

983,416.

Patented Feb. 7, 1911.

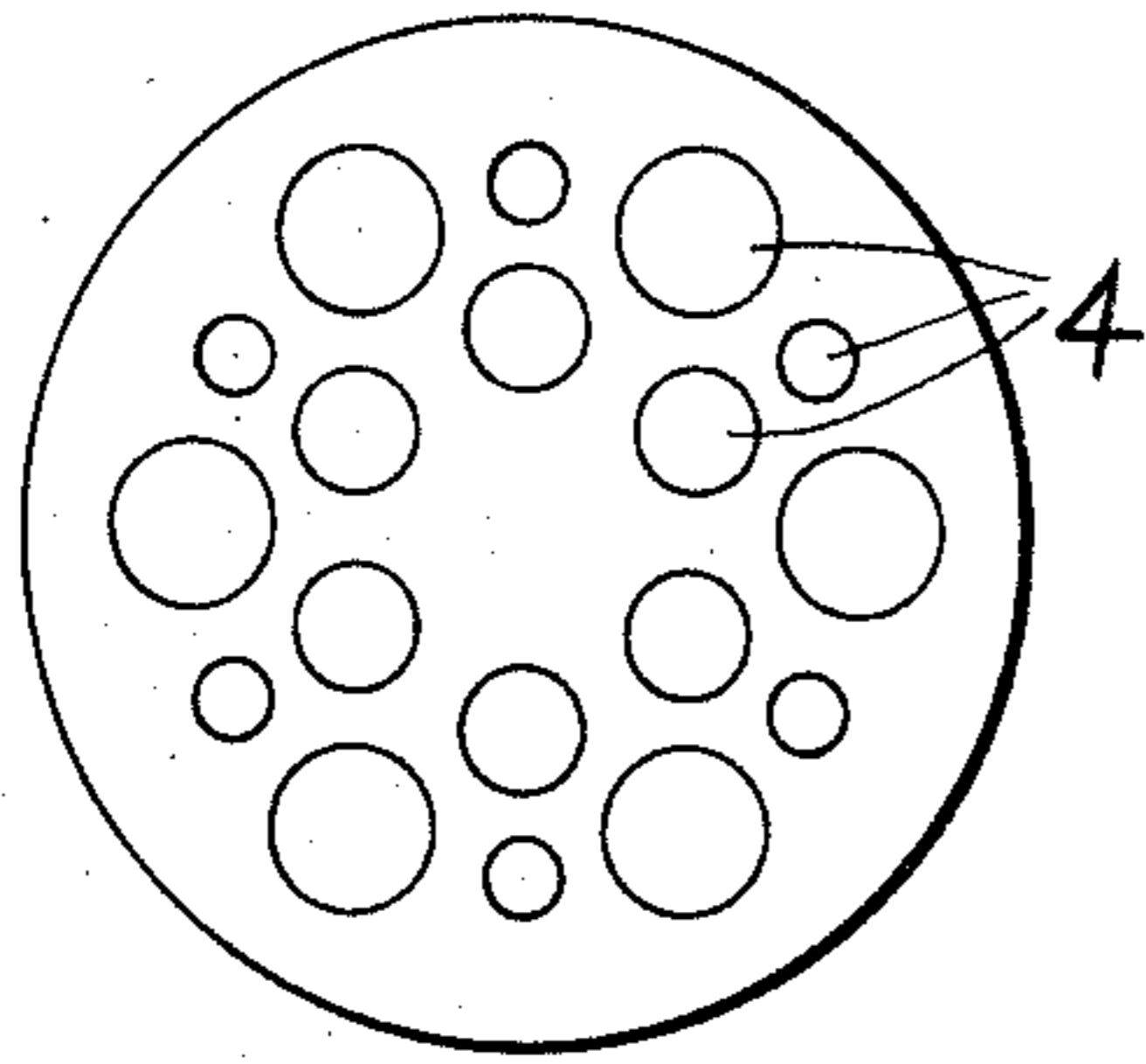


FIG. 1.

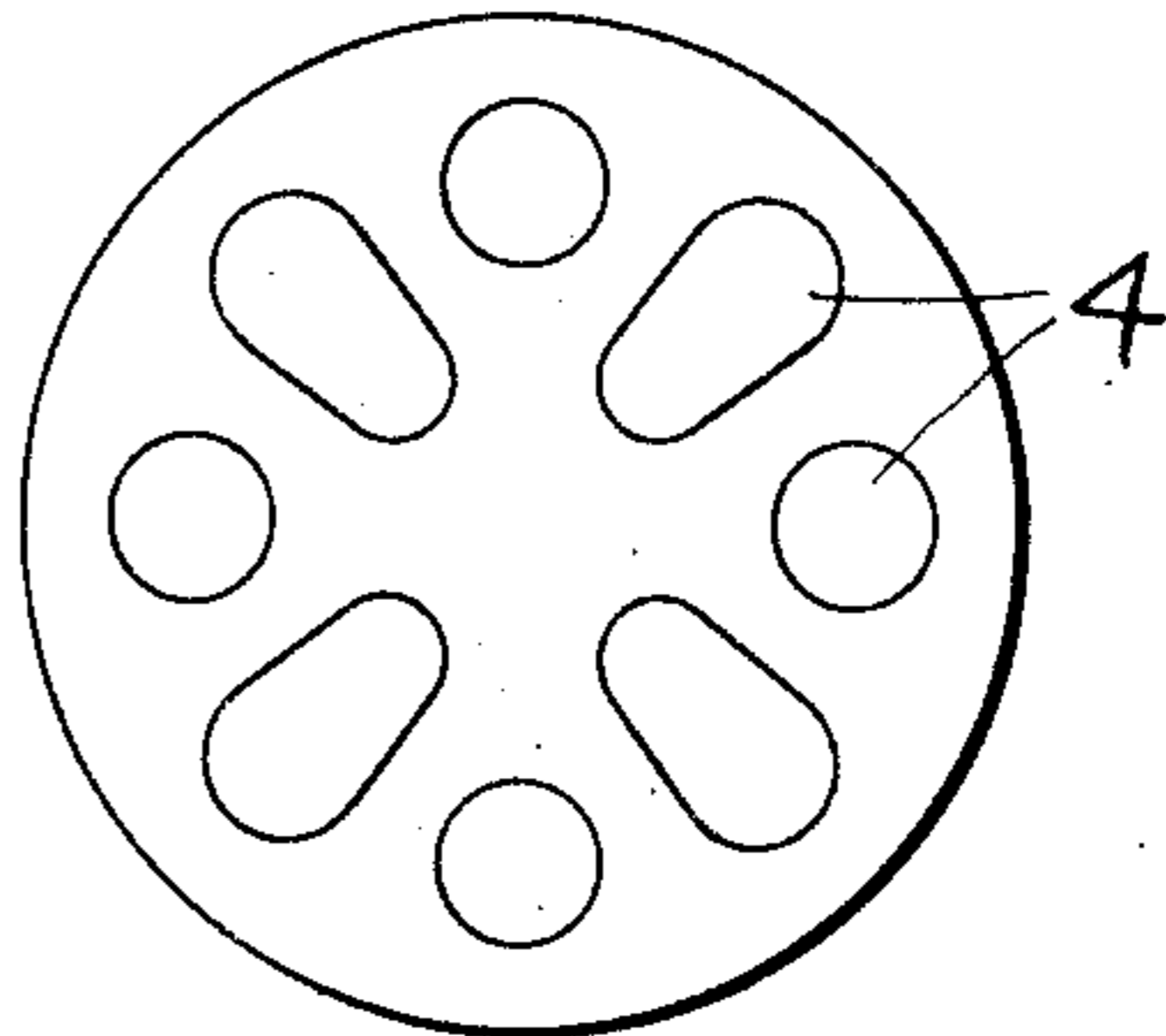


FIG. 2.

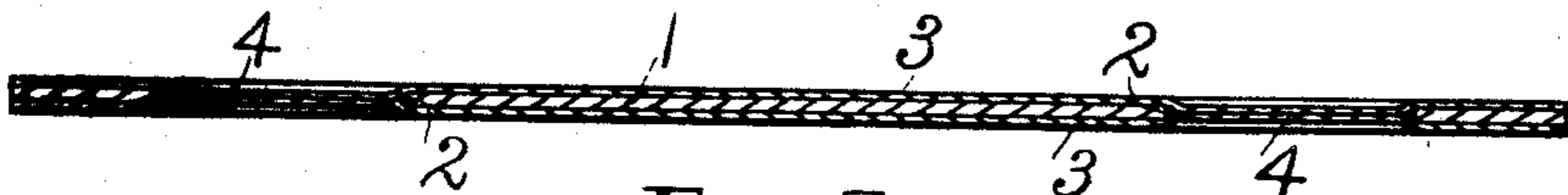


FIG. 3.

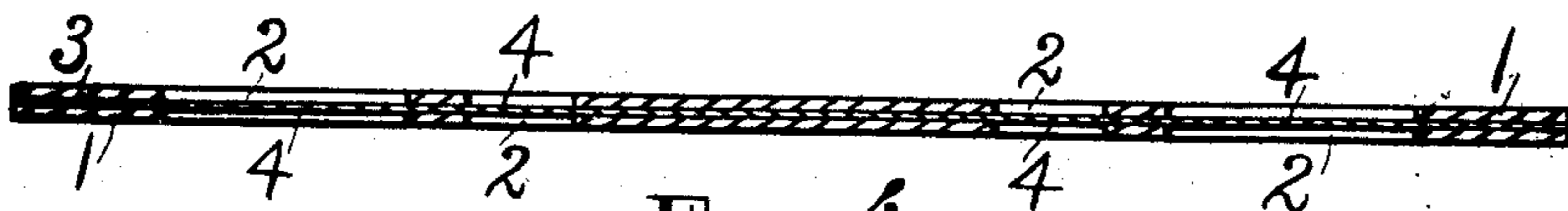


FIG. 4.

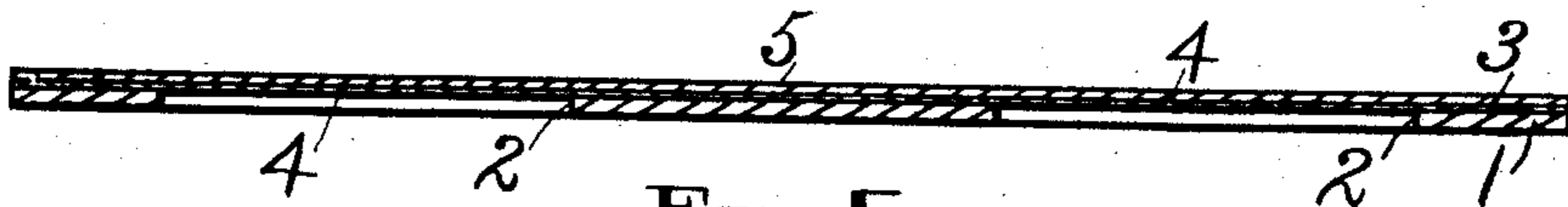


FIG. 5.

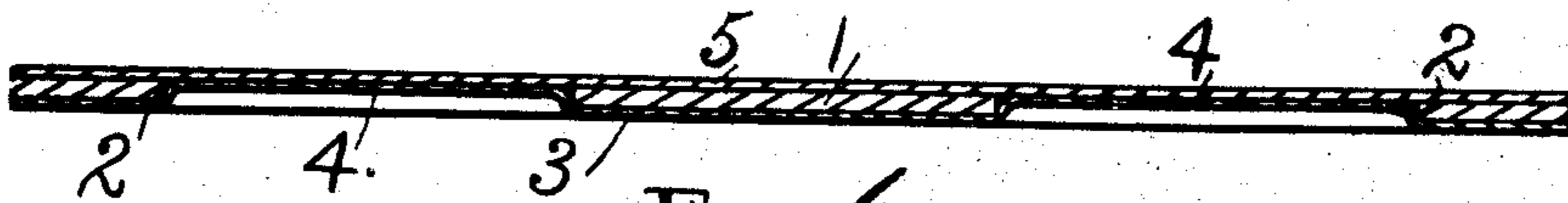


FIG. 6.

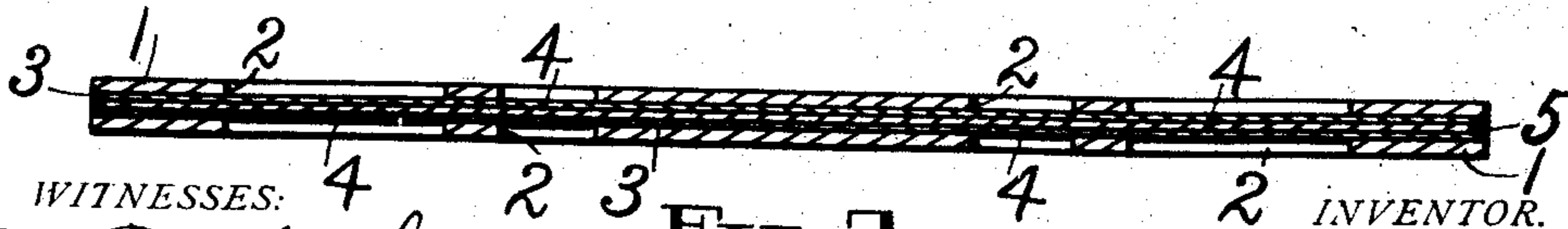


FIG. 7.

WITNESSES:  
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# UNITED STATES PATENT OFFICE.

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## ACOUSTIC DIAPHRAGM.

983,416.

Specification of Letters Patent.

Patented Feb. 7, 1911.

Original application filed January 23, 1909, Serial No. 473,819. Divided and this application filed February 18, 1910. Serial No. 544,659.

*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 Acoustic Diaphragm, of which the following is a specification, the same being a divisional part of United States application for patent, Serial No. 473,819, filed January 23, 1909.

My invention relates to improvements in acoustic diaphragms for talking machines, telephones, and the like, and consists broadly of a large diaphragm or diaphragm proper provided with one or more lesser diaphragms.

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 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 elevations of two of my diaphragms, 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.

This diaphragm may be made in several different ways, as will presently appear, without, however, departing from the general nature of the invention.

Referring first to Fig. 3, it will be seen that a diaphragm is there represented which consists of a disk 1, of what may be termed the base material which enters into the construction of the diaphragm, in which are a number of perforations 2, and having firmly

attached to both sides thereof two integuments 3. These members constitute the diaphragm proper or major diaphragm, in which are lesser or minor diaphragms 4 consisting of those portions of the integuments 3 which extend across the perforations 2.

Slight modifications of the diaphragm described above 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 diaphragms 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 are self-evident facts.

In Fig. 3 diaphragm the integuments 3 should be pressed into the perforations 2 and into contact with each other, this being done at the time the diaphragm is made, 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 regular or irregular, 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 diaphragm in each case is not only coated with a suitable material or combination of materials at the time the integument or integuments are attached thereto and for the purposes of effecting such attachment, but also after the several parts have been thus united, so that the exterior of the finished diaphragm consists of such material or materials. The material or combination of materials used for thus 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 diaphragms 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% of the emulsion thus produced, and the other ingredients comprising the other 5% in proportions of about one-third each. This emulsion is applied to the other elements and is pressed and baked thereon, with the result that it cements such elements together and unites with them, even when the base material or one of the integuments or both is or are metal. The diaphragm thus produced possesses the qualities hereinbefore enumerated. I do not intend to confine myself, however, 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 evenly, 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 dia-

phragms 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.

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 compound with the metal, when baked, and probably does—in any event, the acoustic properties of the diaphragm are greatly enhanced by the emulsion coating applied thereto and fixed thereon.

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 or 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 increased or improved 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 claim 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 the disks and integuments that may be resorted to are quite numerous. The metal foil integument 5 may be substituted for the fabric integument 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—

As an improved article of manufacture, an acoustic diaphragm, of the class described, consisting of a plain disk having a plurality of openings therein between the

central portion and the periphery thereof,  
such openings being so located as to leave in-  
tact both the central and edge portions of  
said disk and also to avoid separating the  
5 disk into independent parts, an integument  
applied to said disk across said openings,  
and a hardened coating between and on the

outside of said disk and integument, the lat-  
ter being thinner than the former and form-  
ing with said coating lesser diaphragms.

WILLIAM W. YOUNG.

Witnesses:

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A. C. FAIRBANKS.