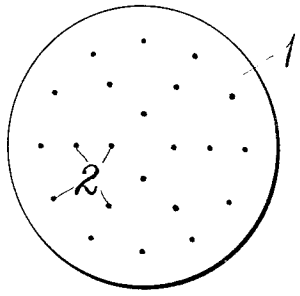



FIG. 1.

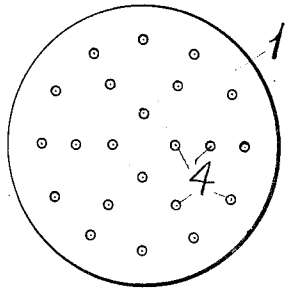



FIG. 2.

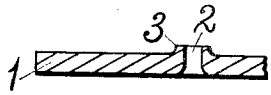



FIG. 3.

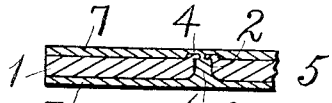



FIG. 4.

Witnesses
A. C. Fairbanks.
M. L. Fairbanks

Inventor
William W. Young,
by Webster & Co.,
Attorneys

# UNITED STATES PATENT OFFICE.

WILLIAM W. YOUNG, OF SPRINGFIELD, MASSACHUSETTS.

## TALKING-MACHINE DIAPHRAGM.

973,735. Specification of Letters Patent. Patented Oct. 25, 1910.

Original application filed December 12, 1908, Serial No. 467,225. Divided and this application filed January 5, 1910. Serial No. 536,473.

*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 Talking-Machine Diaphragm, of which the following is a specification, the same being a divisional part of my application filed in the United States Patent Office December 12, 1908, and serially numbered 467,225.

My invention relates to improvements in reproducing diaphragms for talking-machines, and consists of thin, imporous, sheet material having perforations therein, which material may have burs or bosses thereon and a filling and coating in the perforations and on one or both sides, said filling and coating having been hardened by compression and heat. Or, differently stated, it may be said that the new diaphragm consists of thin, perforated material either with or without burs thereon and if with burs then either with or without them in a flattened condition, and either with or without the filling and coating hardened by compression and heat, the diaphragm in the first case being of one material or homogeneous and in the second case of different materials or heterogeneous.

With the mica and the ordinary sheet-metal, reproducing diaphragms commonly used in talking machines, it has not been possible to obtain the best results from such machines, because neither of these diaphragms is capable of producing such results; moreover, the mica diaphragms or disks, which greatly exceed in number the ordinary sheet-metal diaphragms or disks, are very fragile and also expensive since there is a great waste incident to procuring disks of the proper size and character; the mica disks, too, deteriorate with use.

The primary object of my invention, therefore, is to provide a substitute for mica, ordinary sheet-metal, and other kinds of diaphragms heretofore employed, which substitute is durable and does not deteriorate, is resilient and resonant, is impervious to moisture and unaffected by climatic changes especially when coated, and is capable of giving out clear, loud, and distinct tones of great depth and volume, of evenly distributing the sound waves and making a quick, complete, and perfect recovery, and of lessening to a great extent all alien and discordant noises such as blasts and scratching sounds which are so prevalent with the ordinary diaphragm.

In the accompanying drawings, which form a part of this application and in which like characters of reference indicate like parts through the several views—Figure 1 is a side view of a sheet metal disk perforated and represents the unfilled diaphragm; Fig. 2, a view of a diaphragm as it appears when the burs left by the perforating punch have been upset or pressed into small bosses and when seen from the side upon which such bosses are located, the appearance being practically the same whether said diaphragm be filled and coated or not provided that, in the former instance, the coating be transparent; Fig. 3, an enlarged fragment in section of the disk or diaphragm shown in the first view, and, Fig. 4, an enlarged fragment in section of a diaphragm which has been filled and coated and pressed.

Various kinds of metals and their alloys which have been rolled or otherwise made thin can be utilized in the manufacture of my improved diaphragms, among which mention may be made of aluminum and copper, the former being an exceedingly good metal for the purpose. In addition to sheet-metals other materials which are sufficiently hard and dense and possess the other necessary qualities to a greater or less degree may be used, the materials being imporous when they are to be filled and coated.

In its simplest form the diaphragm consists of a disk 1, of aluminum for example, in which there are a number of small holes 2 therein. The holes 2 are more or less numerous, they extend through the disk 1 from side to side, and they are preferably punched rather than cut so as to leave projections or burs on one side of said disk, as shown at 3, in Fig. 3. The object of perforating the disk, and more especially of perforating it in the manner just stated, is for the purpose of breaking up the structure of the same and of obtaining the small bosses which are formed by flattening the aforesaid burs, as will presently be made clear, such changes in the character of the original disk being productive of beneficial results. A further object of the perforations may be to afford means for producing a structure of

different materials or a structure that consists of unlike parts in texture, as is done when the perforations are subsequently filled. This last phase of the invention will be dealt with at length in the course of this description.

In some cases the burs 3 may be left intact, but usually they will be upset to form small, flat bosses 4, Figs. 2 and 4, on one side of the disk 1 at the corresponding ends of the holes 2. In reality, the bosses 4 are necessarily somewhat irregular in shape, and the openings in their centers are often so exceedingly minute as scarcely to be discernible, but of course the metal, which has been perforated by punching, when subjected to pressure in the upsetting process does not return to its former place or condition. In the drawings the holes 2, burs 3, and bosses 4 are on an exaggerated scale. The disk 1 is pressed between steel plates or their equivalent to flatten the burs 3 into the bosses 4.

A more complex and perhaps in some respects better diaphragm than that previously described is made by filling and coating the perforated disk 1 with one or more suitable chemical substances or materials which are suitable for the purpose and give the desired results, such as soluble minerals like plaster-of-paris, oxid of zinc, silicate of soda, etc. The filling and coating materials mentioned, while practical, are not the only ones that may be used successfully, and I do not, therefore, intend to be limited to them. The disk 1, with the holes 2 punched therein, is treated with a suitable filling and coating compound, solution, mixture, or emulsion, such consisting of silicate of soda or silicate of potash and oxid of zinc, for example, which is introduced into said holes and spread on one or both sides of said disk, generally on both sides. The coating is usually applied several times, and the combined filling and coating is set or fixed and rendered hard and otherwise fit to serve its purpose by subjecting the disk treated with it to pressure and heat. The burs 3 are transformed into the bosses 4 by the pressure to which the disk is subjected. The diaphragm 5, Fig. 4, embodies the features just described, the filling being represented at 6 and the coats on the two sides of the disk at 7. When the burs 3 are flattened the substance of the disk 1 is forced partly into the adjacent ends of the holes or perforations 2 and into the filling when present, but enough remains outside to form the bosses 4. Wire-mesh, -cloth, or -gauze may be utilized for the disks, but in that case there will be no burs or bosses.

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

1. As a new article of manufacture, a diaphragm, for talking-machines, consisting of a perforated disk having burs formed thereon, each bur surrounding the perforations at one end.

2. As a new article of manufacture, a diaphragm, for talking-machines, consisting of a perforated disk having flattened burs thereon which form bosses, each of the latter surrounding its perforation at one end.

3. As a new article of manufacture, a diaphragm, for talking-machines, consisting of a disk having perforations therein and bosses thereon which latter surround said perforations and partially fill the same.

4. As a new article of manufacture, a diaphragm, for talking-machines, consisting of a disk having perforations therein which are filled with the material originally forced out to form such perforations, and with hardened filling material.

5. As a new article of manufacture, a diaphragm, for talking-machines, consisting of a perforated metallic disk having bosses thereon surrounding the perforations therein at one end of each, hardened filling material in the perforations in said disk, and hardened coating material on the outside of said disk.

WILLIAM W. YOUNG.

Witnesses:
F. A. CUTTER,
A. C. FAIRBANKS.